JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

KATOL ROAD, NAGPUR

Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.i

An Autonomous Institute, with NAAC "A" Grade

Affiliated to DBATU, RTMNU & MSBTE, Mumbai

Department of Civil Engineering

"Building Better Development"

Session 2018-19

VISION	MISSION
To be a well-known center for shaping professional leaders of Global Standards in Civil Engineering	Provide quality education and excellent learning Environment for overall development of students. Making Sustainable efforts for integrating academics with Industry.

Semester- III

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
		Theory				
01	BTBSC301	Mathematics – III	3	1	-	4
02	BTCVC302	Mechanics of Solids	3	1	✓	4
03	BTCVC303	Hydraulics I	2	1	✓	3
04	BTCVC304	Surveying I	2	1	✓	3
05	BTCVC305	Building Construction	2	-	✓	2
06	BTCVC306	Engineering Geology	2	-	✓	2
07	BTHM303	Soft Skills Development	2	-	-	AU
		Practical / Drawing and/or Design				
08	BTCVL307	Hydraulics Laboratory I	-	-	2	1
09	BTCVL308	Surveying Laboratory I	-	-	2	1
10	BTCVL309	Building Construction - Drawings Laboratory	-	-	2	1
11	BTCVL310	Engineering Geology Lab	-	-	2	1
12	BTCVS311	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
13	BTCVF312	Field Training / Internship/Industrial Training Evaluation (from semester II)	-	-	-	1
		Sub-Total	16	4	09	
		Total	29			23

Semester- IV

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
		Theory				
01	BTCVC401	Hydraulics II	2	1	✓	3
02	BTCVC402	Surveying – II	2	1	✓	3
03	BTCVC403	Structural Mechanics-I	3	1	-	4

04	BTID405	Product Design Engineering	1	2	-	3
05	CV E1	**Elective I**	3	-	-	3
06	BTCVC406	Engineering Management	1	-	-	AU
07	BTHM3401	Basic Human Rights	2	-	-	AU
Practical / Drawing and/or Design						
8	BTCVL407	Hydraulics Laboratory II	-	-	2	1
09	BTCVL408	Surveying Laboratory II	-	-	4	2
10	BTCVL409	Mechanics of Solids Laboratory	-	-	2	1
11	BTCVM410	Mini Project	-	-	2	1
12	BTCVF411	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	1
		Sub-Total	**14**	**5**	11	
		Total	**31**			**22**
Elective I						
	BTCVE404A BTCVE404B BTCVE404C	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

Detailed Syllabus

Semester III

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
Theory						
01	BTBSC301	Mathematics – III	3	1	-	4
02	BTCVC302	Mechanics of Solids	3	1	✓	4
03	BTCVC303	Hydraulics I	2	1	✓	3
04	BTCVC304	Surveying I	2	1	✓	3
05	BTCVC305	Building Construction	2	-	✓	2
06	BTCVC306	Engineering Geology	2	-	✓	2
07	BTHM303	Soft Skills Development	2	-	-	AU
Practical / Drawing and/or Design						
08	BTCVL307	Hydraulics Laboratory I	-	-	2	1
09	BTCVL308	Surveying Laboratory I	-	-	2	1
10	BTCVL309	Building Construction - Drawings Laboratory	-	-	2	1
11	BTCVL310	Engineering Geology Lab	-	-	2	1
12	BTCVS311	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
13	BTCVF312	Field Training / Internship/Industrial Training Evaluation (from semester II)	-	-	-	1
		Sub-Total	16	4	09	
		Total	**29**			**23**

BTBSC 301 Mathematics – III

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Laplace Transform (Lectures 08)

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by tn, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Module 2: Inverse Laplace Transform (Lectures 08)

Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Module 3: Fourier Transform (Lectures 05)

Definitions – integral transforms; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Module 4: Partial Differential Equations and Their Applications (Lectures 05)

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one-dimensional heat flow equation $\left(\frac{6u}{6t} = c^2 \frac{6^2u}{6x^2}\right)$, and two-dimensional heat flow equation (i.e. Laplace equation: $\frac{6^2u}{6x^2} + \frac{6^2u}{6y^2} = 0$)

Module5: Functions of Complex Variables (Differential calculus)(Lectures 05)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

Module6: Functions of Complex Variables (Integral calculus) (Lectures 07)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books

1) Grewal B. S., "Higher Engineering Mathematics" Khanna Publishers, New Delhi.

2) Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New York.

3) Das H. K. and Er. VermaRajnish, "Higher Engineering Mathematics", S. Chand & Co. Pvt. Ltd., New Delhi.

4) Dr. Singh B. B., "A course in Engineering Mathematics (Vol III)", Synergy Knowledgeware, Mumbai.

5) Wartikar J.N. and Wartikar P.N., "Engineering Mathematics Vol. I & II", Pune VidyarthiGrihaPrakashan, Pune, 1992

6) Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill Publications, New Delhi.

Reference Books

1) Peter O' Neil, "A Text Book of Engineering Mathematics" Thomson Asia Pte Ltd., Singapore.

2) Wylie C. R. & Barrett L. C., "Advanced Engineering Mathematics", Tata Mcgraw-Hill Publishing Co. Ltd., N. Delhi.

3) Dr. Singh B. B., "Integral Transforms and their Engineering Applications", Synergy Knowledgeware, Mumbai.

4) Sneddon I. N., "Integral Transforms", Tata McGraw-Hill , New York.

Course Outcomes: On completion of the course, student will be able to formulate and solve mathematical model of civil engineering phenomena in field of structures, survey, fluid mechanics and soil mechanics.

☑☑☑☑☑☑☑☑☑☑☑

BTCVC 302 Mechanics of Solids

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Stress and Strain

Simple stress -Analysis of internal forces, simple stress, shearing stress, bearing stress, diaphragm or skin stresses in thin walled vessels, statically indeterminate members and thermal stresses

Simple strains -Stress strain diagram for different engineering materials and its importance for elastic and plastic analysis, Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and tri -axial deformations, variation of stress with inclination of element, relationship between modulus of rigidity and modulus of elasticity, variation of stress at a point: analytical derivation, introduction to strain measurement devices, Sensors: working principle

Module 2: Axial Force, Shear Force and Moment in Beams

Axial force, shear force and moment in beams – concept of unbalanced forces at a transverse section, axial forces, shear forces and moment – interaction of these, relations among load shear and moment, introduction to moving loads

Module 3: Stresses in beams: Theory of cylindrical bending,Relationship between intensity of loading, shear force and bending moment over elemental length, Derivation of flexural formula, economic sections, analysis of flexural action, derivation of formula for shearing stress, concept of shear flow, shear lag and shear center

Torsion -Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous shafts

Module 4: Columns and Struts

Concept of short and long columns, formulae by Euler and Rankin, Euler's Crippling load for different end conditions, limitation of Euler's formula, equivalent length, eccentrically loaded short compression members, Kern of a section; load applied off the axes of symmetry, introduction to combined axial and flexural loads,

Module 5: Combined Stresses

State of simple shear, Analytical and graphical representation of state of combined stress at a point, absolute maximum shearing stress, application of Mohr's circle to combined loading, principal stresses and strains

Module 6: Theories of Failure: Concept of failure in strength and failure in deformation, statement and application of maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory

Text Books

- Singer F.L. and Pytle, "Strength of Materials", Harper Collins Publishers, Fourth Edition
- Junnarkar S.B. (2014), "Mechanics of Structures", Charotor Publishers, Anand, 31st edition,
- Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
- Sadhu Singh, "Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-048-7
- Prasad I.B, "A text book of Strength of Materials", Khanna Publishers, N. Dehli, ISBN NO:978-81-7409-069-X
- Timoshenko S.P. and Young D.H., "Elements of Strength of Materials", East West Press, 4th edition 1962, New Delhi
- Prasad I.B, "A text book of Strength of Materials", ISBN: 978-81-7409-069-X
- Dr. Sadhu Singh, "Strength of Materials", ISBN: 978-81-7409-048-7
- Ramamrutham S., "Strength of Materials", Dhanpatrai and Sons, Delhi

Reference Books

- Beer F P., Jhonston E. R., John. T. D E wolf, "Mechanics of Materials" TMH, 7th edition
- Popov E.P., "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
- Crandall S.H., Dahl N.C., & Lardner T.J., "An Introduction to Mechanics of Solids", Tata McGraw Hill, 2^{nd} Edi, 1978
- Nash W., "Strength of Materials Schaum's outline series", McGraw Hill, fourth edition
- Punmia B. C., "Mechanics of Materials" Laxmi Publications, revised edition, 2016
- Subramanian R., "Strength of Materials" Oxford University Press, 2nd edition, New Delhi
- Dr. Sadhu Singh, "Theory and Solved Problems in Adv. Strength of Materials", ISBN: 978-81-7409-212-7

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform the stress-strain analysis.

CO2: Draw force distribution diagrams for members and determinate beams.

CO3: Find deflections in determinant beams.

CO4: Visualize force deformation behavior of bodies.

☑☑☑☑☑☑☑☑☑☑☑

BTCVC 303 Hydraulics I

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Fundamental Concepts **(Lectures 06)**

Definition of fluids, fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, types of fluids - Newtonian and non-Newtonian fluid, continuum, fluid pressure

Module 2: Fluid Statics **(Lectures 06)**

Forces on fluid elements, fundamental equation, manometers, hydrostatic thrust on submerged surfaces, buoyancy, stability of unconstrained bodies, fluids in rigid body motion

Module 3: Fluid Kinematics **(Lectures 06)**

Types of flow, continuity equation, derivation and applications of momentum equation, Euler's equation, Bernoulli's equation, velocity potential and stream function, concept of flow net

Module 4: Laminar Flow **(Lectures 06)**

Fully developed laminar flow between infinite parallel plates, both plates stationary, upper plate moving with constant speed, fully developed laminar flow in pipe.

Turbulent flow: Shear stress distribution and turbulent velocity profiles in fully developed pipe flow, velocity distribution and shear stresses in turbulent flow, Prandtl mixing length theory, Nikuradse's experiment, Introduction to Boundary Layer Theory

Module 5: Dimensional Analysis and Similitude **(Lectures 06)**

Nature of dimensional analysis, Rayleigh’s Method, Buckingham pi theorem, dimensionless groups and their physical significance, flow similarity and model studies, Scale Effects, Distorted and Undistorted Models

Module 6: Flow Measurement **(Lectures 06)**

Direct methods, restriction flow meters, linear flow meters, traversing methods, measurements in open channel flow

Flow Through Pipes: Loss of energy in pipes, pipe discharging from a reservoir, pipe connecting two reservoirs in series and parallel, siphon, transmission of power through nozzle, water hammer in pipes- rigid and elastic water column theory, surge tanks - function, calculation of head loss, introduction to Moody's chart, nomograms and other pipe diagrams

Text Books

- Fox. R. W. andMc-Donald. A. T., “Introduction to Fluid Mechanics”, John Wiley and Sons, Fifth Edition
- Modi and Seth, “Fluid Mechanics and Hydraulic Machinery”, Standard Book House, Tenth Edition , 1991
- Kumar K. L., “Fluid Mechanics”
- Bansal R. K., “Fluid Mechanics”
- Jain A.K, “Fluid Mechanics including Hydraulic Machines” ISBN: 978-81-7409-194-7

Reference Books

- Streeter V. L., Bedford K. W. and Wylie E. B., “Fluid Dynamics”, New York, McGraw-Hill, Ninth Edition, 1998
- Som S. K. & Biswas G., “Introduction to Fluid Mechanics & Fluid Machines”, Tata McGraw-Hill, 2nd Edi., 2003

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calibrate the various flow measuring devices.

CO2: Determine the properties of fluid and pressure and their measurement.

CO3: Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network.

CO4: Visualize fluid flow phenomena observed in Civil Engineering systems.

* * *

BTCVC 304 Surveying – I

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Chain Surveying **(Lectures 08)**

Definition, principles, classification, fields and office work, scales, conventional signs, survey instruments, their care and adjustment, ranging and chaining, reciprocal ranging, setting perpendiculars, well-conditioned triangles, traversing, plotting , enlarging and reducing figures

Module 2: Compass Surveying **(Lectures 08)**

Prismatic compass, surveyor's compass, bearing systems and conversions, local attraction, magnetic declination, dip traversing, adjustment of errors

Module 3: Plane Table Surveying (Lectures 05)

Plane table instruments and accessories, merits and demerits, methods: radiation, intersection, resection, traversing

Module 4: Leveling and Applications (Lectures 08)

Level line - Horizontal line - Levels and Staves, Sprit level – Sensitiveness, Bench marks - Temporary and permanent adjustments, Fly and Check leveling, Booking, reduction, Curvature and Refraction – reciprocal leveling - Longitudinal and cross sections - Plotting - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs. Planimeter-Types, Theory, concept of zero circle, Study of Digital Planimeter, Computation of Areas and Volumes

Module 5: Theodolite Surveying (Lectures 05)

Theodolite - Vernier and micro-optic - Description and uses - temporary and permanent adjustments of vernier transit – Angles: Horizontal - Vertical - Heights and Distances - Traversing - Closing error and distribution - Gales's table - Omitted measurements

Module 6: Engineering Surveys (Lectures 05)

Reconnaissance, Preliminary and location surveys for engineering projects, Layout, Setting out works, Route Surveys for highways, railways and waterways, introduction to curve ranging, Mine Surveying - Instruments – Tunnels: correlation of underground and surface surveys, shafts

Text Books

- Kanetkar T.P. and Kulkarni S. V., "Surveying and Leveling", Vols. I, II and III, VidyarthiGruhPrakashan, Pune
- Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications, 16th edition, 2016

Reference Books

- Clark D., "Plane and Geodetic Surveying", Vol. I & II, C.B.S. Pub. &Distri., N. Delhi, 6th edi.
- Anderson J. M. and Mikhail E. M., "Introduction to Surveying", McGraw Hill Book Company
- Bannister A. and Raymond S., "Surveying", ELBS, Sixth Edition, 1992
- KahmenHeribert and Faig Wolfgang, "Surveying", Walter de Gruyter, 1995

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform measurements in linear/angular methods.

CO2: Perform plane table surveying in general terrain.

CO3: Know the basics of leveling and theodolite survey in elevation and angular measurements.

☑☑☑☑☑☑☑☑☑☑☑

BTCVC 305 Building Construction

Teaching Scheme: (2 Lectures) hours/week

Course Contents

Module 1: Masonry Construction (Lectures 06)

Stone masonry: Random rubble, un-coursed rubble, coursed rubble & ashlar brickwork & brick bonds - english, flemish, principles to be observed during construction composite masonry, various partition walls, brick, aluminum & timber, solid concrete blocks, hollow concrete blocks and light weight blocks (aerated autoclaved), soil stabilized blocks, fly ash blocks, cement concrete walls

Module 2: Concrete for Construction (Lectures 06)

Introduction and properties of ingredients, importance of admixture materials such as pozzolona, fly ash, specific purpose chemical admixtures, Properties of fresh and hardened concrete

Module 3: Arches and Lintels **(Lectures 06)**

Arches and their stability, technical terms in arches, types of arches, methods of construction; Lintel: Necessity, materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels, beams: types according to material, layout such as primary an d secondary, continuous beams, formwork for RCC elements: function, requirements

Module 4: Means of Lateral Communication **(Lectures 08)**

Doors and windows

Doors - classification based on parameters such as material, geometry, fixtures and fastening

Windows - classification based on parameters such as material, geometry, fixtures and fastening

Use of composite materials for doors and window frames and shutters, laying out of passages

Stairs: Terminology, requirements of a good stair, various types, uses and limitations

Ramps: Requirements and types, planning aspects for physically handicapped persons

Elevators: Types and their Use

Module 5: Flooring Roofs and Types **(Lectures 06)**

Flooring: Types, factors for selections of floorings, flooring in ground and upper floors, various types of tiled flooring: natural, composite, synthetic, and special purpose flooring, concrete flooring for industrial purpose: tremix flooring

Roof coverings: Terms used, roof and their selection, pitched roofs and their types, roof coverings and their selection. Natural, composite, synthetic, and special purpose roof coverings, timber trusses (King Post and Queen Post), steel trusses types and their suitability

Module 6: Precast and Pre-engineered Buildings **(Lectures 05)**

Principles- advantages and disadvantages, types of prefabricate, standardization, basic, nominal and actual dimensions, tolerances, joints production, transportation and erection

Text Books

- Punmia B.C., Jain A. K., “Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi
- Arora S. P. and Bindra S. P., “Text Book of Building Construction”, DhanpatRai Publications
- Kumar Sushil, “Building Construction” Standard Publishers, 20th Edition, 2010.
- P. Purushothama Raj, “Building Construction Materials and Techniques”, Pearson Education
- Jain V.K., “Automation Systems in Smart and Green Buildings” ISBN NO: 978-81-7409-237-3

Reference Books

- NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- Chudley R., "Construction Technology", Vol.1, 2, 3 and 4 ELBS Publisher
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi
- Sikka V. B., “A Course in Civil Engineering Drawing”, S. K. Kataria and Sons
- Catalogues. Information Brochures, Trade Literature by material or product manufacturers
- Mehta, Scarborough, Armpriest, “Building Construction”, Pearson Education
- Macay W.B, “Building Construction”, Vol. I, II, III, IV, Pearson Education
- Jain V.K., “Handbook of Designing and Installation of Services in High Rise Building Complexes” ISBN : 978-81-7409-245-8

Course Outcomes: On completion of the course, students will be able to:

CO1: Understand types of masonry structures.
CO2: Understand composition of concrete and effect of various parameters affecting strength.
CO3: Comprehend components of building and there purposes.
CO4: Comprehend the precast and pre-engineered building construction techniques.

☑☑☑☑☑☑☑☑☑☑☑

BTCVC 306 Engineering Geology

Teaching Scheme:(2 Lectures) hours/week

Course Contents

Module 1: Introduction and Physical Geology **(Lectures 06)**

Definition, Scope and subdivisions, applications of Geology in Civil Engineering, Major features of the Earth's structure, internal structure of earth, and Geological work of river: features of erosion, deposition and transportation, Civil Engineer ing Significance, Geological work of wind: Processes and features of erosion, deposition and transportation, Civil Engineering Significance. Volcano: Central and Fissure types, Products of volcano, Mountain: Origin and formation, types, examples

Module 2: Mineralogy and Petrology **(Lectures 07)**

Mineralogy: Physical properties of mineral, Classification of minerals, Petrology: Definition, rock cycle, Igneous rocks: Origin, Textures and Structures, Classification, Concordant and Dis-concordant Intrusions, Civil Engineering significance, Secondary rocks: Formation, Classification, Residual deposits: Soil, Laterite and Bauxite and their importance, Sedimentary deposits: Formation, Textures, Classification and Structures, Civil Engineering significance, Chemical and organic deposits, Metamorphic rocks: Agents and Types of Metamorphism, Stress and anti-stress Minerals, Structures, Products of metamorphism

Module 3: Structural Geology **(Lectures 05)**

Outcrop, Strike and Dip, Unconformity-Types, Outliers and Inliers, Overlap Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance Joint: Types, Civil engineering considerations

Module 4: Building Stones **(Lectures 05)**

Properties of rocks, Requirement of good building stone, Building stones of India

Groundwater: Sources of groundwater, water table, Zones of groundwater, Porosity and permeability

Module 5: Geology of Dams and Reservoirs, Tunnels and Bridges **(Lectures 08)**

Preliminary geological survey, Influence of geological conditions on location, alignment, Design and Type of a dam, geological considerations in site selection for dams, Site improvement techniques, dams on carbonate rocks, sedimentary rocks, folded strata and Deccan traps, favorable and unfavorable geological conditions for reservoir site

Tunnels and Bridges: Influence of geological conditions on tunneling, difficulties during tunneling, tunnel lining, tunneling in folded strata, sedimentary rocks and Deccan traps, dependence of types of bridges on geological conditions

Module 6: Preliminary Geological Investigations **(Lectures 06)**

Steps in geological investigations, consideration of structural features exploratory drilling: Observations, Preservation of cores, Core logging, Core recovery, Graphical representation of core log, Limitation of exploratory drilling method

Text Books

- Singh Prabin, "Engineering and General Geology", S. K. Katariya and sons, Delhi
- Mukerjee P. K., "A Text Book of Geology", World Press Pvt. Ltd., Calcutta
- Gokhale K.V.G.K. and Rao D. M., "Experiments in Engineering Geology", TMN, New-Delhi
- Gupte R. B., "A Text Book of Engineering Geology", Pune VidyarthiGrihaPrakashan, Pune
- SubinoyGangopadhyay, "Engineering Geology ",oxford university

Reference Books

- G. W. Tyrrell, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi
- A. Holmes, "Principles of Physical Geology", ELBS Chapman & Hall, London
- Billings M. P., "Structural Geology", Prentice Hall of India Private Ltd., New Delhi
- Legget R. F., "Geology Hand book in Civil Engineering", McGraw-Hill, New York
- Krynine D. P. & Judd W. R., "Principles of Engineering Geology & Geo-technics", CBS Publishers &Distri., New Delhi
- Reddy Dr. D. V., "Engineering Geology for Civil Engineering", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

- Read H. H., “Rultey’s Elements of Mineralogy”, CBS Publishers & Distributors, Delhi

Course Outcomes: On completion of the course, the students will be able to:

CO1: Recognize the different land forms which are formed by various geological agents.
CO2: Identify the origin, texture and structure of various rocks and physical properties of mineral.
CO3: Emphasize distinct geological structures which have influence on the civil engineering structure.
CO4: Understand how the various geological conditions affect the design parameters of structures.

* * *

BTHM 303 Soft Skills Development

Teaching Scheme: (2 Lectures) hours/week

Program Educational Objectives:

1) To build the skills like team building so that they can work efficiently in groups.
2) To provide knowledge of conflict management while working in large organizations.
3) To develop management skills required in routine work environment.
4) To polish the personality of the learners in order to make them good leaders and employees.
5) To imbibe qualities like manners & etiquettes co-ordination, mutual understanding while working in a group.

Module 1: Development of Proficiency in English (Lectures 02)

Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws& 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis

Module 2: Self-Management (Lectures 02)

Self-Evaluation, Self-discipline, Self-criticism, Recognition of one’s own limits and deficiencies, dependency, etc., Self-Awareness, Self-Management, Identifying one’s strengths and weaknesses, Planning & Goal setting, Managing self -emotions, ego, pride, Leadership & Team Dynamics

Module 3: Time Management Techniques (Lectures 02)

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time

Module 4: Motivation/ Inspiration (Lectures 02)

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation

Motivation techniques: Motivation techniques based on needs and field situations

Module 5: Interpersonal Skills Development (Lectures 02)

Positive Relationship, Positive Attitudesand Empathies: comprehending others’ opinions, points of views, and face them with understanding Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Module 6: Effective Computing Skills (Lectures 02)

Designing an effective Presentation, Contents, appearance, themes in a presentation, -Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference Books

1) Mitra, Barun, “Personality Development and Soft Skills”, Oxford University Press, 2016

2) Ramesh, Gopalswamy, “The Ace of Soft Skills: Attitude, Communication & Etiquette for Success”, Pearson Education, 2013

3) Covey, Stephen R., “Seven Habits of Highly Effective People: Powerful Lessons in Personal Change”

4) Rosenberg Marshall B., “Nonviolent Communication: A Language of Life”

***Program* Educational Outcomes**

1) Learners will acquire interpersonal communication skills.

2) Learners will develop the ability to work independently.

3) Learners will develop the qualities like self-discipline, self-criticism and self-management.

4) Learners will have the qualities of time management and discipline.

5) Learners would be able to present themselves as an inspiration for others.

☑☑☑☑☑☑☑☑☑☑☑

BTCVL 307 Hydraulic Engineering Laboratory I

Practical:2 hours / week

Practical Work consists of at least eight performances from list below and detailed reporting in form of journal. Practical examination shall be based on above.

1) Measurement of Viscosity of various fluids
2) Demonstration of working of different types of valves and pipe fittings
3) Measurement of pressure Piezometer, manometers, Pressure gauges
4) Measurement of discharge - Calibration of measuring tank, Use of hook or point gauge.
5) Verification of Bernoulli's Theorem
6) Determination of metacentric height.
7) Calibration of an orifice / mouthpiece / venturimeter / orifice meter
8) Study of factors affecting coefficient of friction for pipe flow (for two different materials and two different diameters)
9) Determination of loss of head due to Pipe Fittings

Use of computer programs such as MS Excel is desirable for post-processing of results.

BTCVL 308 Surveying Laboratory - I

Practical:2 hours / week

Practical Work consists of performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Practical examination shall be based on above practical course.

Essential Practical

1) Use of Dumpy Level, Auto Level and Tilting Level.
2) Sensitivity of Bubble Tube using Dumpy Level.
3) Evaluation of constant of Planimeter, and use of Digital Planimeter for measurement of areas.
4) Study of Theodolite.
5) Methods of Plane Table Survey
6) Study and use of Total Station

Among following any four shall be performed

1) Reciprocal Levelling.
2) Illustration of Permanent adjustment of Dumpy Level
3) Measurement of Horizontal Angle by Various Methods
4) Measurement of Magnetic Bearing and Vertical Angle by Theodolite
5) Two Point and Three Point Problems
6) Study and use of Minor Instruments

Course Outcomes: On completion of the course, the students will be able to:

CO1: Use the theodolite along with chain/tape, compass on the field.
CO2: Apply geometric and trigonometric principles of basic surveying calculations.
CO3: Plan a survey, taking accurate measurements, field booking, and adjustment of errors.
CO4: Apply field procedures in basic types of surveys, as part of a surveying team.
CO5: Employ drawing techniques in the development of a topographic map.

☑☑☑☑☑☑☑☑☑☑☑

BTCVL 309 Building Construction - Drawings Laboratory

Practical: 2 hours / week

List of Drawing Assignments

1) Sketch Book consisting of free hand proportional scale sketches for items to be drawn on drawing sheets as mentioned below under (2)
2) Drawing to scale on a half imperial drawing sheet covering following aspects.
    a) Lettering, Symbols, Types of lines and dimensioning as per IS 962.
    b) Foundations: - Isolated, Combined Footings, Under Reamed Piles, Rafts.
    c) Types of Stone Masonry: Elevation and Sectional Drawings.
    d) Types of Brick masonry: Elevation and Sectional Drawings.
    e) Types of Doors: Elevation and Sectional Drawings.
    f) Types of Windows: Elevation and Sectional Drawings, Standard Aluminum Sections.
    g) Types of Stairs: Plan and Sectional Drawings.
    h) Trusses: Various types, various roof covering materials, sketches for sectional profiles
    i) Typical plan for a single room and sectional views.
3) Site visit: To understand various building materials and their use.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Draw plan, elevation and section of various structures.

CO2: Apply the principles of planning and by laws used for building planning.

CO3: Prepare detailed working drawing for doors and windows.

☑☑☑☑☑☑☑☑☑☑☑

BTCVL 310 Engineering Geology Laboratory

Practical:2 hours / Week

List of Experiments

Practical Work consists of study of relevant rock and mineral samples. Detailed report is expected.

- Megascopic study of Rock forming minerals
- Megascopic study of Ore forming minerals
- Megascopic study of Igneous rocks
- Megascopic study of Secondary rocks
- Megascopic study of Metamorphic rocks
- Cross-section Preparation and interpretation of geological maps
- Study of Structural Geological models
- Preparation of bore log /lithologs
- Interpretation of bore- hole data

Study tour to the places of Engineering Geological importance.

A Journal containing record of above practical work shall be examined as Term Work. Practical examination shall be based on above practical course.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calculate the linear measurement on surface.

CO2: Find out engineering properties of various geological materials.

CO3: Draw subsurface lithologs.

CO4: Identify minerals and rocks by studying physical properties.

☑☑☑☑☑☑☑☑☑☑☑

BTCVS 311 Seminar on Topic of Field Visit to Foundation Work

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of foundation execution. It is desirable to collect basic information of geotechnical aspects of foundations, types and components of foundations, tools and plants, construction machinery, etc. Intention is to introduce students to process of collection and presentation of technical information. Report shall be submitted to cover above aspects as studied.

BTCVF 312 Field Training (from semester II)

Student shall undergo field training / industrial training / internship during summer vacation after Semester II. This training is at elementary level expecting exposure to field practices. A brief report shall be submitted. Evaluation shall be based on report and power point presentation.

☑☑☑☑☑☑☑☑☑☑☑

Semester- IV

Sr. No.	**Subject Code**	**Subject**	**Contact Hours**			**Credit**
			L	**T**	**P**	
		Theory				
01	BTCVC401	Hydraulics II	2	1	✓	3
02	BTCVC402	Surveying – II	2	1	✓	3
03	BTCVC403	Structural Mechanics-I	3	1	-	4
04	BTID405	Product Design Engineering	1	2	-	3
05	CV E1	**Elective I**	3	-	-	3
06	BTCVC406	Engineering Management	1	-	-	AU
07	BTHM3401	Basic Human Rights	2	-	-	AU
		Practical / Drawing and/or Design				
8	BTCVL407	Hydraulics Laboratory II	-	-	2	1
09	BTCVL408	Surveying Laboratory II	-	-	4	2
10	BTCVL409	Mechanics of Solids Laboratory	-	-	2	1
11	BTCVM410	Mini Project	-	-	2	1
12	BTCVF411	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	1
		Sub-Total	**14**	**5**	11	
		Total	**31**			**22**
		Elective I				
	BTCVE404A BTCVE404B BTCVE404C	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

BTCVC 401 Hydraulics II

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Uniform Flow in Open Channel **(Lectures 06)**

Introduction, difference between pipe flow and open channel flow, types of open channels, types of flows in open channel, geometric elements, velocity distribution, measurement of velocity-(pitot lube, current meter) weir & spillway: sharp, broad & round crested weirs, calibration of weir, time of emptying tank with weir, profile of ogee spillway, flow below gates

Module 2: Steady & Uniform Flow **(Lecture 05)**

Chezy's& Manning's formula, Roughosity coefficient, uniform flow computations, hydraulically efficient section-considerations for rectangular, triangular, trapezoidal, circular sections

Specific energy: definition & diagram, concept of critical, sub-critical, super-critical flow, specific force, specific discharge derivation of relationships and numerical computations

Module 3: Varied Flow **(Lectures 07)**

Gradually (G.V.F.): Definition, classification of channel Slopes, dynamic equation of G.V.F. (Assumption and derivation), classification of G.V.F. profiles-examples, direct step method of computation of G.V.F. profiles

Rapidly varied flow (R.V.F.): Definition, examples, hydraulic jump- phenomenon, relation of conjugate depths, parameters, uses, types of hydraulic jump

Module 4: Impact of Jet **(Lectures 05)**

Impulse momentum principle, impact of jet on Vanes-flat, curved (stationary and moving), inlet & outlet velocity triangles under various conditions, Series of flat, curved vanes mounted on wheel

Module 5: Hydraulic Machines **(Lectures 08)**

Turbines: Importance of hydro-power, classification of turbines, description, typical dimensions and working principle of Pelton, Francis & Kaplan turbine (detailed design need not to be dealt with), Module quantities, specific speed, performance characteristics, selection of type of turbine, description & function of draft tube, Thomas's cavitation number

Pumps: Classification, component parts, working of centrifugal pump, performance characteristics, pump selection, common troubles & remedies, introduction to different types of pumps: reciprocating, multi-stage, jet, air lift, submersible pump

Module6: Boundary Layer Theory **(Lectures 06)**

Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy. Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation, Introduction to Drag and Lift on submerged bodies (Flat plates, Sphere, Cylinder, aerofoil), Stokes law, Concept of Drag and Lift coefficients

Text Books

- Modi, Seth, “Fluid Mechanics – Hydraulic & Hydraulic Mechanics” Standard Book House
- Bansal R.K., “Fluid Mechanics”, Laxmi Publications, 9th edition 2017
- Garde R. J., “Fluid Mechanics through Problems”, New Age Publications, 3rd edition 2011
- Jain A. K., “Fluid Mechanics”, Khanna Publications, 8th edition, 2003, Delhi
- Kumar K. L., “Fluid Mechanics”, Eurasia Publication House, 11th edition, Delhi
- Rangaraju, “Open Channel flow”, Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., “Fluid Mechanics through Problems” Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., “Flow in Open Channel”, Edition V, Tata McGraw-Hill Pub. Co., Delhi

Reference Books

- Streeter, “Fluid Mechanics” McGraw-Hill International Book Co., 3rd edition, Auckland
- Shames, “Mechanics of Fluids”, McGraw Hill, 4th edition

- Chaw V. T., “Flow in Open Channel”, McGraw-Hill International Book Co., Auckland
- Hughes & Brighton, “Fluid Mechanics”, Tata McGraw Hill

Course Outcomes: On completion of the course, the students will

CO1: Design open channel sections in a most economical way.

CO2: Know about the non-uniform flows in open channel and the characteristics of hydraulic jump.

CO3: Understand application of momentum principle of impact of jets on plane

* * *

BTCVC 402 Surveying – II

Teaching Scheme: (2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Tachometry **(Lectures 08)**

Significance and systems, principle, constants, basic formulae and field work stadia method, auto reduction tachometer, tangential system

Electronic Distance Measurement: Importance, principles of electronic distance measuring (EDM) instruments, classification of EDM’s based on carrier waves used, study and use of total station

Module 2: Triangulation **(Lectures 06)**

Principle & classification, system, selection of station, base line measurement, correction and use of subtense bar, signals, satellite station, reduction to center, spherical excess, angular observations, tri-iteration

Triangulation Adjustments: Theory of errors, laws of weights, concept of most probable value

Module 3: Field Astronomy **(Lectures 06)**

Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

Module 4: Curves **(Lectures 06)**

Horizontal and vertical curves, simple curves, setting with chain and tapes, tangential angles by theodolite, double theodolite, compound and reverse curves, transition curves, functions and requirements, setting out by offsets and angles, vertical curve s, sight distance requirements

Module 5: Photogrammetry **(Lectures 06)**

Terms, types, vertical photographs, scale, ground coordinates, relief displacement, flight planning photomaps and mosaics, stereoscopy and photo interpretation

Module 6: Remote Sensing **(Lectures 06)**

Introduction, classification and principles, electromagnetic energy and its interaction with matter, idealized systems, sensors, platforms, and application in civil engineering, G.P.S & G.I.S. as surveying techniques – Overview, uses and applications

Text Books

- Bannister A., Raymond S., Wartikar J.N., Wartikar P.N., “Surveying", ELBS, 6th Editon, 1992
- HeribertKahmen and Wolfgang Faig, “Surveying ", Walter de Gruyter, 1995
- Kanetkar T.P., "Surveying and Leveling", Vols. I, II and III, VidyarthiGruhPrakashan, Pune
- Punmia B.C., “Surveying”, Vols. I , II and III, Laxmi Publications

Reference Books

- James M. Anderson and Edward M. Mikhail, “Introduction to Surveying”, McGraw Hill Book Company
- Clark D., “Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition
- Agor, “Advanced Surveying”, Khanna Publications, Delhi
- Arora K. L., “Surveying”, Vol.1 & 2
- Basak, “Surveying and Levelling”Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi

- Duggal S. K., “Surveying”, Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi
- Gopi S., Satikumar R. and Madhu N., “Advanced Surveying”, Pearson Education,
- Chandra A. M., “Higher Surveying”, New Age International Publication

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand basics different types of curves on roads and their preliminary survey.

CO2: Perform setting of curves, buildings, culverts and tunnels.

CO3: Comprehend different geodetic methods of survey such as triangulation, trigonometric leveling.

CO4: Comprehend modern advanced surveying techniques.

* * *

BTCVC 403 Structural Mechanics – I

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Beam Deflections (Lectures 06)

Calculations of deflection for determinate beams by double integration, Macaulay’s method, moment area method, conjugate beam method, deflection by method of superposition

Module 2: Energy Principles (Lectures 05)

Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion - Castiglano's and Engessor's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams, Maxwell's reciprocal theorem, Williot Mohr diagrams

Module 3: Method of Consistent Deformation (Lectures 07)

Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns, Castiglano'stheorem

Indeterminate Beams: Analysis of indeterminate beams: Propped cantilever and fixed beams - fixed end moments and reactions for standard cases of loading – slopes and deflections in fixed beams

Module 4: Moment Distribution Method (Lectures 06)

Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments - analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames with and without sway

Module 5: Slope Deflection Method (Lectures 06)

Analysis of continuous beams, analysis of rigid frames, frames without sway and with sway, settlement effects, introduction to difficulties in frames with sloping legs and gabled frames

Module 6: Thin Cylinders (Lectures 07)

Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders, thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, maximum shear stress, concept of stresses in thick cylinders

Text Books

- Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill,3rd edition 2010
- Wang C.K., “Statically Indeterminate Structures”, McGraw Hill
- Vazirani V.N., Ratwani M.M and Duggal S.K., “Analysis of Structures - Vol. I”, ISBN NO: 978-81-7409-140-8
- Khurmi R.S., “Theory of Structures”, S Chand, Delhi
- Punmia B.C., “Structural Analysis”, Laxmi Publications

Reference Books

- Timoshenko and Young, “Theory of structures”, McGraw Hill

- Norris C. H. and Wilbur J. B., “Elementary Structural Analysis”, McGraw Hill
- Kinney J. S., “Indeterminate Structural Analysis”, Oxford and IBH
- Hibbler R. C., “Structural Analysis”, Pearson Publications, 9th Edition
- Schodek, “Structures”, Pearson Education, 7th edition
- Ramamrutham S. and Narayanan R., “Theory of Structures” DhanpatRai Publishers, Delhi

Course Outcomes: On completion of the course, the students will be able to:

CO1: Describe the concept of structural analysis, degree of indeterminacy.

CO2: Calculate slopes and deflection at various locations for different types of beams.

CO3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses

Perform the distribution of the moments the in continuous beam and frame.

BTID 405 Product Design Engineering

Course Contents

Pre Requisites: Knowledge of Basic Sciences, Mathematics and Engineering Drawing

Design Studio:2 hr / week to develop designs through sketching,practical skills and learning digital tools

Continuous Assessment: Documentation of steps in the selected product design

Final Assessment: Product Design in Studio with final product specifications

Course Outcomes: At the end of the course, students will be able to

1. Create simple design of components or a system as whole
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively in a team

Subject refers to products in civil engineering. Product may an entity such as a building, bridge, road, railway, airport, tunnel, port, harbor, water supply or disposal schemes or components involved in such entities as tiles, doors, windows, walls, structural members, abutment, pier, etc., or even materials produced in industry such as cement, steel, composits, FRP, bricks or blocks etc. It is intended to refer to few of these products which may be chosen by student. Group activity is encouraged.

Module1:Introduction to Engineering Product Design: (Lectures 02)

Concept of a product, Problem solving approach for Product Design, Trigger for Product/ Process/ System, Disassembling existing Product(s) and understanding relationship of components with each other, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failed products, Public/Society’s perception of products, and its input into product design.

Module 2: Ideation (Lectures 02)

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or group of individuals, Sketching of products, Market research for need, competitions, scale and cost, Initial specifications of products

Module 3: Conceptualization (Lectures 02)

Computer operation principles and image editing through a graphical Composition; Computer aided 2D drafting and 3D Modeling through simple exercises.

Designing of components, Drawings of parts and synthesis of a product from its component parts, idea of rendering designs for 3-D visualization and to create a photo image, Parametric modelling of product, 3-D Visualization of mechanical products,Detail Engineering drawings of components

Module 4:Detailing **(Lectures 02)**

Managing assembling, Product specifications- data Sheet, Simple component designs, Workshop and erection safety and health issues, Create documents for knowledge sharing

Hands-on Activity Charts for Use of Digital Tools using software such as Autodesk Fusion 360 or similar freeware

Activity 1	Learn the basic vector sketching tools.	2
Activity 2	General understanding of shading for adding depth to objects. Understanding of editing vectors	2
Activity 3	Begin developing a thought process for using digital sketching.	3
Activity 4	Create a basic shape objects sphere, box cylinders	3
Activity 5	Create Automotive wheel concepts	3
Activity 6	Understanding Navigation and Data Panel Interface	2
Activity 7	Solid and Surface modelling, Rendering 3-D models	4
Activity 8	Product market and Product Specification Sheet	3
Activity 9	Documentation for the product	2

Reference Books

- Model Curriculum for “Product Design Engineer –Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Ver 1.0, NSQF Level: 7)
- Eppinger, S., & Ulrich, K. (2015), “Product Design and Development”. McGraw-Hill Higher Education.
- Green, W., & Jordan, P. W. (1999), “Human Factors in Product Design: Current Practice and Future Trends”, CRC Press.
- Sanders, M. S., & McCormick, E. J. (1993), “Human Factors in Engineering and Design”, McGraw-Hill Book Company
- Roozenburg, N. F., &Eekels, J. (1995), “Product Design: Fundamentals and Methods (Vol. 2)”, John Wiley & Sons Inc.
- Lidwell, W., Holden, K., & Butler, J. (2010), “Universal Principles of Designs: Revised and Updated: 125 ways to Enhance Usability, Influence Perception, Increase Appeal, make Better Design Decisions and Teach through Design”, Rockport Pub.

BTCVE 404 A Numerical Methods in Engineering

Teaching Scheme:(3 Lectures) hours/week

Pre Requisites: Mathematics - I and Mathematics – II

Course Contents

Module 1(Lectures 06)

Basis of Computations, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Cholesky Decomposition method, Gauss Jordan and Gauss Sceidal Methods

Module 2 **(Lectures 06)**

Roots of Equation, Trial and Error, Bisection, Secant Iteration, Newton Rapson Method, Solution of Ordinary Differential Equation, Euler’s Method, Modified Euler’s Method and RungaKutta Methods.

Module 3 **(Lectures 06)**

Interpolation with Newton's Divided Differences, Lagrange's Polynomial, Finite Difference Method, Central, Forward and Backward Differences, Least Square Polynomial Approximations Application in Deflection of Determinate Beams, Buckling Load of Long Columns

Module 4 **(Lectures 04)**

Numerical Integration: Trapezoidal Rule, Simpon’s Rules, Gauss Quadrature Rules

Module 5 **(Lectures 04)**

Statistical Analysis of Experimental Data, Mean, Median, Mode, Deviation, Measures of Dispersion, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

Module 6 **(Lectures 04)**

Implementation of above methods by algorithm development leading to programming in Spreadsheets / Fortran / C / C++

Text Books

- Balaguruswami E., “Numerical Methods”, Tata Mc-Graw Hill
- Scheid F, “Numerical Analysis (Schaum’s series)”, Tata Mc-Graw Hill
- Chapra. S. C. and Canale R. P., “Numerical Methods for Engineers”, by, Tata Mc-Graw Hill
- Shantha Kumar M , “Computer Based Numerical Analysis”, Khanna Publication
- Grewal B.S. and Grewal J.S., “Numerical Methods in Engineering and Science”, Khanna Publication, N. Delhi
- Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi

Reference Books

- Jain, Aryengon, “Numerical Methods for Scientific and Engineering Applications”, Wiley Eastern Publication
- Numerical Recipe , Oxford Publishing
- Manuals for the Commercial Computer Programmes

* * *

BTCVE 404 B Planning for Sustainable Development

Teaching Scheme:(3 Lectures) hours/week

Course Contents

Module 1: **(Lectures 06)**

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

Module 2: **(Lectures 06)**

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

Module 3: **(Lectures 04)**

Innovation for sustainable development- Environmental management and innovation strategies.

Module 4: **(Lectures 04)**

Societal transformations. Institutional theory.

Module 5: **(Lectures 04)**

Governance for sustainable development. Policy responses to environmental degradation.

Module 6: **(Lectures 04)**

Capacity development for innovation. Research methods.

Text/Reference Books:

- Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment
- Institute, working paper 00-04, available at:
  http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
- Robinson, J. (2004), “Squaring the circle? Some thoughts on idea of sustainable Development” Ecological Economics 48(4): 369-384.
- Hjorth, P. & A. Bagheri (2006), “Navigating towards Sustainable Development: A System Dynamics Approach”, Futures 38: 74-92.

- Mog, J.M. (2004) „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
- Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
- Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding & fostering innovation, London, Zed Books.

☑☑☑☑☑☑☑☑☑☑☑

BTCVC 406 Engineering Management

Teaching Scheme:(1 Lecture) hours/week

Course Contents

Module 1: Evolution of Management Thought (Lectures 02)

Scientific, human behavior, system approach, introduction to elements of systems – input, output, process restriction, feedback, contingency approach, contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (theory X and theory Y), H. L. Gantt, Maslow

Module 2: Functions of Management (Lectures 02)

Planning – nature and purpose of planning, strategies and policies, management by objectives, formal and informal organization, centralization, decentralization, line, line and staff, functional organization, principles of site layout, lea ding and directing, controlling and coordination (introduction only), communication process, motivation

Module 3: Decision Making (Lectures 02)

Importance of decision making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monitory value, decision tree, theory of games (dominance pure and mixed strategy).

Module 4: Operations Research (Lectures 04)

Linear programming, simple l-p model, simplex method - duality, sensitivity analysis, application of linear programming in transportation and assignment models

Module 5: Simulation Studies (Lectures 02)

Monte-Carlo simulation, queuing or waiting line theory (simple problems), dynamic programming, introduction to emerging optimization techniques

Module 6: Material Management (Lectures 02)

Material management – purchasing principles, stores, coding system function, responsibilities, record and accounting. Inventory control – an introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks

Text Books

- Deshpande S. H., "Operation Research"
- Deshpande A. S., "A Text book of Management"
- Gopal Krishnan, "Material Management", Sdueshan.
- Taha, "Operation Research"
- Banga and Sharma, "Engineering Managnment"

References

- Stoner, "Engineering Management"
- Davar, "Principles of Management"
- Koontz, Dounell and Weigrick, "Essentials of Management"
- Kast and Rosinweig, "Management and Organization", Tata McGraw Hill Publication.

- Wagner, "Operation Research", Wikey Easter Ltd., New Delhi
- Zhamb L.C., "Quantitative Techniques in Management", Vol. I,
- Miller and Stars, "Executive Decisions & Operation Research", Prentice Hall of India

Course Outcomes: On completion of the course, the students will be able to:

CO1: Demonstrate the nuances of management functions.

CO2: Analyze the framework of a business organization.

CO3: Adopt an empirical approach toward business situations.

CO4: Apply various Management techniques.

☑☑☑☑☑☑☑☑☑☑☑

BTHM 3401 Basic Human Rights

Teaching Scheme:(2 Lectures) hours/week

Course Contents

Module 1: Basic Concepts **(Lectures 04)**

Individual, group, civil society, state, equality, justice. Human Values, Human rights & Human Duties: Origin, Contribution of American bill of rights, French revolution. Declaration of independence, Rights of citizen, Rights of working & exploited people

Module 2: Fundamental Rights and Economic Program **(Lectures 04)**

Society, religion, culture, and their inter-relationship. Impact of social structure on human behavior, Social Structure and Social Problems: Social and communal conflicts and social harmony, rural poverty, unemployment, bonded labour.

Module 3: Workers and Human Rights **(Lectures 04)**

Migrant workers and human rights violations, human rights of mentally and physically challenged. State, Individual liberty, Freedom and democracy.

Module 4: NGOs and Human Rights in India **(Lectures 04)**

Land, Water, Forest issues.

Module 5: Human Rights in Indian Constitution and Law **(Lectures 04)**

i) The Constitution of India: Preamble; ii) Fundamental rights; iii) Directive principles of state policy; iv) Fundamental duties; v) Some other provisions

Module 6: UDHR and Indian Constitution **(Lectures 04)**

Universal declaration of human rights and provisions of India; Constitution and law; National human rights commission and state human rights commission.

References

1) Shastry, T. S. N., "India and Human Rights: Reflections", Concept Publishing Company India (P Ltd.), 2005.

2) C. J. Nirmal, "Human Rights in India: Historical, Social and Political Perspectives (Law in India)", Oxford India.

☑☑☑☑☑☑☑☑☑☑☑

BTCVL 407 Hydraulic Engineering Laboratory II

Practical:2 hours / week

Practical Work consists of at least three performances from groups listed below and detailed reporting in form of journal.

Practical examination shall be based on above.

Group (A)

1) Calibration of V notch / Rectangular notch.
2) Calibration of Ogee Weir.
3) Study of hydraulic jump

    a) Verification of sequent depths,
    b) Determination of loss in jump.
    c) Study of parameters with respect to Fraud Number: i) Y2/Y1; ii) Length; iii) Energy loss

4) Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
5) Velocity distribution in open channel in transverse direction of flow.

Group (B)

1) Impact of jet.
2) Study of Turbines (Demonstration).
3) Tests on Centrifugal Pump.
4) Study of Charts for Selection of Pumps

Use of computer programs such as MS Excel is desirable for post-processing of results.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand various properties of fluids and measurement techniques.
CO2: Carry out calibrations of various flow measuring devices.
CO3: Understand mechanism of hydraulic jump, various jets and pumps.

BTCVL 408 Surveying Laboratory - II

Practical:4 hours / week

Practical Work consists of performing field practical from the list below and detailed reporting in form of journal. Practical examination shall be based on above.

1. Tacheometry
a) Determination of tachometric constants, b) Determination of grade of a line.
2. Use of subtense bar for distance measurement.
3. Setting out of curves
    a) Simple circular curves, b) Transition curves
4. Study of topo sheets
5. Study of Aerial Photographs under Stereoscope
6. Traversing by Total Station.

Projects: 1) Road Project 2) Radial Contouring. 3) Block Contouring Project 4) Theodolite Traversing

Course Outcomes: On completion of the course, the students will be able to:

CO1: Determine contour level of field.
CO2: Determine the tachometric constants and grade of a line.
CO3: Use sub tense bar for distance measurement.

BTCVL 409 Solid Mechanics Laboratory

Practical: 2 hours / week

Practical Work consists of performance of at least seven experiments from the list below (excluding the eleventh study) experiment: Detailed report is expected.

List of Experiments

1. Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)
2. Compression test on mild steel, aluminum, concrete, and wood.

3. Shear test on mild steel and aluminum (single and double shear tests).
4. Torsion test on mild steel and cast iron solid bars and pipes.
5. Flexure test on timber and cast iron beams.
6. Deflection test on mild steel and wooden beam specimens.
7. Graphical solution method for principal stress problems.
8. Impact test on mild steel, brass, Aluminum, and cast iron specimens.
9. Experimental on thermal stresses.
10. Strain measurement involving strain gauges / rosettes.

Assignment involving computer programming for simple problems of stress, strain computations.

Course Outcomes: On completion of the course, the students will be able to:

Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
Determine the strength of coarse aggregates.
Find the compressive strength of concrete cubes and bricks.
Determine physical properties of given coarse aggregates, fine aggregates and cement samples.

BTCVM 410 Mini Project

Practical: 2 hours / week

Students shall take up work leading to product development. Needs of community around may be of prime concern. Work may target at easing out conventional construction operation by improvement of traditional devices / tools or development of altogether new approach.

BTCVF 411 Seminar on Topic of Field Visit to works involving Superstructure Construction

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of superstructure of buildings or other. It is desirable to collect basic information on components of superstructure, tools and plants, construction machinery, etc. Intention of the work is to introduce the student to the chronological order of execution of works and generate data on vocabulary of terms in field.

* * *

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Semester: Fifth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practicals				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE501T	Structural Analysis -II	3	1		4	4	20	80	100	40					3
BECVE501P	Structural Analysis -II			2	2	1					25	25	50	25	
BECVE502T	Reinforced Cement Concrete (RCC) Structures	3	1		4	4	20	80	100	40					4
BECVE502P	Reinforced Cement Concrete (RCC) Structures			2	2	1					25	25	50	25	
BECVE503T	Fluid Mechanics -I	3	1		4	4	20	80	100	40					3
BECVE503P	Fluid Mechanics -I			2	2	1					25	25	50	25	
BECVE504T	Geotechnical Engineering -II	3	1		4	4	20	80	100	40					3
BECVE505T	Hydrology & Water Resources (HWR)	4			4	4	20	80	100	40					3
BECVE506P	Communicative English & Technical Writing			3	3	2					25	25	50	25	
Total		**16**	**4**	**9**	**29**	**25**	**100**	**400**	**500**		**100**	**100**	**200**		

Note: 1."Technical Writing" shall consist of detailed report on Summer Training- 1 (ST-1) underwent after 4th Semester.

2. Equal weightage shall be given to the components of "Communicative English" and "Technical Writing"

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology
CIVIL ENGINEERING
Scheme of Examination & Evaluation
Semester: Sixth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practicals				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE601T	Steel Structures	3	1		4	4	20	80	100	40					4
BECVE601P	Steel Structures			2	2	1					25	25	50	25	
BECVE602T	Surveying-II	3	1		4	4	20	80	100	40					3
BECVE602P	Surveying-II			4	4	2					25	25	50	25	
BECVE603T	Fluid Mechanics -II	3	1		4	4	20	80	100	40					3
BECVE603P	Fluid Mechanics -II			2	2	1					25	25	50	25	
BECVE604P	Building Design and Drawing			4	4	4					50	50	100	50	
BECVE605T	Environmental Engineering-II	3	1		4	4	20	80	100	40					3
BECVE606P	Site Visit & Mini Project			3	3	3					25	25	50		
Total		**12**	**4**	**15**	**31**	**27**	**80**	**320**	**400**		**150**	**150**	**300**		

Summer Training - 2 (ST-2) of 2-4 Weeks duration during Summer Vacation is mandatory and will be evaluated in Seventh Semester.

Note:
1. External Practical Evaluation of Building Design and Drawing shall be performance based by drawing assigned problem given jointly by the Internal & External Examiners on AutoCAD
2. "Site Visit" shall cover minimum Five Site Visits.
3. "Mini Project" shall include report on Site Visits and Assigned Mini Project/Software Training, etc.
4. Equal weightage shall be given for components of "Site Visits" and "Mini Project".

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
CIVIL ENGINEERING
Scheme of Examination & Evaluation
Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

V Semester

Code No.	Name of Subject in Semester Pattern	Code No.		Name of Equivalent Subject in Credit Based Semester Pattern
5CE01	Steel Structures (T)	BECVE601T		Steel Structures
5CE01	Steel Structures (P)		BECVE601P	Steel Structures
5CE02	Environmental Engineering - II	BECVE605		Environmental Engineering - II
5CE03	Surveying - II (T)	BECVE602T		Surveying – II
5CE03	Surveying - II (P)		BECVE602P	Surveying – II
5CE04	Transportation Engineering - I (T)	BECVE403T		Transportation Engineering - I
5CE04	Transportation Engineering - I (P)		BECVE403P	Transportation Engineering - I
5CE05	Building Design and Drawing (T)		BECVE604P	Building Design and Drawing
5CE05	Building Design and Drawing (P)		BECVE604P	Building Design and Drawing
5CE06	Project Management	BECVE704		Construction Management and Law
5CE07	Site Visit		BECVE606P	Site Visit and Mini Project

VI Semester

Code No.	Name of Subject in Semester Pattern	Code No.		Name of Equivalent Subject in Credit Based Semester Pattern
6CE01	Structural Analysis - II (T)	BECVE501T		Structural Analysis - II
6CE01	Structural Analysis - II (P)		BECVE501P	Structural Analysis - II
6CE02	RCC Structures (T)	BECVE502T		Reinforced Cement Concrete (RCC) Structures
6CE02	RCC Structures (P)		BECVE502P	Reinforced Cement Concrete (RCC) Structures
6CE03	Geotechnical Engineering - II	BECVE504T		Geotechnical Engineering - II
6CE04	Fluid Mechanics - II (T)	BECVE603T		Fluid Mechanics - II
6CE04	Fluid Mechanics - (P)		BECVE603P	Fluid Mechanics - II
6CE05	Computer Applications in Civil Engineering		Semester - I, Serial No. 8	Computational Skills
6CE06	Technical Writing	BECVE506		Communicative English and Technical Writing

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU’s relevant ordinance.

STRUCTURAL ANALYSIS –II

BECVE501T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Apply the different methods of analysis of frames in practical problems
2. Formulation of stiffness matrix, transformation matrix, load matrix for various structural components for analysis purposes.
3. Understand the basics of finite element method in the analysis of structural components.
4. Understand the concepts related to structural dynamics.

Unit – I

Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

Unit - II

Analysis of Continuous Beams & Simple Portal frames (sway and Non Sway) Using Moment Distribution.

Unit - III

Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8). Member load matrix including lack of fit, temperature, Assembly of Global/ Structure load matrix, Solution to problems with maximum degree of freedom three.

Unit - IV

Formulation of element/local stiffness matrix and global stiffness matrix for beam members (without axial deformations) for continuous beams, Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three.

Unit – V

Formulation of element/ local stiffness matrix and global stiffness matrix for Plane frame members (without axial deformations), Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, temperature Moments Assembly of global/ structural load matrix.

Solution to Plane frame problems with maximum degree of freedom six inclined member problems.

Unit - VI

Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, (MDOF (up to 3 DOF), mode shape and nodal frequency).

Introduction to finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/Non-prismatic) Displacement based bar elements (Prismatic/Non-prismatic)

REFERENCE BOOKS:

1. **C K Wang, 'Intermediate Structural Analysis"**
2. **S P Timoshenko, 'Theory of Structure'**
3. **Jain, Jain Krishna, 'Plain & Reinforced Concrete Structures', Vol-II**
4. **Rally and Dally, 'Experimental Stress Analysis'**

STRUCTURAL ANALYSIS –II

BECVE501P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

Minimum Eight Problems, on complete syllabus with hand calculations using scientific calculators and also solution to same problems by using available application software.

(Solution is restricted to four degree of freedom problems and assembly restricted to eight degree of freedom problems)

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 4 hrs**

COURSE OUTCOMES: The students shall be able to

1. Understand the basic concepts of structural design Methods of RCC to the practical problem
2. Understand the composite action of reinforced steel and concrete in reinforced concrete structural members
3. Use the knowledge of the structural properties of materials i.e. steel and concrete in assessing the strength.
4. Use the knowledge in structural planning and design of various components of buildings.
5. Apply the concepts and applications of prestressed concrete in real problems

Unit – I

Introduction to the Working Stress Method of RCC design. Basic concepts in design for flexure, assumptions, design constants. Analysis of the rectangular section, Balanced, under-reinforced and over-reinforced sections; Drawbacks and limitations of Working stress methods.

Unit – II

Prestressed Concrete: Properties of high grade/strength materials, concepts of prestressed concrete, methods of prestressing, losses in prestressing. Various systems of prestressing with particular reference to Freyssinet, Magnel Blatton and Gifford Udall systems Analysis of rectangular, T and I section. Design of prestressed slab/ rectangular beam

Unit - III

Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, other limit states. Review of IS – 456-2000.

Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode

Analysis & Design of Doubly reinforced sections

Unit - IV

Limit state of collapse in flexure: Analysis and design of Tee and L-beam section.
Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.

Design of rectangular pad/ slopped footing for axial load

Unit - V

Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and force. Check for bond.

Limit state of Serviceability:

Causes and control cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, Cracks due to loading. Needs for crack width control

Moment- curvature relationship, deflection control of beams; Deflection calculation for beam.

Limit state of collapse in torsion: Concepts of interaction to torsion, shear and flexure Analysis & design of rectangular section for torsion, shear and flexure

Unit – VI (with LSM)

Design of one-way, simply supported, single span and cantilever slabs, and continuous slab/ beam with IS coefficients.

Design of RCC Two way slab with various end conditions using IS code coefficient. Deflection calculation for one-way slabs

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

1. Design of beams, columns, slab and foundation as per relevant IS Code
2. Understanding the professional RCC drawing.
3. Minimum One Site visit pertaining to above design

FLUID MECHANICS-I

BECVE503T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Measure and determine fluid pressures and forces on plates/surfaces, pipe bends, etc.
2. Apply the Bernoulli's equation to solve the problems in fluid.
3. Understand the concepts of dimensional analysis use the dimensionless number suitably.
4. Understand the basic concepts related to laminar and turbulent flow.
5. Apply the principles of hydrostatics and determine the forces.

Unit-I :

Fluids and their Properties: Definition of fluid, fluid properties, mass density, specific weight and specific gravity, viscosity; Newton's equation, coefficients of dynamic and kinematic viscosity. Rheological Diagram. Ideal and real fluids. Compressibility and bulk modulus, Surface tension capillarity, pressure inside a bulb and cylindrical jet, vapor pressure and cavitations. Effects of pressure and temperature on fluid properties.

Fluids Pressure and its Measurement: Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure, Gauge pressures. Pressure measurements using manometer, differential manometer and gauges

Unit-II

Hydrostatics: Hydrostatic pressure on plane and curved surface. Centre of pressure, fluids in relative equilibrium; fluid masses subjected to horizontal, vertical and inclined acceleration.
Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium

Unit-III

Fundamentals of Fluid Flow-I: Kinematics of Flow: Velocity, its variation with space and time; Steady, unsteady, uniform & non-uniform; One, two and three dimensional; rotational, irrotational flow. Acceleration of fluid particles, Normal and Tangential acceleration. Stream line, path line & streak line; Lagrangian and Eularian approaches in fluid flow description. Equation of continuity in Cartesian co-ordinates, stream functions, velocity potential and potential flow. Relationship between stream function and velocity potential, flow nets, circulation, vortices, source and sink. Free and forced vortices.

Unit-IV

Fundamentals of Fluid Flow-II: Kinetics of Flow: Factors influencing motion, Euler's equations of motion. Bernoulli's equation, Assumptions, derivation, limitations and application, Kinetic energy correction factor. Momentum equation, Impact of Jets, forces on plates, pipe bends and closed conduits.

Fluid Measurement-I: Velocity measurement; pitot tube, pitot-static tube and Prandit tube. Discharge measurement: Venturimeter, Orificemeter and flow nozzles.

Unit-V

Fluid Measurement-II: Orifices and Mouth pieces- Orifice: definition, types, Hydraulic coefficients, factors affecting them and their experiments. Large/small orifices and submerged orifices. Time for emptying tanks by orifices Mouthpieces: Definition, types and utility, pressure at Vena contracta, Coefficients of discharge.

Flow Measurement and Control: Notches & Weirs – Definitions, Types; Rectangular, triangular and trapezoidal, End contraction. Co-efficient of discharge and its determination; Error in measurement of head. Velocity of approach and its effects Cipolletti, broad-crested and submerged weirs

.

Unit-VI

Dimensional Analysis And Theory of Models: Dimensional Analysis: Fundamentals, methods, (Raleigh's and Buckingham); Similitude, Geometric, Kinematic and Dynamic similarities. Predominant forces, Dimension-less numbers and their significances.

Behavior of Real Fluids: Viscous flow - Laminar and Turbulent flows, Reynolds apparatus critical velocity. Reynolds Number, simple problems on determination of Laminar and Turbulent flows in pipes.

FLUID MECHANICS-I

BECVE503P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Minimum eight practicals from the given below list should be performed

1. To verify Bernoulli's theorem
2. To determine the coefficient of discharge of Venturimeter
3. To determine the coefficient of discharge of Orifice meter
4. To determine the coefficient of discharge of Rectangular Notch
5. To determine the coefficient of discharge of Triangular Notch
6. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.
7. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
8. To determine the variation of friction factor 'f' for turbulent flow in commercial pipes.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number

GEOTECHNICAL ENGINEERING-II

BECVE504T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of different soil exploration techniques to ascertain the properties of soil
2. To analyze the stability of natural slopes, safety & sustainability of the slopes, design of retaining structures, reinforced earth walls, etc.
3. Practice Ground Improvement Techniques.
4. Design the shallow & deep foundation.

Unit- I: GEOTECHNICAL EXPLORATION

Importance and objective of field exploration , geophysical methods and its limitations, methods of subsurface exploration, methods of boring, number, location and depth of boring, types of soil samples and samplers, principles of design of samplers, collection & shipments of samples, boring and sampling record.

Unit- II: STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes, Taylor's stability numbers & stability charts, stability analysis of finite slope for purely C- soils and C - □soils, center of critical slip circle, (Swedish circle method), slices method for homogeneous C - □ soil slopes with pore pressure consideration, Friction circle method, method of improving stability of slopes; types, selection and design of graded filters.

Unit- III: LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure; general & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories of earth pressure. Effects of surcharge & submergence. Determination of Active earth pressure through graphical construction; Rebhann's and Culman's method

Unit- IV: GROUND IMPROVEMENT

Need of ground improvement, ground improvement techniques, stabilization using lime, cement & flyash; prealoading concept, vibrocompaction/flotation, concept of sand drains, stone columns, encased stone column, concept of NPVD (natural prefabricated vertical drain) and PPVD (polymer prefabricated vertical drain). Basic concept of reinforced soil, different types of Geo-synthetics, Geo-synthetic application and functions in civil engineering

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory, its validity and limitation, types of shear failure in foundation soil, effect of water table on bearing capacity, (introduction to IS method, factor affecting bearing capacity, field determination of bearing capacity through plate load test and standard penetration test,) Settlement of shallow foundation: Causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. (Standard penetration test, corrections for N - values to obtain design soil parameters**.)**

Unit- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Pile capacity by static formula & dynamic formulae, pile load test, group action of piles, spacing of piles in group, settlement of group of pile (pile group,) negative skin friction and its effect on pile capacity, general features of under reamed piles.

REFERENCE BOOKS:

1. Gopal Ranjan &Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
2. Arora K.R. : Soil Mechanics & Foundation Engineering
3. Punmia B. C. : Soil Mechanics & Foundation
4. P Raj : Geotechnical Engineer,Mc Graw Hill Education,2000

HYDROLOGY AND WATER RESOURCES

BECVE505T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use of knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.
2. Use the techniques of the Hydrographs to forecast flood discharge at various durations.
3. Apply the Statistical techniques to analyze the flood occurrence & frequency.
4. Use the knowledge pertaining to the flood to plan flood routine & emergency plans.
5. Apply the knowledge of geo-hydrology terms in planning, assessing & computation of ground water potential and its assessment using various techniques.
6. Take-up planning of water resources mini project.

Unit – I

Introduction: Hydrology, definition, engineering hydrology, and its importance, development of hydrology and allied science, hydrological cycle, hydrological evolution and brief description of its components, the earth and its atmosphere, importance of temperature, humidity, and wind in hydrological study.

Precipitation: Definition anticipation, artificial rains, types of precipitation, orthographic, conventional and cyclonic, factors affecting precipitation with reference to physiographic divisions of India

Measurement of precipitation: non automatic and automatic rain gauges, selection of site, density and adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, supplementary rainfall data missing records, intensity duration frequently and depth area duration analysis

Unit - II

Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement, application, problems.

Evaporation and transportation: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and imperial formula, control of evaporation. Evapo-transpiration and its measurement. Interception and its measurement.

Unit - III

Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.

Hydro-graphics: flood hydrology, definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, theory, S-curve and its use, instantaneous UHG.

Unit - IV

Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis.

Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routine and flood forecasting, economic planning for flood control (Emergency action plan)

Unit - V

Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy's law, introduction to hydraulic wells, open wells, safe yield test.

Unit - VI

Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting

Project planning for water resources: multipurpose projects inter basin water transfer and inter-state river dispute. Water resource planning through watershed management, (Instrument used for measurement of climatic parameter, wind vane, anemometer, Sunshine Recorder, Stavenson's Screen, Different types of thermometers, Thermo hydro graph).

COMMUNICATIVE ENGLISH & TECHNICAL WRITING

BECVE506P **Evaluation Scheme: (25-Internal/25-External)**
(P-3 Hrs/Week); Total Credits-2

Outcomes:
Students will be:

1. Adept in using functional grammar
2. Able to write at work
3. Able to draft reports and letters
4. To understand the planning and procedure of carrying out research work
5. Dexterous in presentation skills and participate in GD

Practical 1- Language and style

Grammar, Mechanics, Punctuations, Spellings, Vocabulary & Word Watch (List of Technical and Business terms with usage
Assignments: 4 Nos. (3 worksheets on Grammar, 1 on Mechanics and Punctuation)

Grammar*- Subject and verb agreement, prepositional phrases, pronouns, pronoun references, avoiding shifts, avoiding sexism (avoiding gender bias), modifiers, the clause and simple sentence, compound sentences, transition words, parallelisms.*

Mechanics*- Fragments, run-ons, and comma splices abbreviations & acronyms.*

Punctuations *- colons and semicolons, end punctuations, parentheses, dashes, brackets, ellipses, slashes, and hyphens, apostrophes.*

Method / plan – Concept clearance using Worksheets with MCQ / activities

Practical 2- Writing at Work & Other Business Writing

Assignments: 4 Nos. (2 topics from A & B each)

A. Writing at Work

Types of Letters (inquiry, order, sales, complaint etc), Memos, E- mail, The Job Search (Resume & Cover letter), Fliers & Brochures.

Method / plan: analyzing errors in mails, resumes, letters and brochures with respect to practical- 1, practice writing with samples given

B. Other Business writing

Itinerary Writing, Inter –office Memorandum (memo), Circulars (Informative, Public, Official), Notice, Agenda and Minutes

Method / plan: analyzing errors in circulars, memos with respect to practical 1, practice writing with samples given as assignment

Practical 3- Report Strategies

Assignment: 2 Nos. (Any two reports from the given topics)

Reports (Trip / study tour / site visit), reports, Incident reports, Investigative Maintenance manual for buildings

Lab reports, Feasibility reports / Recommendation reports, Technical Proposals, The Summary,

Method / plan: Analyze reports and proposals in the area of your study. Attempt following all the rules in Practical -1 & Practical-5 and give a presentation to your class.

After attending a lecture / meeting / conference, summarize its contents. Provide the speakers name, location of the presentation, date of presentation for the source citation.

Sample for summary

Many textbooks begin or end chapters with summaries. Find such a summary in one of your textbooks. Then read the accompanying chapter. Is the summary effective? If so, why? If not, Why not? If the summary is ineffective, how would you rewrite it?

Practical 4- Orientation to Research

Planning and process, Structure, documentation, composing a bibliography for a research paper /report

Assignments: 3 Nos. (Preparation of a technical paper, Review of 10 technical papers on a particular subject, Study of Detailed Project Report & Preparing a summary)

Method / Plan: Assignments
1. Planning and process,

Structure*- Title, authors details, abstract, introduction, discussion, conclusion, footnotes / list of references, Bibliography*

Documentation- relevance and purpose, methods and systems available

composing a Bibliography for a research paper /report*- placement and arrangement, author, inclusive page numbers, citing an introduction, preface, foreword, or afterword, articles, online journals or website, Check list for a research paper*

2. Choosing a Detailed Project Report / Carrying out feasibility study (prepare a summary based on the research)

Sample

Many people are opening their own businesses. What does it take to open your own business? Before you can write an effective business plan and seek financing from a bank, you must research the project.

Choose a new venture, selling or a product or service of your choice. What would it cost to open this business? What would be your best location, or should your business

be online? What certification or licensing is needed? How many personnel would you need? What equipment is necessary? Who would be your clientele?

Based on research, write a proposal appropriate for presentation to a bank. In this proposal present your business plan for a new entrepreneurial opportunity

Practical 5- Dynamics of Professional Presentations

1. Introduction, planning, occasion, audience, purpose, thesis statement
2. Outlining and structuring, introduction, main body, conclusion
3. Nuances of delivery, modes of delivery, guidelines to effective delivery
4. Visual aids in presentation
5. Organizational GD

Activities : 2 Nos. (A PPT presentation on any one of the Research Project and GD)

Practical 6: Report Writing on Summer Training-1 (ST-1)

Note: Based on the 5 practicals prescribed, many assignments can be prepared and given to the students. Any innovative project and assignment will be highly appreciated.

Proper evidence of the execution of the projects/ Reports / assignments / worksheets should be maintained.

REFERENCE BOOKS:

1. **Technical Writing: Process and Product: S.J. Gerson and S. M. Gerson, Pearson Education Inc., Singapore (Printed in India by Anand Sons)**
2. **Basic Communication Skills for Technology: A.J. Rutherfoord, Darling Kindersley(India) Pvt. Ltd, India (Printed in India by Saurabh Printers Pvt. Ltd)**
3. **Effective Technical Communication: Rizvi. M Ashraf, Tata Mc Graw Hills, India**
4. **Communication Skills: Sanjay Kumar and Pushp Lata, Oxford University Press**

VI Semester

STEEL STRUCTURES

BECVE601T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**
.

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of structural properties in assessing its strength for the construction purpose.
2. Apply the knowledge of various techniques in analyzing the steel structural components.
3. Make use of knowledge of analysis in structural planning and design of various components of buildings.

NOTE: Use I.S Code. - 800-2007

Unit – I

Steel as a structural material, various grades of structural steel properties; various rolled steel sections (including cold formed section, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875 etc.

Introduction to Plastic Analysis, Shape Factor, Plastic hinge formation Collapse mechanism for beams

Design of axially loaded members: (a) Tension members. (b) Compression members. Design of roof truss: Load assessment for DL, LL and WL.

Unit - II

Structural Fasteners:

Behavior of bolted and welded connections (types, Designation, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolt and welded connections. Moment resistant bolted and welded connection (bending and torsion)

Design of connection: Beam to beam, beam to column

Unit – III

Design of simple and built up beams: Laterally restrained and un-restrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. (Design of welded plate girder.)

Unit - IV

Design of single rolled steel section column subjected to axial load and biaxial moment including base design.

Design of axially loaded built up columns. Laced and battened (Column bases, slab base, gusseted base, and moment resistant bases).

STEEL STRUCTURES

BECVE601P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-1

Term Work –

Minimum three design assignment based on above topics along with the detailed structural drawings on A2 size sheets.

Practical Examination shall be based on the above Practical work.

SURVEYING-II

BECVE602T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Carry forward the concepts of basic surveying techniques
2. Operate various survey instruments effectively with precision
3. Use different types of techniques in various surveying problems
4. Apply the concepts of modern surveying techniques & instrumentation.
5. Take – up mini project using different surveying techniques.

UNIT-I

Tacheometric Surveying: Classification, principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.

UNIT II

Simple, Compound, Reverse Curves and Vertical Curves:

a) Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves.
b) Compound Curves: Elements of compound Curves, setting out the curve.
c) Reverse Curves: Elements of reverse Curves, setting out the curve.
d) Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point.

UNIT III

Transition Curves: Elements of transition curves, super elevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.

UNIT IV

Geodetic Surveying and Triangulation Adjustment

Geodetic Surveying: Classification of triangulation survey, inter-visibility of stations, field work, reduction to centre, base line measurement, corrections.

Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment (Triangle only)

UNIT V

Photographic Surveying: Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, Tilt and height displacements, heights from relief displacement and parallax measurements, flight planning, study of photo theodolite and stereoscope.

UNIT VI

Advanced Techniques in Surveying:

Total station, Electromagnetic Distance Measurement (EDM)

Remote Sensing: Introduction, definitions, Remote sensing systems, advantages, Basic Principles, energy interaction in the atmosphere, Indian remote sensing Satellite series and their characteristics

GIS & GPS: Components of geographical information system (GIS),advantages, function of GIS, Raster and vector data, advantages and disadvantages, global positioning system.(GPS),Introduction, definitions, GPS receivers, antenna, advantages of GPS.

REFERENCE BOOKS:

1. Surveying & Levelling by B.C. Punmia (Vol 2 & Vol 3)
2. Surveying & Levelling by Kanetkar & Kulkarni (Vol 2)
3. Remote sensing & G.I.S. by Dr. M. Anji Rddy

SURVEYING-II

BECVE602P **Evaluation Scheme: (25-Internal/25-External)**
(P-4 Hrs/Week); Total Credits - 2

A) PRACTICALS: Minimum Eight Practicals out of following

1. Determination of constants of Tacheometer
2. Determination of elevation of points by Tacheometric surveying
3. Determination of elevation of points and horizontal distance between them by Tacheometric survey.
4. Determination of gradient of given length of road by Tacheometric survey
5. Setting out of simple circular curve by offsets from chord produced method
6. Setting out of simple circular curve by Rankine method of tangential angle
7. Setting out of simple transition curve by tangential angle method
8. Use of Advanced techniques of surveying.
9. Toposheet: Understanding and identification of different features of drawing

B) SURVEY PROJECT:

Survey project should be carried out for minimum 2 days in the following areas (Any One)

1. Road Project,
2. Irrigation Project (canal alignment, watershed demarking, contouring)
3. Water Supply Project

FLUID MECHANICS –II

BECVE603T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**.

COURSE OUTCOMES: The students shall be able to

1. Understand the concepts related to boundary layer theory and determination of drag and lift forces.
2. Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer pressures.
3. Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
4. Understand the different techniques of dimensional analysis and its use in model testing.
5. Understand and apply basics related to Turbines & Pumps in Water Resources planning.
6. Make use of specific energy concepts in the analysis of open channel flow.
7. Undertake Gradually Varied Flow analysis and its computation.

UNIT-I

LAMINAR FLOW: Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen Poiseuille equation.

BOUNDARY LAYER THEORY: Nominal thickness, displacement thickness, momentum thickness of the boundary layer: Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub-layer: Separation of boundary layer on plane and curved surfaces.

REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: General definition of drag and lift; Flow past plates, cylinders and spheres; drag on sphere, cylinder and flat plate.

UNIT-II
FLOW THROUGH PIPES:

Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade’s experiment; Moody’s chart; Darcy-Weisbach & Hazen- William’s equation for frictional head loss; Hydraulic gradient and energy gradient: Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross method of pipe networks; Water-hammer, pressure head due to sudden closure of valve.

UNIT-III
FLOW THROUGH OPEN CHANNEL:

(A) GENERAL: Types of channel and their geometrical properties; Types of flow in open channel.

(B) UNIFORM FLOW: Chezy’s and Manning’s equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

(C) CRITICAL FLOW: Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope; normal, critical slope; Specific force and its diagram; Conditions of critical flow.

UNIT-IV

(A) APPLICATIONS OF SPECIFIC ENERGY, gradual transitions of channels.

(B) GRADUALLY VARIED FLOW: Dynamic equation for GVF; Classification and characteristics of surface profiles; Direct Step method of computing profile length.

(C) RAPIDLY VARIED FLOW: Definition of hydraulic jump; Equation of hydraulic jump in horizontal, rectangular channel; Length & height of jump; Energy loss in jump; Classifications of jump.

UNIT-V

HYDRAULIC MODELS: Difference between model and prototype; Similitude- type of similarities; Model Laws- Reynolds model law and Froude model law; Types of model-distorted, undistorted; Froude’s method of determining resistance to partially submerged objects like ship.

UNIT-VI
FLUID MACHINERY:

(A) TURBINES: Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

(B) RECIPROCATING PUMPS: Components parts, working principle, Work done of single & double acting pumps; Negative slip, Air vessels – Working principle and necessity.

(C) CENTRIFUGAL PUMP: Component parts; Working principle; Static and manometric heads; different efficiencies; Priming & priming devices, Specific speed; Theoretical aspects of multistage pumps; Trouble & remedies; operating characteristics curves. Selection of pumps, system head curves and pump head curves. Model testing of pumps

REFERENCE BOOKS:

1. Hydraulics & Fluid Mechanics- Dr.Modi & Dr. Seth
2. Fluid Mechanics-Streeter & Wylie
3. Fluid Mechanics- Dr. A.K.Jain
4. Fluid Mechanics through problems- Garde
5. Theory and applications of Fluid Mechanics- K. Subramanya
6. Foundation of Fluid Mechanics-Yuan
7. Flow through open channel – K.G.Rangaraju

FLUID MECHANICS –II

BECVE603P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits - 1

PRACTICALS:
Minimum TEN practicals, from the list given below shall be performed:

1. Study of flow around immersed bodies.
2. Determination of Darcy-Weisbach friction factor for given pipes.
3. Determination of Manning’s or Chezy’s constant for an open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Study of hydraulic jump in a horizontal rectangular channel.
7. Study and performance of Francis turbine.
8. Study and performance of Pelton Wheel turbine.
9. Study and performance of Centrifugal pump.
10. Study and performance of Reciprocating pump.
11. Problem on pipe network analysis manually and using application software.

BUILDING DESIGN & DRAWING

BECVE604P Evaluation Scheme: (50-Internal/50-External)
(P- 4 Hrs/Week); Total Credits-4

COURSE OUTCOMES: The students shall be able to

1. Understand building bye laws & building code
2. Apply the principles of building planning and design.
3. To draw submission/working drawing using suitable software.
4. Make use of knowledge to give layout on the field as per the plan.
5. To draw simple perspective drawings.
6. Understand Drawings and Detailing of Building services

UNIT-I

Introduction: Site requirements, requirements of owner and Building byelaws, Importance of Building drawing to Engineer. Use of building byelaws and National building code

UNIT-II

Method of Drawing: Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962. a) Developing working drawings to scale as per IS. 1962 from the given sketch design and general specifications for terraced and pitched roofs.
b) Developing submission drawings to scale with location site and block plan complete

UNIT-III

Designing of Buildings:

Introduction: Climate and design consideration, orientation, recommendations of CBR1, Roorki and general principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

UNIT-IV

(A) Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.
(B) Drawings and Detailing of Building services; electrical, plumbing, sanitary, etc.

TERM WORK:

1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment one manual and one with Computer Aided Drafting)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One manual and one with Computer Aided Drafting)

3. Working drawing of multistoried Public/Educational/Health/Community/Industrial building including structural details and layout of services. (One assignment)
4. Two point perspective of the single storied Residential building neglecting small building elements. (one assignment - pitched or terraced roof)
5. Minimum 10 CAD based self explanatory dimensioned sketches of various building elements.
6. Line plans of various types of buildings e.g. public/educational/industrial/hospital/ community on graph sheets (04 assignments = 2 manual+2 CAD)
7. Submission drawing of two storied residential building framed structure including all details and statements as per the local byelaws.
8. One compulsory field exercise on layout of building etc.
9. Understanding professional architectural drawing.

NOTE:-

1. The internal practical exam includes drawing exam using AutoCAD of 20 marks and 30 Marks for continuous assessment.
2. The external practical exam shall consist of performance based on above syllabus on software of 30 marks and viva voce 20 marks

ENVIRONMENTAL ENGINEERING-II

BECVE605T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs.**

COURSE OUTCOMES: The students shall be able to

1. Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
2. Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of water treatment plant components.
5. Take-up functional planning, layout and design of sewage treatment plant components.
6. Plan for rural sanitation provisions, perform functional design of septic tank,
7. Analyze the industrial waste water for its treatment units.
8. Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter Phelp’s equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

REFERENCE BOOKS

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. S.K.Garg, "Environmental Engineering" -Vol II Standard Publication
3. G.S.Birdie, "Water Supply & Sanitary Engineering"
4. M.J.Macghee, "Water Supply & Sewage" – McGraw Hill Publication
5. M.N.Rao & HV.N.Rao, "Air 'Pollution" McGraw Hill Publication
6. C.S.Rao,"Enviromental Pollution Control Engineering".

SITE VISITS & MINI PROJECT

BECVE606P **Evaluation Scheme: (25-Internal/25-External)**

(P-3 Hrs/Week); Total Credits-3

COURSE OUTCOMES: The students shall be able to

1. Get an idea of various project details such as contracts, layout, planning, drawing, estimates, Arbitration provision, licensee & licensor, architects, structural designer, etc

2. Get an idea of various construction equipment, manpower & techniques used at site, techniques of batching, mixing, transportation, and placement of different construction materials.

3. Get an overview on safety measures, basic amenities to provide, inventory control.

4. Write a legible, correct and technically sound report after the visit.

5. Ascertain the provisions and execution as per the working drawing.

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

- Minimum Five visits are expected.
- Students should submit a detailed report on the visit duly approved by the concerned teacher. **The Detailed Report should mainly consist of the following: -**
  - Name of Construction Site with address
  - Nature of construction work and various structural components
  - Nature of ownership, executing and supervising authority
  - Architect and Structural Engineer
  - Architectural concept and Design features
  - Commencement of the work and tentative completion
  - Present Status of work
  - Estimated cost of the work (Money spent till date)
  - Mode of availability of finance
  - Various types of manpower for the work
  - Various safety measures and amenities provided to manpower
  - Various construction equipments for the work
  - Various materials used for the work
  - CPM / PERT of the project
  - Type of inventory control
  - Resource planning implemented
  - Social benefits and implication
  - Safety measures during and posts construction
  - Post Construction Maintenance provisions
  - Effect on environmental aspect and sustainable development
  - Various of scaffolding, Formwork, lifting devices

- Site of precast units for the work and its mode of transportation
- Use of local available material like fly-ash, slag, silica-fumes, etc.
- Causes for delay / faulty construction

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation - CBS

Semester: Seventh

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE701T	Advanced Concrete Structures	3	1		4	4	20	80	100	40					4
BECVE701P	Advanced Concrete Structures			2	2	1					25	25	50	25	
BECVE702T	Estimating and Costing	3	1		4	4	20	80	100	40					4
BECVE702P	Estimating and Costing			2	2	1					50	50	100	50	
BECVE703T	Elective -I	3	1		4	4	20	80	100	40					3
BECVE704T	Construction Management and Law	4			4	4	20	80	100	40					3
BECVE705T	Transportation Engineering - II	3	1		4	4	20	80	100	40					3
BECVE706P	Industrial Case Study and Project Seminar			3	3	3					50	50	100	50	
Total		**16**	**4**	**7**	**27**	**25**	**100**	**400**	**500**		**125**	**125**	**250**		

Note: 1. External Practical Evaluation of "Estimating & Costing" shall be performance based (Manual or using suitable Software) on assigned problem by the External Examiner

2. Evaluation of Summer Training – 2 (ST-2) shall be done as Industrial Case Study Component & minimum two seminar should be delivered as continuous college assessment for project seminar component.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation - CBS

Semester: Eighth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE801T	Irrigation Engineering	3	2		5	5	20	80	100	40					3
BECVE802T	Elective - II	3	1		4	4	20	80	100	40					3
BECVE803T	Elective - III	4			4	4	20	80	100	40					3
BECVE803P	Elective - III			2	2	1					25	25	50	25	
BECVE804T	Construction Economics and Finance	3	1		4	4	20	80	100	40					3
BECVE805P	Project			6	6	6					75	75	150	75	
Total		**13**	**4**	**8**	**25**	**24**	**80**	**320**	**400**		**100**	**100**	**200**		

Note: Internal Evaluation of Project shall be based on the academic contribution of a student and delivery of minimum one seminar on the project work.

BECVE804T - Construction Economics and Finance subject shall be dealt by Board of Basic Science and Humanities.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
CIVIL ENGINEERING

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

VII Semester

Code No.	Name of Subject in **Semester Pattern**	**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
7CE01	Structural Analysis – III (T)	BECVE501T		Structural Analysis – II
7CE02	Advanced Concrete Structures (T)	BECVE701T		Advanced Concrete Structures
7CE02	Advanced Concrete Structures (P)		BECVE701P	Advanced Concrete Structures
7CE03	Irrigation Engineering (T)	BECVE801T		Irrigation Engineering
7CE03	Irrigation Engineering (P)		BECVE801T	Irrigation Engineering
7CE04	Maintenance and Rehabilitations of Civil Engineering Structures (T)	BECVE802T		Elective – II (Maintenance and Rehabilitations of Civil Engineering Structures)
7CE05	Elective – I (T)	BECVE703T		Elective – I
7CE06	Industrial Case Study (P)		BECVE706P	Industrial Case Study & Project Seminar
7CE07	Project and Seminar (P)		BECVE706P	Industrial Case Study & Project Seminar

VIII Semester

Code No.	Name of Subject in **Semester Pattern**	**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
8CE01	Estimating and Costing (T)	BECVE702T		Estimating and Costing
8CE01	Estimating and Costing (P)		BECVE702P	Estimating and Costing
8CE02	Transportation Engineering – II (T)	BECVE705T		Transportation Engineering – II
8CE03	Elective – II (T)	BECVE802T		Elective – II
8CE04	Elective – III (T)	BECVE803T		Elective – III
8CE04	Elective – III (P)		BECVE803P	Elective – III
8CE05	Project (P)		BECVE805P	Project

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU's relevant ordinance.

SEVENTH SEMESTER B.E. CIVIL

ADVANCED CONCRETE STRUCTURES

BECVE701T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOME: The Students will be able to

1. Understand the behavior and failure modes different concrete members
2. Analyze and apply the results in designing various concrete member of structure.
3. Apply the knowledge & skills in practical problems
4. Understand the relevant software and use the same in analysis & design of concrete members.

Unit – I

Design of circular water tank with roof slab/dome resting on ground by approximate methods/IS code method (by Working Stress Method).

Design of rectangular water tank with one-way roof slab resting on ground by approximate methods/ IS code method (by Working Stress Method).

Unit – II

Analysis and design of columns subjected to biaxial moments. Design of long columns.

Design of Isolated footing, for uniaxialmoment , For Square Rectangular & Circular.

Unit – III

Moment redistribution: Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuous beam.

Unit – IV (with LSM)

Design of RCC Cantilever and Counter-fort Retaining wall.

Unit - V

Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of hinge (design of Dog-legged and Open Well Staircase).

Unit – VI : Design of combined footing.

i) Rectangular footing ii)Strap beam footing iii)Trapezoidal footing iv)Raft footing

ADVANCED CONCRETE STRUCTURE

BECVE701P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-1**

PRACTICAL

1) Minimum 5 Design of Structure based on above Syllabus.
2) One problem of design of structure based on analysis and design software.
3) Minimum One Site visit pertaining to above design.

ESTIMATING AND COSTING

BECVE702T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOMES: The Students will be able to

1. Prepare the preliminary estimate for administrative approval & technical sanction for a civil engineering project.
2. Write the specification of the works to be undertaken, prepare the tender documents, fill the contracts and make use of knowledge of different contract submission & opening in awarding the work to the contractor.
3. Use the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project
4. Schedule the project for its timely completion.
5. Use the technique of Rate analysis in estimating the exact cost of material & manpower and hence the entire project.
6. Estimate the bill of quantities using different techniques of preliminary & detailed estimation of buildings & roads
7. Arrive the exact value of the asset (movable & immovable) using different Valuation techniques.

Unit I

Introduction: Importance and purpose of the subject, Units of measurement as per I.S.1200. Items of work and Description of items of work, administrative approvals, technical sanction, preliminary estimates. objectives, and its methods

Earthwork estimates in road, hill roads and canals, mass haul curves, methods of consumptions of earthwork.

Unit II

Detailed estimates, objects, importance, accuracy. Methods of detailed estimates,
Detailed estimates of load bearing and framed structures. Calculation of reinforcing steel with Bar bending Schedule.

Unit III

Tenders and Contracts: Method of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, Legal aspects of various contract provisions, Arbitration.

Unit IV

Specifications: IS 1200 Introduction, Purpose and principles of specifications writing, Types of specifications, writing and developing detailed specifications of Important items of building and road work.

Cost Accounting : Various methods, classification of cost, direct and indirect charges, distribution of overheads, M.A.S. Account, issue rates and stores Account.

Unit V

Rate Analysis: Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, market rates of materials and labour, Rate analysis of major items of work

Unit VI

Valuation :- Purpose of valuation, Factors affecting property price and cost, Types of Value. Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalised value, Methods of valuation, Net & Gross income, Rent fixation.

REFERENCE BOOKS

1. Estimating and Costing by Dutta
2. Estimating & Costing by Chakraborty
3. Valuation by Roshan Namavati
4. Philosophy of Valuation. – S. S. Rathore.

ESTIMATING AND COSTING

BECVE702P **Evaluation Scheme: (50-Internal/50-External)**
(P-2 Hrs/Week); Total Credits-1

PRACTICAL – Minimum 8 practical assignment based on

1. Preliminary estimate using Plinth area method.
2. Detailed estimate of Load bearing structure
3. Detailed estimate of Frame structure.
4. Calculation of steel with Bar bending Schedule.
5. Detailed estimate of earthwork of road for Approximate 1km length.
6. Draft Detailed specification for 8 major items.
7. Analysis the unit rate of 8 major items of work contained.
8. Draft a short tender notice for proposed work.
9. Calculation of annual and total Depreciation and book value of the end of each year.
10. Fixation of standard rent of property.
11. Market survey for material and labour rates for various items.
12. Detailed planning and estimate of plumbing work.
13. Detailed estimate of building using estimate software.

EARTHQUAKE RESISTANT DESIGN OF STRUCTURE (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand the different aspects related to seismology and terms related to it
2. Analyze earthquake loading effect on structures.
3. Perform the analysis and design of structures against earthquake loading.
4. Analyze multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method
5. Understand the different seismic retrofitting techniques and its implementation.
6. Use the knowledge in practical situation.

Unit I :

Engineering seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale, Introduction on to tsunami. Seismic zoning maps of India. Response spectra. Strong motion characteristics.

Unit II :

Earthquake effects on the structures, classification of loads,. Seismic damages during past earthquakes, effect of irregularities and building architecture on the performance of RC structures

Unit III :

Seismic methods of analysis, seismic design methods, Mathematical modeling of multistoried RC buildings with modeling of floor diaphragms and soil foundation, (Winkler model.)

Unit IV :

Design of multi – story RC structure foundation as per latest IS 1893 by Equivalent static lateral load method and Response spectrum Method. Introduction to Time history method. Concept of Capacity based design of soft story RC building.concept of shear walls. Ductile detailing as per latest IS :13920

Unit V :

Seismic retrofitting, Source of weakness in RC framed building, Various retrofitting techniques, Conventional and non- conventional methods, Comparative study of various methods and case studies.

Unit VI :

Introduction to Base Isolation system. IS code provision for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques.

REFERENCE BOOKS:

1. Seismology Committee (1999). *Recommended Lateral Force Requirements and Commentary.* Structural Engineers Association of California.
2. Design of Seismic Isolated Structures- FarzadNaeim, James M. Kelly, Published 2 DEC 2007
3. A K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering (3rd Edition), Prentice-Hall of India.
4. IS 13920, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice, 1993.
5. A.K. Chopra, Dynamics of Structures, 3rd Edition, Pearson, 2007.
6. PankajAgarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India, 2006.

ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Use the knowledge to carry out traffic studies and give solutions to planning of transportation system.
2. Apply basic principles for the geometric design of roads and other traffic controlling devices
3. To understand the parking systems, riding quality standards, traffic safety and accident study and suggest the solutions to the practical problems.

Unit – I

Elements of Traffic Engineering : Road, Road user & Road Vehicle Characteristics, problems related to heterogeneous traffic.

Traffic Surveys and Data collection :~~–~~Speed, journey time and delay studies, methods of measurement of spot speed, headway, gaps, volume / capacity surveys, speed, volume-density interrelations, measurements of running and journey speeds, origin-Destination surveys, necessity, survey methods, sample size, data analysis & Presentation. Highway capacity, level of service concepts.

Unit – II

Statistical methods : Binomial, Normal Poisson, Probability. distributions, Discrete and continuous, variable application to traffic flow, Test of significance – Chi-square & 'T' test, (Regression analysis)

Unit – III

Traffic Design : Hierarchy of urban roads and their standards, Diverging, merging crossing weaving maneuver's conflict points, types of road junctions ,channelization of traffic flow, traffic rotary design, Grade separated inter-sections, Drive ways, design of pedestrian facilities, Design criteria for separate cycle track, Exclusive Bus lane, (Bus stop locations and facilities.) introduction to Intelligent Transport system

Unit – IV

Traffic Control Devices : Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems~~,~~(Queuing)Theory, Traffic control aids, and street furniture. Introduction to transport systems, Traffic controls for Expressway~~.~~

Unit – V

Traffic Safety, **Enforcement and Education :**

Elements responsible for accidents, situations in India, Collection and interpretation of accident data and recording in Standard form, Analysis of Accidents. Traffic regulation and E`s of traffic management, (vulnerable road user safety, Introduction to Regulation Act.)

Motor Vehicle Acts and Rules, traffic Education, traffic Controls on National Highways

Unit – VI

Urban Traffic: Present traffic scenario. Urban transportation problems, mixed traffic flow, head and administrative set up of traffic cells at various levels, co-ordination with other transport modes.

Parking : Parking surveys, on and off street parking, parking systems, parking demand, design of off-street parking lot, underground & multistoried parking.(Truck lay bye, bus lay bye, facilities to parking and way side amenities.

Students should complete the assignment based on

1. ***Accident data collection***
2. ***Speed, Volume and Parking studies.***
3. ***Data collection for Rotary design and traffic signal.***

Reference Book:

1. Traffic Flow fundamentals: Adolf D.MayVIII
2. Traffic Engineering :Mcshane and Roess
3. Traffic Engineering and Transport Planning : L.R. KadyaliI
4. Principles of Transportation Engineering :PathaChakraborty and Animesh Das III
5. Traffic Flow Theory *by* Drew, D.R., McGraw- Hill Book Co., New York.VII
6. Highway Engg*by*S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.IV
7. Traffic Engg. *by* Matson, T.M., Smith, W.S. and Hurd, F.W., McGraw- Hill Book Co., New York.VI
8. principles of traffic engg. Garber &Hoel. II

AIR POLLUTION AND SOLID WASTE MANAGEMENT (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students will be able to

1. Understand different aspects of air pollutants, its sources and effects on man and material etc.
2. Design controls methods and equipments for air pollution to reduce its impact on environment.
3. Understand problems arriving in handling large amount of solid waste generated ,its collection and transportation, processing and will bw able to design safe collection and disposal methods.

Unit - I

Introduction to air pollution : Definition, air pollution episodes, atmosphere & its zones.

Classification and sources of air pollutants, Standards for air pollution (as per Indian Standards and CPHEEO). Effects of air pollutants on man, and materials.

Unit - II

Meteorological parameters and Air sampling: Primary and secondary parameters, atmospheric stability, plume behavior. Wind rose diagram, wind data analysis & wind impact area diagram, Stack height determination.

Air sampling and measurement : ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, site selection criteria methods of estimation.

Unit – III pollution control

Air pollution controls methods and equipments ; Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers, (adsorption, absorption, incineration, condensation)

Automobile exhaust :Introduction to Pollution due to diesel & petrol engines,

Noise Pollution : Sources, ill effects, control measures.

Unit - IV

Introduction to solid waste management.(SWM) : Structure , necessity and responsibility,

Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis.

Unit – V : Collection and Transportation methods:

Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route.

Solid waste processing : Methods of processing, choice of methods, merits and demerits of various methods, gas control measures.3R concept

Unit – VI : Disposal methods:

Composting of waste, methods of composting, factors affecting composting

Sanitary land filling : Site requirements, methods, leachate management., control of gases.

Incineration: Principles of incineration, types of incinerators, advantages and disadvantages.,3T Diagrams

REFERENCE BOOKS

1. M.N. Rao & H.V.N.Rao, " Air Pollution", Tata McGraw Hill Publishing Co. Ltd.
2. C.S.Rao, "Environmental Pollution Control Engineering", Wiley Estern Ltd. New Delhi.
3. Stern A.C., "Air Pollution" Vol I to X.
4. A. D. Bhide, & Sunderesan B.B., "Solid Waste Management in developing countries, INSDOC, N. Delhi.
5. Tchobanoglous, "Integrated Solid Waste Management in Engineering principles and management isssues,
6. K.V.S.G. Murlikrishna" Air Pollution" JTNU, Kakinada.

ADVANCED HYDRAULICS (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**

(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1 Apply the concept of uniform flow and critical flow in open channels.
2 Analyze and identify GVF profiles and its importance in practical aspects.
3 Understand the concept of rigid water column theory and elastic water column theory and apply it to the hydraulic projects.
4 Understand water hammer theories and problems encountered in practical situations.

Unit-I : GENERAL:

Computation of uniform flow, computation of critical flow, conveyance of channel section factor, hydraulic exponent for uniform & critical flow.

Theory of gradually varied flow, dynamic~~s~~ equation~~s~~ for GVFin various forms, Analysis of gradually varied flow profiles.

Unit-II : GVF (GRADUALLY VARIED FLOW):

Computation of gradually varied flow, Bresse’s method, Chow’s method, Direct step method, Standard step method

Unit- III : HYDRAULIC JUMP:

Theory of Hydraulic jump, Location of hydraulic jump, application of hydraulic jump types of hydraulic jump, stilling basin with horizontal apron. Numerical on hydraulic jump.

Unit- IV : UNSTEADY FLOW IN PIPE :

Equation of unsteady flow in a pipe line for incompressible fluid, time of flow establishment, rigid water column theory of water hammer and computation of water hammer pressures.

Unit-V : WATER HAMMER :

Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, computation of water hammer pressure of frictionless flow in horizontal pipe, for sudden and slow closure of valve, Application of Allievi’s method and charts, approximate pressures, water hammer pressures in pumping systems, method characteristics.

REFERENCE BOOKS

1. Fluid flow in pipe & channel by G.L.Asawa, CBS publication.
2. Open Channel Flow – K. Subramanya
3. Open Channel Flow – V.T. Chow
4. Open Channel Flow – Ranga Raju

SUSTAINABLE RESOURCE MANAGEMENT IN CIVIL ENGINEERING
(ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : The students shall be able to

1 Understand the concept of sustainability, sustainable resources management and make use of understanding in planning the civil engineering project.
2 Understand the need of environment protection and energy saving through the use of alternative green construction materials.

Unit – I

Sustainability & Resource Management- Definition of Sustainability & Background. Need ,

Gap between need and practice, Current Global and local scenario, Resources in Construction, current status.

Unit – II

Sustainable Construction Materials & Management- concept of zero waste production in construction engineering, classification of Solid waste (Industrial, agricultural, municipal) utilization in various construction materials (Masonry, concrete, interior, timber, rerolled steel, etc. Alternative building materials e.g. CMB.AAC blocks etc

Unit – III

Sustainable Water Management- 3Rof water **conservation**, reduce, reuse, and recycle (grey water treatment)

Unit – IV

Sustainable Energy Management- Non-renewable energy sources & potential in India (Solar, wind, geothermal, hydro, etc.), energy conservation , introduction to ECBC

Unit – V

Public Health Engineering & Management- Health issues during construction, occupants comfort & indoor air quality, basic design principles (SP41), effects of light , heat, humidity etc.

Unit – VI : Life Cycle Costing of Sustainable Technologies & Management

Recommended Standards- National Building Code, concept and need of life cycle costing, advantages, Introduction to techniques of life cycle costing. Provision of national building code.

Reference :

1. Green Rating for Integrated Habitat Assessment, TERI, New Delhi;
2. Indian Green Building Council, Hyderabad
3. Energy conservation building code -2011
4. SP 41 -1987
5. SP 7-2005 (NBC)

BUILDING SERVICES (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

1. To design a building with all essential facilities for better life style.
2. To create a sustainable structure.
3. To design a green building

Unit-I:

Plumbing work :- water supply and sanitary provisions, Accessories of sanitary provision, methods of plumbing, problems associated with plumbing work.

Unit-II:

Acoustics, Sound Insulation and Noise Control: Basic terminology and definitions, Physics of sound. Behaviour of sound in an enclosed space. Requisites for acoustic environment , Acoustic design approaches for different building types, with reference to applicable standards. Selection of acoustic materials.Noise and its control, control of structure borne sound and noise from different mechanical equipment.

Unit-III

Electrical and Allied Installations: day lighting , basic design, artificial lighting . Different types of wiring, need of earthing, comparison between fuse and MCB, substation, types of lightening fixtures, electricity distribution in multi-storeyed building. Building protection against lightening, Planning and layout of electrical installations within a building complex.

Unit-IV:

Ventilation: Functions of ventilation, supply of fresh air, convective cooling, Stack effect, physiological cooling, provision for air movement; wind effect, Air flow through buildings, cross-ventilation, position and size of openings, air flow around buildings, humidity control.

Air Conditioning, Heating and Mechanical (Thermodynamics of human body.) Ventilation: Requirement of air conditioning, air conditioning system, elements of air conditioning, Working and p-H diagram of vapour compression cycle, refrigeration effect,

Unit-V

Mechanical Equipment & Installation: Installation of lifts and escalators, different types of Security and alarm systems. Hot Water Provision (Solar and Electrical), Special features required for physically handicapped and elderly, -

Unit-VI:

Firefighting and safety measures : Planning considerations in buildings using non-combustible materials, escapes, Fire detection and fire fighting systems. Heat and smoke detectors, Fire alarm system, Automatic sprinklers.

Assignment:

Case Study of any Building & its services

Reference Books:

1 Building Services Engineering by David V Chadderton
2 General Specification for Electrical Work – Part – I, II & III, Government of India Publication, Jain Book Depot.
3 General Specification of Heating & Ventilation - 2004, Government of India Publication, Jain Book Depot.
4 Handbook on Functional Requirement of Buildings.
5 Building Services Environmental & Electro – Mechanical Services, by S M Patil, Jain Book Depot.

ADVANCED CONSTRUCTION MATERIALS (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand properties and utilities of cement, mortar, concrete ceramic materials.
2. Understand properties and its utilities of metals and various composites
3. Study the importance of Construction chemicals
4. Study shoring and formwork materials
5. Understand the elementary concepts of smart materials

UNIT I: CEMENT, MORTAR AND CONCRETE CERAMIC MATERIALS

Study of Special Purpose Cement, Mortar, Concrete • High Strength And High Performance Concrete, Self Compacting Concrete, supplementary cementitious material - Fly Ash, Red Mud, Gypsum, Various Types of Finishes & Treatments, Engineering Grouts, Mortar plaster, Gypsum, Glass. GGBS, micro silica etc. Replacement of aggregates; stone dust, light weight aggregates, recycled aggregate.

UNIT II: METALS

Steels • HYSD, TMT, Tendons, Light Gauge Steel, Steel Fastenings, New Alloy Steels – Aluminum and Its Products, Protective Coatings to Reinforcement.

UNIT III: COMPOSITES

A) Polymer and its composites
B) Ceramic and its composite, FRC, Ferro cement etc.
C) Timber, bamboo, veneer, Laminates, Particle boards.
D) Thermal and Sound insulating materials.

UNIT IV: CONSTRUCTION CHEMICALS AND WASTE

Chemical Admixtures and Adhesives, Water Proofing Compounds – Non Weathering Materials, Geo-Synthetics, Geo-Membranes,, Asphalt, Tar & Bituminous Materials, Agro Waste Materials, Industrial Waste Materials, Disposable Materials.

UNIT V: SHORING & FORMWORK MATERIALS

Materials, Accessories and Proprietary Products - Lumber - Types - Finish - Plywood -Types and grades, Reconstituted wood -Steel -Aluminum Form lining materials, Design Considerations, Building and Erecting the formwork, Causes of Failure of Formwork.

UNIT VI: ELEMENTARY CONCEPT OF SMART MATERIAL

Smart and Intelligent Materials-Piezoelectric Materials, Shape Memory Alloys & Polymers, Magnetostrictive Materials, Temperature Responsive Polymer, Halo chromic Materials, Smart Hydrogels, Chromomeric Systems, Photomechanical Materials, Self Healing Materials, Dielectric Elastomers.Bio cement, Phase change material.

CONSTRUCTION MANAGEMENT & LAW

BECVE704T	**Evaluation Scheme: (80/20)**
(L-4, T-0, P-0) Total Credits-4	**Exam Duration: 3 hrs**

OUTCOMES :

On completion of this syllabus, the students should be able to:

1. *Demonstrate the understanding of various types of projects, modern construction techniques and will exhibit the mastery in construction planning, scheduling and various controls.*
2. *Achieve the knowledge of various types' of equipments to be used in the construction and its operational cost estimates, understand manpower requirement, planning, resources utilization and management.*
3. *To know the quality control aspects in planning & management, modern trends project management, application of information system in management of construction projects, safety provisions and equipments.*
4. *Analyze the legal aspects in construction projects through the understanding of various laws pertaining to civil engineering and architectural planning & sanctioning, labor & organizational welfare measure, provisions of arbitration and litigations.*

UNIT - I :
BASIC STUDIES IN CONSTRUCTION PROJECT

Type of Project & its Financing, Detailed Project Report Analysis and Feasibility, Time of Completion, Provisions of Escalation in Time and Cost, Choice of Technology and Construction Tecniques, Site Planning.

UNIT- II :
CONSTRUCTION SCHEDULING

Network Analysis : The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT), Bar Chart, Resource Oriented Scheduling, Allocation, Leveling, Crashing and Time/Cost Tradeoffs, Line of Balance.

UNIT III - :
MANPOWER, MATERIAL AND MACHINERY (3M) MANAGEMENT

Manpower – Requirement and methods of calculating Productivity, Staffing, planning, directing & controlling. Organisational Charts, Duties and Responsibility of Personal Manager

Material – Requirement, Procuring, Storing & Delivery. Quality Checks, Inventory Control techniques, construction Waste generation and Management .

Machinery – different type of construction equipments and their applications- Excavators, Dozer,Rollers, Hoisting and Hauling equipments, Cost & Working Hour analysis, Depreciation analysis,

UNIT- IV:
QUALITY AND SAFETY MANAGEMENT

Concept of Total Quality Management, Safety Provisions as per National Building Code of India, Safety Equipments, MIS in Construction Project, Project Management System-MS Project.

UNIT –V :

LEGAL ASPECTS IN CONSTRUCTION PROJECTS

Town Planning Requirements, Acts and codes related to planning, Regional Town Planning, Housing Development act, Highway Act, Irrigation act, Local Rules (Gunthewari),

UNIT –VI :

INTRODUCTION TO DIFFERENT LAWS

Environmental (Protection) act, Forest Conservation - Water Pollution and air pollution, Transfer of property act – sale, purchase, lease. Land Acquisition and Rehabilitation act, Indian Contract act.

Reference Books :

1. Construction Planning and Management – Purifoy
2. Construction Planning and Management – Dr U K Shrivastava, Galgotia Publ.
3. Project Planning & Management – B C Punmia
4. Laws related to buildings and engineering contracts in India- Gajaria G T, LexisNexis Butterworths India Publisher, 2000
5. Construction Contracts- Jimmie Hinze McGraw Hill,
6. Contracts and the legal Environment for Engineers and Architects- Joseph T Bockrath, McGraw Hill,

TRANSPORTATION ENGINEERING-II

BECVE705T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students are able to

1. Understand the functions of various elements of railways, airports, tunnels and docks and harbor.
2. Plan and design various elements of railways, airports, tunnels and docks and harbor.
3. Understand the various principles traffic control in railways, airports, tunnels and docks and harbor.
4. Understand layout, design and construction permanent way, runway, taxiways, tunnels, births and jetty.
5. Understand the maintenance of various elements of railways, airports, tunnels and docks and harbor.

Unit – I : RAILWAYS

Classification of Rail way~~:~~ lines and their track standards.

Traction and Tractive Resistance, Hauling capacity and Tractive effort of locomotives, Different Types of tractions
Permanent Way: (Ideal permanent way), gauges, track section. Coning of wheels, Stresses in railway track, High speed track.

Unit – II

Rail types and functions, selection for rails, wear & defects, creeps of rails, long welded rails., sleepers -function, types, merits and demerits, sleeper density. Ballast cushion. Ballast section, Spikes, fishplates, hook bolts, Dog bolt, pondrot clip .
Geometric design of railway track, Gauge, Gradient~~s~~ speed, super elevation, cant deficiency, Negative super elevation, objectives of transition curves, grade compensations.

Unit - III

Points & crossings: Left and right hand turnouts, design calculations for turnouts ~~,~~Station and Yards: Types, functions,
Railway signaling and interlocking: Objects of signaling, principles of signaling. Classification and types of signals. Necessity of interlocking methods and mechanical devices Railway track construction, inspection & modern techniques of maintenance. Modern technology related to track, signaling & controlling.

Unit – IV : AIRPORTS

Aircraft components and characteristics, Airport site election. modern aircrafts.

Airport obstructions: Zoning Laws, Approach and turning Zone, clear zone, . (vertical) Clearance for Highway & Railway.

Runway and taxiway design: Wind rose, cross wind component, Runway Orientation and configuration. Basic runway length and correction, runway geometric design standards. Taxiway Layout and geometric design standards, Exit Taxiway~~.~~

Unit – V

Airport layout and classification: Terminal Area, Aircraft parking, configuration and system. Aprons, Hangers, Helipads and Heliports,

Visual Aids: AirPort marking and Lighting for runway, Taxiway and other areas.

Air traffic control: Need, network, control aids, instrumental landing systems, Microwave loading system

Unit – VI (Tunnel Engineering and Docks and Harbors)

16. Tunnel (Engineering) – surveys, Drainage, Ventilation, Lighting ~~(~~and Lining~~)~~

Text Books and Reference Book:

1. A text book of Railway Engineering *by*S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi.
2. Railway Track Engg. *by* J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
3. Airport Planning and Design *by*S.K. Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
4. Planning and Design of Airports *by*RobertHornjeff, McGraw Hill Book Co.
5. Air Transportation Planning and Design *by* Virender Kumar &Satish Chandra, Galgotia Publications, N.Delhi.
6. Mundary, J.S. Railway Track Engineering, Tat McGraw Hill, New Delhi.
   OZA, Docks and Harbours, Charotar Publisher)
7. Air Planning and Design by G.V. Rao

INDUSTRIAL CASE STUDY & PROJECT SEMINAR

BECVE706P **Evaluation Scheme: (50-Internal/50-External) (P-3 Hrs /Week); Total Credits-3**

Industrial Case Study

The student is expected to prepare Mini project report on the basis of data collected in Summer Training (ST-2) of 3 / 4 Weeks and submit detailed report .

Project & Seminar

This includes preparation of preliminaries for the project work to be under taken in 8th Semester.

1. Finalizing the title of the Project .
2. Literature Survey
3. Collection of Data
4. Scope of the project

Each group shall deliver seminar on the work done during the semester. In addition student will deliver one more seminar on the topic finalized by him with the consent of his guide.

EIGHTH SEM. B.E CIVIL

IRRIGATION ENGINEERING

BECVE801T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-2 Hrs/Week); Total Credits - 5 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1. Understand the importance and scope of irrigation engineering
2. Understand fully the methods and efficiencies of irrigation, crop water requirement.
3. Understand the planning, design and operation of storage reservoir and make use of it in the practical situation.
4. Understand the basic profile of dams and use the knowledge in checking stability of Gravity dams and Earth dams.
5. Understand the theories of Canal design and apply the concept to design lined and unlined canals and detail out the cross sections.
6. Understand water logging and provide the solution to such problem.

Unit – I

General : Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; General principles of flow, lift, perennial, inundation Irrigation systems; Comparative study of sprinkler and drip Irrigation systems.

Water Requirement Of Crops : Suitability of soils for Irrigation, Standards of Irrigation water; (Modified Penman Method), Depth and frequency of Irrigation; Definitions of field capacity, wilting point, available moisture, duty, delta, GCA, CCA, or depth, base period, outlet factor, capacity factor, time factor, root zone depth; Relation between duty and delta; Factors affecting duty; Principal crops in India; Crop rotation; Methods of assessment of Irrigation water.

Unit – II

Reservoir Planning : Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of LWL, FTL, TBL, HFL; Different storage zones in reservoir; Determination of storage capacity by mass curve method; (Reservoir operation scheduling,) Reservoir sedimentation; Life estimation of reservoir by Brune’s method; Organizational setup & Administration of Irrigation projects.

Dams: General Classification of dams as per use, hydraulic design and materials; Factors governing selection of dams. Instrumentation in dam.

Unit – III

Gravity Dam : Forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

Earthen Dams: Types of earthen dam; Description of component parts of earthen dams-foundation, cut off trench, rock toe, hearting, central impervious core, pitching and chipping, turfing; seepage through body of earthen dam and drainage arrangements; Failure of earthen dams; Plotting of phreatic line for earthen dams with horizontal filters; Stability of foundation against shear. (OMC and ODD tests for hearting and casing zones)

Unit – IV

Spillways: Types of spillway, General principle of design of ogee spillway; Spillway gates – vertical lift, radial, rolling and drum; Gate O.S. Energy dissipation methods.

Diversion Head Works: Component parts of diversion headworks – Fish ladder, guide wall, divide wall, silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Bligh's Creep theory; Dr. Khosla's theory for design of weirs on permeable foundations.

Unit – V

Canals : General : Types of canal; Alignments of canal; Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals,

Canals In Alluvial Soils : Kennedy's silt theory – Design procedure, drawbacks; Lacey's silt theory - Definition of initial, final and permanent regime channels, Lacey's Regime equation, channel design procedure, drawbacks; Garret's diagram for channel design.

Lined Canals: Design procedure, Types of lining; relative merits and demerits of canal lining; Economics of canal lining.

Unit – VI

Canal Structures: Canal Regulation Works : Purpose, components of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

Cross Drainage Works : Purpose aqueducts, siphon aqueducts, super passage, canal siphon, inlets and level crossings.

Water Logging And Land Drainage : Causes, effects, preventive measures of water logging, types of drains, layout of tile drains system, flow of ground water to drains.
(Components of lift irrigation scheme)

RECOMMENDED BOOKS

1. Irrigation Engineering and Hydraulic Structures- Santosh Kumar Garg
2. Irrigation Engineering and Hydraulic Structures- S.R. Sahastrabudhe
3. Irrigation Engineering and Water Power Engineering- B.C. Punmia
4. Irrigation Engineering and Hydraulic Structures- K.R.Arora
5. Irrigation Engineering- N.N. Basak
6. Irrigation Engineering and Hydraulic Structures-R.K.Sharma
7. Irrigation Engineering- G.L. Asawa
8. Water Resource Engineering Principles and Practice-C.S. Murty

ADVANCED STRUCTURAL ANALYSIS (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1 Analysis of Symmetrical & Unsymmetrical plane frames, plane Grids, space trusses.
2 Analysis for Free & Forced Damped/ un-damped vibrations for SDOF
3 Perform the earthquake Analysis of structures using IS:1893.

Unit – I

1. Beams On Elastic Foundation: Introduction, Case studies, infinite beams on elastic foundation, Development of computer program.
2. Beam Curved in Plan (Statically Determine Beams Only)
   Introduction, circular beam loaded uniformly and supported on symmetrically placed columns, semicircular Beams, Varandah circular beams.

Unit – II

3. Advanced MATRIX METHOD OF ANALYSIS FOR PLANE Frames, Analysis of Symmetrical & Unsymmetrical plane frames Effects of Shear deformation. Symmetry, Anti-symmetry conditions for solving symmetric frames.

Unit – III

4. MATRIX METHOD OF ANALYSIS FOR PLANE GRIDs Analysis of Symmetrical & Unsymmetrical plane Grids, space trusses using stiffness approach subjected to member loading (UDL, Conc. Load, Temperature etc.) and joint loads. Introduction to computer program development. Introduction to MATARIX METHOD OF ANALYSIS FOR Space Structures frames.

Unit – IV

5. INTRODUCTION TO STURCTURAL DYNAMICS : Basis concepts, D’Alemberts Principle, equation of Motion of the Basis Dynamic System, Effect of Gravitation force, Influence of Support Excitation, Analysis for Free & Forced Damped/ undamped vibrations for SDOF only, Transmissibility ratio, Response to Harmonic Loading.

Unit – V

6. Response to Periodic loading, Response ti Impulse loading, Numerical methods. Approximate methods for analysis of impulsive loading, Response to ground dynamic Loading. MDOF (3DOF), mode shape and frequency

Unit – VI

7. Earthquake Analysis of structures using IS:1893 : Introduction to Earthquake code, Calculation of earthquake forces on building using codal coefficient method.

Note: Solution is restricted upto three DOF problems and assembly restricted upto 8 DOF problem.

RECOMMENDED BOOKS:

1. Matrix Method of Structural Analysis - Gere and Weaver
2. Computer Analysis of Structures - Beaufait, Rowen, Headly et al
3. Structural Dynamics- Clough &Penzin
4. Computational Structural Mechanics, S Rajasekaran& G Sankarasubramanian
5. Computer Analysis of Structures – Flemmings

PRE-STRESS CONCRETE (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1) Gaining the thorough knowledge of the basic theories and the fundamental behavior of pre-stressed concrete
2) Perform the analysis and design of pre-stress elements.
3) Apply the fundamental knowledge to the solution of practical problems.

Unit – I

1. Losses in prestress.
2. Partial prestressing
3. Analysis and design of End Blocks as per IS 1343 Method. (Only comparative study with the other methods is expected)
4. Use of untensioned reinforcement.
5. Types of pre-stressed concrete structures - Type – I, II, and III

Unit - II

6. Structural design of pre-stressed concrete beams, including I Section by Limit state method, including Limit state design criteria for pre-stressed concrete members.

7. Deflection of pre-stressed concrete beams.
8. Behaviour of unbounded and bonded pre-stressed concrete beams.

Unit - III

9. Shear and Torsional resistance of the pre-stressed concrete members.

   Composite construction of pre-stressed concrete structures and in-situ concrete, Differential shrinkage, deflection, flexural strength, serviceability (Limit state) of the composite sections.

Unit - IV

10. Statically Indeterminate structures, Continuous beams, primary and secondary moment, transformation profile, concordant profile.
11. Flexibility Influence coefficient, Analysis of single-storey, single-bay fixed portal frame.

Unit - V

12. Analysis and design of circular water tank, fixed, hinged and sliding base at the bottom, use of IS-3370.
13. Design of pre-stressed concrete poles.

Unit - VI

14. Special problems in pre-stressed concrete structures like corrosion, fatigue, dynamic behavior of pre-stressed concrete beams, behavior of pre-stressed concrete structures under fire.

    Introduction to pre-stressed concrete bridges, pavements, one way, two way and grid floor.

RECOMMENDED BOOKS:

1 Pre-stressed Concrete by Dr, N. Krishna Raju
2 Pre-stressed Concrete by Dr. TY Lin
3 Pre-stressed Concrete by N. Rajgopalan, Narosa Publishing House, Mumbai, Ed. II- 2007.
4 Pre-stressed Concrete Design & Construction- Leonhardt F. Ernst Wilhelm and Sohen, Publ .

PAVEMENT ANALYSIS AND DESIGN (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1 Analyze and Design pavement and under different loading conditions for highways and airfields taking into consideration different characteristics.
2 Propose a pavement management system framework.
3 Design highway appurtenance and highway drainage.
4 Perform different tests considering field conditions and using the knowledge to increase the strength of pavements along with its economy point of view.

UNIT - I

1) General: Structural action of flexible and rigid pavements. Characteristics of high way and airfield pavement.
2) Design parameters: Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, type and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield, pavement, airport traffic area.

UNIT - II

3) Material characteristics: AASHO subgrade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for K, Marshal's method of Bituminous mix design, modulus of rupture, elasticity, poisons's ratio and coefficient of thermal expansion of concrete. Layer equivalent concepts.
4) Analysis of flexible and right pavements: stress, strain, deflection analysis for single, two three and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis, joints.

UNIT - III

5) Highway pavement design:

   Flexible: North Dakota cone, CBR, IRC-37, Burmister, Traiaxial (Kansas), AASHTO method of design

6) Airfield pavement design

UNIT - IV

7) RIGID IRC58, PCA, AASHTO method of design, design of joints and reinforcements.

   Flexible: US Corps of engineering, CBR, FAA, McLeod (Canadian)

   Rigid PCA, FAA & LCN, Ultimate load analysis yield lines patterns method

UNIT –V

8) Pavement testing and evaluation: field density, CBR, plate load test, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkalman beam deflection study. Introduction to high way Design method(HDM)

UNIT VI

9) Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.
10) Specification and cost estimate: Review of IRC/MOST/ICAO/IAAI specifications and standards for highway and airfield construction. Cost evaluation and comparative study.
11) case studies of highway and airfield pavement projects.

Reference Book:

1) Highway Engg *by* S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.
2) Relevant IRC Code: 37 , 58, (latest) and BIS standards.
3) Principles and Practice of Highway Engg. *by*L.R.Kadiyali, Khanna Publishers, Delhi.
4) Principles of Pavement Design *by*Yoder,E.J&Witczak,M.W., John Wiley and Sons, USA.
5) Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey.

WATERSHED MANAGEMENT (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students ~~will~~shallbe able to

1. Understand the Watershed and its characteristics
2. Understand the importance of watershed in terms of drinking water, irrigation water, increases in ground water.
3. Plan and design of Watershed protection, conservation elements
4. Envisage the management plan of Watershed.

Unit – I

Soil and Water – Issues related to plant life like composition of soil, water requirement of crops, necessary conditions for plant growth etc. Soils, their origin and classification. Land classification for WM, Land capability rating, determination of land capability class, land capability and suitability surveys, (Desalination of water logging and its remedial measures).

Unit – II

Watershed Behavior – Physical elements of a watershed, effects of land use changes on hydrological cycle component Concept of vegetative management of water yield and quality. Watershed Experiments, extrapolation of results from representative and experimental basins, Regional studies.(Water auditing and Bench marking).

Soil erosion – problem, types, conservation, and control measures in agricultural and non-agricultural land.

Unit – III

Water conservation and Harvesting – Agronomical measures in soil and water conservation. Examples and critical reviews. Inventory techniques for precipitation runoff, soil, timber, range-land and wild life

Water harvesting techniques – Elements, Development of modern harvesting Techniques Estimation of peak runoff rate Land capability classification

Unit IV

Erosion process – Factors affecting erosion, Types of erosion, Assessment of erosion, Control measures for erosion

Conservative practices – Objective and general practices, land and soil classification, identification of critical areas, (Catchment area treatment).

Unit V

Watershed Management – Objectives of Planning Watershed Projects, Guidelines for Project Preparation. Approach in Govt. programmes, people's participation, conservation farming, watershed-management planning, identification of problems, objectives and priorities, socioeconomic survey, use of tools like GIS.

Unit VI

Watershed Modelling: Runoff components –Simple parametric models – Curve Number Method, variable source area models; quasi- physically based models; a simple physically based model. Rainfall, Runoff modeling, USLE model for soil erosion.

RECOMMENDED BOOKS

1. J. V. S Murthy, Watershed Management, New Age International Publishers, 1998.
2. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers, 2003.
3. V.V. N. Murthy, Land and Water Management, Kalyani Publishers, 1994.

4. Ghanshyam Das, Hydrology &soil Conservation Engineering ,PHI Publication.

ENVIRONMENTAL MANAGEMENT SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1 Understand the Environmental issues such as pollution, degradation and its impact.
2 Understand the environment management system and certification
3 Understand and carry out Environment Impact Analysis of a civil engineering project
4 Learn to Perform the risk analysis.

Unit – I : Environmental Management

Environmental management- issues and strategies, Environmental reporting and certification, Development and implementation of international environmental management system, Introduction to ISO 1400 series , International voluntary standards,

Unit – II : Environmental legislation

Pollution control acts, rules & notifications, Environmental audit, EMS certification , Post Project Monitoring

Unit – III : Environmental impact Assessment :

Environmental impact analysis-Concept-methodology, Identification, Prediction and evaluation, checklist material, network and overly methodology. Environmental clearance Procedures in India EIA Case studies

Unit – IV

Methods of Impact Analysis :- - **Environmental clearance procedure in India** ,Cost benefit analysis & its dimensions, Role of GIS in EIA-base line study , risk assessment & management,

Unit – V : Risk Analysis

- Environmental Risk Analysis, Fundamentals of hazards, exposure & risk assessment, management Basic Steps in risk management- hazard identification, exposure assessment & risk characterization, Quantified risk assessment for industrial accidents , Design of risk management program , Risk assessment application to environment management problems.

Unit – VI

Energy Impact Analysis

Energy sources, Importance of energy impact analysis, Energy inventory, Supply demand scenario, Energy conservation, Energy alternatives , Energy Inventory data, energy conservation.

Recommended Books:

1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.
3. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment Earthscan, London, 1992.
4. A.Gilpin, Environmental Impact Assessment-Cutting edge for the 21st century, CUP, London, 1994.
5. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press, 1994.
6. Suresh, K.D., Environmental Engineering and Management, SK Kataria Publishers, New Delhi, 2002.
7. Gupta, K.R., Environmental Legislation of India, Atlantic Publishers, 2006.
8. Chandrasekhar M., Environmental Science, Hi-Tech Publications, Hyderabad, 2004.

WATER TRANSMISSION AND DISTRIBUTION SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand concepts of pipes, reservoir, pumps and valves.
2. Analyze water distribution networks and its designing process.
3. Carry out optimal design of water distribution network
4. Carryout the reliability analysis of water distribution network

Unit-I

General Hydraulic Principles: Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe.

Reservoir Pumps and Valves: Impounding reservoir, Service and balancing reservoir, Three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Valves- their types, analysis of reservoir system with checks valves and pressure reducing valves.

Unit- II

Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method, Introduction of Dynamic analysis.

Unit-III

Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave's approach- Node classification, node category compatibility, NFA theory. Introduction to other NFA methods- Germanopolus approach, Wagner ethal approach, Gupta and Bhave's approach.

Unit-IV

Reservoir capacity: Estimation of minimum required reservoir capacity using graphical and analytical method. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete variable.

Unit-V

Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method

Unit-VI

Optimal Design of Water Distribution Networks: Cost Head Loss Ratio(CHR) method- CHR criterion, Problem formulation, CHE methodology for single source branching networks. Linear programming formulation and solution using simplex method.Introducton of Non- Linear Programming based approaches.

Reference Books:

1. Jeppaon R.W.(1977), “Analysis of Flow in Pipe Networks’’ Ann Arbor Science. Ann Arbor Michigan, USA
2. Walski. T.M.(1984),’’ Analysis of flow in water distribution networks’’
3. Technomic Publishing CO.Lancaster, Pennsylvnia,USA
4. Analysis of water distribution networks by P.R. Bhave, R.Gupta.

GEOTECHNICAL INVESTIGATION & GROUND IMPROVEMENT TECHNIQUE
(ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
((L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand methods of soil exploration and analysis of the results
2. Understand the methods ground improvement and material used.
3. Understand the use of geosynthetic materials.

Unit I - Importance and objects of Geotechnical exploration:

Planning of geotechnical exploration program: Methods of boring, location, number of bore, depth of boring.
Sub-surface Investigation Report: Salient features and boring logs; Types of soil samples & their suitability, precautions in sampling, parameter for sampler design, preservation & shipment of samples.
Seismic refraction method, electrical resistivity method, qualitative and quantitative interpretation of test results, limitations.

Unit II - Field investigation:

Standard Penetration test, static cone and dynamic cone penetration tests, interpretation of test results for obtaining design soil parameters for cohesive and cohesion less soil,
Plate load test– purpose, procedure, interpretation for bearing capacity and settlement of foundation.
Field vane shear test, design value of un-drained shear strength of clays, correction factor;

Unit III - Introduction to ground improvement techniques:

Need for ground improvement and ground improvement techniques, economic considerations and suitability.
Grouting: Materials and methods of grouting grout volume and grouting pressure, grout requirements and tests.
Stone Column: Application, layout feature, procedures of installation, rammed & floated column, quality control in construction, methods of improving the effectiveness of stone column, skirted and cemented stone column technique, geosynthetic encased stone column.

Unit IV - Reinforced soil and Geo-synthetics:

Basic theory of reinforced soil, concept of reinforced soil wall and slope geo-synthetics types, application and function in civil engineering,. Application of Geofoam & Geocell.

Unit 5 : Ground Anchor and Soil Nailing

Concept , Design features , types, construction procedure, Functions, Application, Advantages. Limitations of soil nailing system and ground anchor.

Unit 6 : Diaphragm wall

Construction sequence, cement slurry wall, Design features, Functions, applications, Case study on Diaphragm wall.

Deep soil mixing – Concept, procedure, Advantages and limitations.

Reference Book:

1. Geotechnical Engineering, Principles & Practices of Soil Mechanics and Foundation Engineering: VNS Murthy
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor, 1989 and later
3. Soil Mechanics and Foundation Engineering: B.C. Punmia, Laxmi Publications Pvt. Ltd.
4. Basic and Applied soil mechanics: Gopal Ranjan & A.S. Rao, New Edge International Ltd., (2004)
5. Ground Improvement Techniques: Dr. P. Purushothama Raj, Laxmi Publications Pvt. Ltd., 1999 and later
6. Engineering Principles of Ground Modification: M.R. Housmann, McGraw Hill (1990)
7. Geotechnical engineering – Braja M.Das, N.Sivakugan, Cengage, learning.

ADVANCE ENGINEERING GEOLOGY (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Acquire sufficient knowledge of existing rocks , its failure and its remedial methods.
2. Understand the application of Geological fundamentals in various fields of Civil Engineering.
3. Understand different Geological Hazards on earth and plan for the mitigation of such hazards..

Rock Mechanics

Unit-I

Foundation Geology : Methods of rock investigation for major Civil engineering projects, Geological Drilling Method, borehole logs, Correlation, percent recovery and Rock quality designation, Engineering classification of Rock based on RMR, RQD, Strength and Weathering resistance.

Unit-II

Rock Strengthening : Defects in rock masses, Grouting method and material, Design of Rock bolts and anchors. Water percolation tests at foundation site. Case studies of Civil Engineering projects in India.

Unit-III

Groundwater Hydrology: Groundwater and well Hydraulics, Determination of permeability, storage capacity, transmissivity, specific capacity, safe yield. Groundwater trends and fluctuations. Construction of Wells.

Unit-IV

Groundwater Exploration : Surface and sub-surface investigations of Groundwater. Geological, Geophysical methods and remote sensing; Water balance technique, Artificial recharge of ground-water.

Unit-V

Environmental Geology: - Land use/cover planning; pollution of surface and groundwater; waste disposal site selection for solid and liquid wastes.

Unit-VI

Geological Hazards: Natural Disaster Management with emphasis on Earthquakes, Stability of slopes and landslides. Prediction, Prevention and Rehabilitation.

RECOMMENDED BOOKS

1. Fundamentals of Engineering Geology- F.G.Bell Publisher BS Publications Edition 2005.
2. Engineering Geology- Parbin Singh, S K Katariya& Sons Edition Sixth Edition.
3. Principles of Physical Geology- Homes Arthur and Homles Doris, ElBS Publications Edition 1987.

WATER POWER ENGINEERING (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOME:-

At the end of syllabus, students shall be able to

1. Understand the significance of water power and hydraulic structures related to water power engineering
2. Apply the knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3. Understand concepts of turbines and pumped storage tanks.
4. Design complete unit of hydro electric power station & its components.

Unit 1:

Introduction: Sources of energy, types of power station, choice of type of generation, component of water power project, types of hydro power schemes, general layouts of various hydropower schemes General arrangements of a power station, power house, sub-structure and super structure, underground power station – necessity principal, types, development and economics.

Unit 2:

Estimation of hydro power potential, basic water power equation, gross head, net head nature of supply, storage and pondage. Method of computing hydrographs, mass curves, flow duration curves.

Nature of demand: Load curve, load duration curves, load factor, plant factor, plant use factor, firm power secondary power

Unit 3:

Intake structures - Types, level of intake, hydraulics of intake structures, trash rack, transition, intake gates.

Conduits: Types, economic section, power canals, pen-stock types hydraulic design and economic diameter pipe supports, anchor blocks, tunnels – classification, location and hydraulic design, tunnel linings

Unit 4:

Surge Tank: Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, fore-bay

Unit 5:

Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitations

Tail race: Functions, types, channel and tunnel draft tubes, function and principal types

Unit 6:

Pumped storage plants, purpose and general layout of pumped storage schemes, main types, typical arrangements of the upper reservoirs, economics of pumped storage plants. Introduction to Tidal power stations

Assignment:

1. Feasibility Study of Hydro Power Station in Vidarbha Region
2. Complete Design of Components of Hydro Power Station .

Recommended books:

1. Dandekar M. M. & Sharma K. N, Water Power Engineering, Vikas Publishing House Pvt. Ltd. , New Delhi.
2. Sharma R.K. & Sharma T.K., Water Power Engineering, S. Chand Publication.
3. Streeter V. L. & Wylie E. B, Hydraulic Transient , McGraw Hill Book Company, New York.
4. ChaudharyHanif, Applied Hydraulic Transients, Van Nostrand Rein Hold Company, New York.
5. Warshne, Water power engineering ,Nemchand Publication.

FORENSIC CIVIL ENGINEERING (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1 Understand various testing methods of Failed Structures.
2 Understand the aspects of failures connected with various structural systems and materials.
3 Plan the strategic measures against failures.
4 Can write the legal and technical report of the failure in lucid manner.

Unit – 1

Introduction to forensic engineering, Forensic investigations-tools and techniques. Scope and extent of application of Forensic Engineering techniques in various fields of Civil Engineering.

Unit - 2

Structural Failures: Failure of construction materials steel, concrete - Joints by Bolt and weld. Failure of compression members and tension members by reversal of loads – Failure aspects of post tensioned concrete systems, space frame, plane frame, precast buildings, failure of bridges.

Geo-Technical Failures: Soil liquefaction, failure of foundation systems – Causes and prevention.

Unit - 3

Testing of failures: Various methods of testing of failed structures & instrumentation- Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology.
Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring. Development of the most probable failure hypothesis - cross-check with original design.

Unit - 4

Designing Against Failure: Quality control – Material selection, workmanship, design and detailing.
Performing reliability checks, Legal issues involving jurisprudence system, insurance, reducing potential liability, responsibility of engineers and contractors. Professional practice and ethics.
Reporting – Oral & Written

Assignment:

One Case Study of complete forensic study of civil engineering structure and reporting.

Recommended Books:

1. Guidelines for Forensic Engineering Practice by Gary L Lewis, ASCE Publication
2. Introduction ot Forensic Engineering by Randall K Noon, CRC Press
3. Forensic Engineering Investigations by Randall K Noon, CRC Press
4. Forensic Engineering by Sam Brown, ISI Publication
5. Forensic Structural Engineering by Robert T Ratay, Mc-Graw Hill Professional
6. Construction Failures by Jacob Feld & Kenneth L Carper, John Wiley & Sons

DISASTER RESPONSE AND MANAGEMENT TECHNIQUES (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:

After studying the subject, student should be able to understand the nature & types of disaster, its preparedness, Role of different government & private agencies, Act & other Statute Provisions, Management of Disaster, Post disaster condition & its management.

Unit - 1

Disasters:

Natures and extent of disasters, natural calamities such as floods, earthquake, drought, forest fire, etc. Manmade disasters such as Chemical and Industrial hazards, Epidemic, etc.

Disaster Response Plan:

Long term & Shot term planning for disaster. Preparation of vulnerable locations map, data assimilation of past recurrence of similar disasters, socio-economic parameters of the area, Resources availability, Training Emergency Response Mechanism, Medical Aid.

Role of Local, State & Central administration, Role of NDRF, NCDC, NGOs, Media, and SHG. Forecasting and Warning Communication aid.

Unit - 2

Risk & Cost Assessment:

Geographical conditions, Population, Living habits, Threats, Extent of damages to the lives, agricultural area, industrial units, Awareness & Safety Program.

Relief arrangement & essential components, Shelters, Rescue & search tools &equipments, transport facilities. Cost assessment of each unit and funding.

Unit - 3

Disaster Management:

Principles/Components of Disaster Management, Organizational Structure for Disaster Management, Disaster Management Schemes/SOPs, Important Statutes, Provisions of DDM Act – 2005.

Natural Disasters and Mitigation Efforts, Flood Control, Drought Management, Cyclones, Epidemic Management, IEDs /Bomb Threat Planning and Safety & Rescue Measures, Forest Fires Management, Oil Fires, Crisis in Power Sector, Accidents in Coal Mines, Terrorism and Emergency Management, Rumors & Panic Control.

Unit - 4

Post Disaster Management:

Rehabilitation: Physical, Psychological & Medical Rehabilitation, Epidemic management through medical camping, Trauma and Stress Management, Rumor and Panic Management, Medical facilitation and Health management post Disasters. Insurance & Claim management.

Assignment:

One Case Study on any one Disaster in India.

Recommended Books:

1. Forest Fire Disaster Management by Satendra Ashutosh & D Kaushik
2. Environmental Extremes – Disaster Risk Management by Anil K Gupta & Sreeja Nair
3. Disaster Management in India – Ministry of Home Affair, Govt of India
4. Risk to Resilience: Strategic Tools for Disaster Risk Management by A K Gupta, S Nair, S Chopde & P Singh
5. Disaster Management by Mukesh Kapoor
6. Management of Manmade Disaster by S L Goel
7. Earthquake & Natural Disaster by Manik Kar
8. A Practical Guide to Disaster Management by A K Jain
9. A manual on Disaster Management by Parag Diwan

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week) Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-At the end of the course teaching, the student shall be able to

1. Understand the properties of clay
2. Know the swelling and shrinkage characteristics of soil.
3. Understand the basics of pile foundation

Unit-I :
EXPANSIVE SOILS:

Origin and classification of clay minerals, Mechanism of swelling recognition & identification of expansive soil. Free swell indices, ground heave, swelling pressure & swelling potential, factors affecting expansivity and swelling pressure of soil, properties and uses of benotonite slurry, design approaches for foundations in swelling soil, introduction to CNS technique, Swelling shrinking of clays identification of clay minerals by x-ray diffraction and DTA methods.

Unit-II:
GRAIN MORPHOLOGY

Effect of size, shape of sand an engineering properties. Effects of grain morphology, stress- strain behavior of soil.

Unit-III:
DRAINAGE &DEWATERING :

Purpose, various methods, well point systems, their suitability, flow towards slots from line source, concept of electro osmosis.

UNIT-IV
CONSOLIDATION:

consolidation theory, application to consolidation due to sand drains, constructional features and design of sand drain installation. Secondary consolidation phenomenon & estimation of secondary consolidation settlement. Over consolidated soil, over consolidation ratio, Schmertmann’s method for determination of Preconsolidation pressure field consolidation curve

Unit –V : DYNAMIC SOIL PROPERTIES

-Introduction, Representation of stress condition by Mohrs circle.Measurements of Dynamic soil properties, stress-strain behavior of cyclically loaded soil.Strength of cyclically loaded soil.

Unit-VI : LIQUEFACTION

Introduction, phenomenon, evaluation, effects of Liquefaction.

Reference Book:

1. Arora K.R. : Soil Mechanics & Foundation Engineering
2. Punmia B. C. : Soil Mechanics & Foundation
3. Gopal Ranjan & Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
4. P Raj : Geotechnical Engineer, McGraw Hill Education,2000
5. VNS Murthy: Soil Mechanics & Foundation Engineering,Vol.-1, Saikripa Tech Consultant, Bangalore 1991
6. Purushottam Raj: Geotechnical Engg.
7. B. M. Das: Principle of Geotechnical Engg.
8. Winterkom H.F &Farg H.: Foundation Engineering Handbook
9. Geotechnical engineering , A practical problem solving Approch- Braja M.Das, N. Sivakugan, Cengage learning.
10. Principles of geotechnical Engineering- Braja M.Das, Cengage learning

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803P Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-2

PRACTICALS:

A. Any three of the following laboratory practicals :

1. Determination of swelling pressure of soil.
2. Determination of swelling, potential of soil
3. Determination of tensile strength of rock by Brazilian test.
4. Determination of stress -strain nature, compressive strength and elastic modulus of rock from uniaxial Compression test.
5. Determination of consolidation property parameters.

B. Any two design assignments:

1. Design of sand drain installation.
2. Design of under reamed pile foundation
3. Stability analysis of well foundation.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

UNIT I: INTRODUCTION TO CONCRETE

Constituentsof Concrete, Special Purpose Cements Binary cement , ternary cement, Hydration Process and Hydrated Cement Pasteof blended cement,Aggregate cement paste interface. Transition Zone in Concrete, Standards, Specifications and Code of Practice.

UNIT II: SPECIAL CONCRETE AND CONCRETING TECHNIQUES

a) Concrete with difference cementatious materials: fly ash, GGBS, Silica fume.
b) Concrete with different Aggregates: No fines, high weight, gap graded, Recycled Aggregate, Auto clave aerated concrete.
c) Modified property: high density, high performance, ultra rapid hardening concrete, transportation concrete, Fiber reinforcement concrete.
d) Techniques: RMC, Underwater concrete , Shot crete, nano concrete.

UNIT III: DESIGN OF CONCRETE

Concept of Design of concrete, Quality control (field and statistical) Indian Standard Method, Comparison with British and.American Method of Mix Design. Acceptance criteria.

Design of High Strength Concrete Mixes, Design of Light Weight Aggregate Concrete Mixes, Design of Fly Ash Cement Concrete Mixes, Design of High Density Concrete Mixes, Standards, Specifications and Code of Practice

UNIT IV: BEHAVIOR AND STRENGTH OF CONCRETE

a) Failure modes inconcrete, type deformation stress strain relation and modulus of elasticity, Shrinkage cause, Factors Affecting and control, creep, causes, Factores influencing and effects. Effects of temperature.
b) Compressive strength, Tensile strength, Fatigue strength, and impact strength, Factors influencing strength of concrete.

UNIT V: DURABILITY OF CONCRETE

Water As An Agent Of Deterioration, Permeability Of Concrete, Classification of Causes of Concrete Deterioration, Deterioration By Surface Wear/Abrasion, Freezing And Thawing of Concrete, Alkali-Aggregate Reaction (Alkali-Silica Reaction / Alkali-Carbonate Reaction), Deterioration By Chemical Reactions, Sulfate

Attack, Concrete In Seawater, Carbonation, Corrosion of Embedded Steel In Concrete, Deterioration By Fire, Guide To Durable Concrete

UNIT VI: TESTING OF CONCRETE

Advanced Non-Destructive Testing Methods: Ground Penetration Radar, Probe Penetration, Pull Out Test, Break off Maturity Method, Stress Wave Prorogation Method, Electrical/Magnetic Methods, Nuclear Methods And Infrared Thermograph, Core Test.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE 803P **Evaluation Scheme: (25-Internal/25-External)**
(P - 2 Hrs/Week); Total Credits-2

1. Minimum 3 Mix Design
2. Minimum 5 Practical on Testing of Concrete with NDT Equipments.

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803T	**Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4	**Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand the principles of analysis and design of special RC structures viz bridge, deck, ESR, shell etc.
2. Understand the behavior of special RC structure under different loading conditions such as IRC, dynamic etc. as per the code provision.
3. Analysis and design of multistoried frame structure incorporating seismic forces.
4. Analysis and design of cylindrical shells.

Unit – I

Design of overhead circular, and Intze service reservoirs (by using Working Stress Method)._Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes. including ductile detailing. Design of foundation- Annular raft, Full raft.

Unit – II

Design of highway bridges with IRC loading and equivalent UDL. Slab type, Two/Three girder type.

Unit – III

Analysis & Design (Using Limit state Method) of building frames upto two bay/two storey, including design of foundation, ductile detailing, and introduction to Seismic Coefficient Method.

Unit – IV

Design of cylindrical shells by beam theory, advantages, assumption, ranges of validity and beam analysis. Design of shells with or without edge beams.

RECOMMENDED BOOKS:

1 Advanced Reinforced Concrete Design - Varghese P.C, Publisher Prentice Hall of India Edition 2001.

2 Advanced reinforced Concrete - N. Krishna Raju, Publisher CBS Publishers & Distributers Edition 2002.

3 Reliability Analysis & Design of Structures- Ranganathan R Publisher Tata McGrawHill Edition 1990.

4 Reinforced Design- Pillai ,S.U.,D. Menon, Publisher T M H Publication Edition (Second Edition)2003

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week) Total Credits-2**

PRACTICALS : (Minimum 3 designs)

1) Design of up to two bay two storey by using Analysis/Design Software.
2) Design and analysis using above syllabus.
3) Minimum One site visit pertaining to above design.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

At the end of this course, students will be able to

1. Understand the analysis and design of tension members, bolted connections, welded connections, compression members and beams.
2. Understand the basic concepts and to incorporate the same in the analysis and design of special structures such as gantry girders, foot bridges, railway bridges, storage vessels etc.

Unit – I

1. Gantry Girders: Cranes, Electrically operated overhead, Design consideration, Crane girder and Gantry girder design.
2. Industrial building frames
   i. Upto two bay single storeyed, foundations, connections, detailing of steel connections.
   ii. North light trussed and lattice girders for industrial buildings.

Unit - II

3. Bridges : Types of bridges foot bridge, road bridge, railway bridge.

   Rolled beam bridges, plate girder bridges, trussed bridge, through type, deck type bridges.

   Loading on foot ways, IRC loading, loading on railway bridges.

   Design of a foot bridge, design of components of railway and road bridges
4. Bearings : Types of bearings, bearing pads, design of rocker and roller bearings

Unit - III

5. Storage Vessels : General concepts, design of bunkers, silo,
6. Open web sections : Introduction, design of open web sections.

Unit - IV

7. Composite construction. General concepts.

   Properties, Steel – concrete composite design of encased beams, columns, shear connectors.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/ 25-External)**
(P-2 Hrs/Week) Total Credits-2

PRACTICLAS:

Minimum 3 designs based on above syllabus

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand composition of typical municipal solid wastes, their sources, collection, treatment and disposal methods.
2. attain an ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practices.
3. designing of different units of water &waste water treatment plant.
4. Give the knowledge about recent development in water &waste water treatment .

Unit – I - Introduction to WTP & Aeration:

1. Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant.
2. Aeration: objective of aeration, types or aerators, design of cascade aerator, gas transfer, two film theory.

Unit – II - Coagulation, Flocculation & Sedimentation

3. Coagulation- Flocculation: Theory of coagulation objectives, types& Design of rapid and slow mixing devices(hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids
4. Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators.

Unit – III - Filtration, Disinfection &Minor methods

5. Filtration: mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration.
6. Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants, chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination.
7. Iron and manganese removal, deflourination.
8. Recent development in water treatment.

Unit – IV - Characteristics & Disposal of Waste water

9. physical and chemical characteristics of waste water, DO, BOD, COD, determination of BOD rate constant
10. Disposal of sewage by dilution and by land disposal, Streater-Phelps's equation. Numerical

Unit – V - Preliminary & Primary Treatment

11. Treatment Methods: Waste water treatment flow sheet, preliminary & primary and secondary methods of treatment, design of screen. Girt chamber and primary settling tank.

Unit – VI- Secondary Treatments

12. Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, aerated lagoons and stabilization ponds. Design of ASP
13. Sludge treatment, aerobic and anaerobic digestion, reactor types (such as UASB, AFFB, Hybrid reactor) & factors affecting anaerobic digestion and sludge drying beds (excluding design)
14. Recent development in waste water treatment.

REFERENCE BOOKS:

1 Sali J. Arcelvala, Tata Mcgraw "Waste Water Treatment for Pollution Control and Reuse".
2 Dr. P.N. ModiVol I – Environmental Engineering I – Standard Publication.
3 Dr. P.N. ModiVol I – Environmental Engineering II – Standard Publication.
4 Dr. A.G. Bhole – Design of Water Treatment Plant, IWWA, Nagpur centre.
5 Dr. B.C. PunmiaVol I &Vol II – Laxmi Publication.
6 CPHEEO Manual.
7 V.N.S. Raju" Water and Waste Water Treatment"- Tata McGraw Hill.
8 Matcalf and Eddy - Water and Waste Water Treatment, Disposal And reuse - Tata McGraw Hill.

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

A) Minimum 6 experiments

1. Determination of Sulphates
2. Determination of Chlorides.
3. Residual, Available Chlorine and Chlorine demand.
4. Determination of BOD
5. Determination of COD.
6. Jar test.
7. Determination of filter sand from available stack sand.
8. Balferiology test on water.

B) Design of individual unit of water and waste water treatment.

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Develop skills and knowledge regarding basic principles of GIS
- Apply knowledge of remote sensing and GIS in various fields of civil engineering
- Understand fundamental knowledge of principles of ariel photography and remote sensing.
- Remote Sensing and GIS for mapping and monitoring land cover and land use changes
- Remote Sensing and GIS approach in the monitoring and evaluation of rapid urban growth for sustainable development.
-

UNIT-I: Basics of Remote Sensing:

Introduction. history & development, Definition and Scope of Remote Sensing, Advantages and disadvantages of remote sensing techniques, Type of Remote Sensing, Basic principle of remote sensing, Electromagnetic energy and its wavelength, Wavelength regions and their applications in remote sensing, Interaction of EMR with atmosphere, Atmospheric windows Ideal Remote sensing system. Radiometers. Spectral signature and Spectral response curves.

UNIT-II: Remote Sensing Platforms and Sensors:
Introduction, Terrestrial, Airborne and Space borne platforms-classification of satellites, Sun-synchronous and geostationary satellites, Type of Orbit. Satellite launch vehicles GSLV and PSLV, Sensors and Scanners, sensor material, sensor systems, Resolution of sensors, Swath, Image referencing system- Path and Row, Multispectral, Thermal and Radar Scanners,, Remote sensing data products, and their types: Analogue and Digital data formats, Thermal and Radar imageries, FCC, Indian remote sensing program. Various Earth resources satellites and their characteristics,

UNIT-Ill: Aerial Photography:
Introduction, Terminology. Geometry of vertical aerial photograph. Elements of photo and image interpretation, Interpretation key, Interpretation Instruments, Orientation of aerial photographs, Aerial mosaics, Flight planning, Types of aerial photographs. Scale of Aerial photographs, Number of photographs to cover a given area, Relief displacement of vertical objects, Image Parallax and vertical exaggeration.

UNIT-IV: Digital Image Processing:
Introduction, Image reduction, Image magnification, Image rectification and restoration, Image Enhancement contrast manipulation, spatial feature manipulation multi image manipulation. Image classification: supervised and unsupervised classifications, accuracy assessments and data merging

UNIT-V: Geographical Information System
Introduction, Components of GIS- Hardware and Software components. data input and editing, spatial and non spatial data, raster and vector data, database management, data manipulation and analysis, data output.
Global Positioning System: Introduction to Global Positioning System (GPS) Fundamental concepts. GPS system elements and signals, Classification of GPS receivers.

UNIT-VI : Applications: Integrated Approach of RS and GIS Application:
Application in Geological Investigations, Water Resources Management. Environmental studies, Land cover and Land use, Transportation planning, Application in Civil Engineering Projects — Dams and Bridges site investigations, Land slide studies. Flood studies.

RECOMMENDED BOOKS

1. Remote Sensing and Geographical Informatiotn Systems - M. Anji Reddy.
2. Concepts and techniqes of Geographic Information Systems- C.P LO Albert KW Yeung, Pritince Hall of India Edition 2002 .
3. Remote Sensing of the Environment ..an Earth Resource Perspective - John R Jensen, Pearson Education Edition 2006 .

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

RS Data Formats and their study : Analogue and Digital Data Products

1. Digital Image Processing : Registration, Enhancements and digital Classifications
2. Case Studies in water Resources (Surface, Ground water) Environmental geology, engineering projects
3. Calculations on RS Data : Elevation, spatial attributes
4. GIS : Vector data generation, data attachments and data analysis.

Construction Economics and Finance

BECVE804T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Acquaint with various economic and financial aspects of construction industry
- Understand the tools and techniques of economic analysis for improving their decision making skills
- Understand the knowledge of economics and finance with special reference to construction industry
- Understand the concept of IRR, turnkey construction projects
- Apply knowledge of inflation, recession, financial ratios

Unit I:

Importance of construction and infrastructure in economic development and growth. Construction – a key industry of India, Concepts of Time value of money, discounted cash flow, internal rate of return, numerical problem based on calculation of IRR.

Unit II:

Factors of production with special reference to construction industry, definition and nature of turnkey construction projects, numerical problem based on calculation of Rate of Return and Net Present Value

Unit III:

Types of market structure in construction industry of India-monopoly, oligopoly and monopolistic competition, definition of recession, inflation, stagflation and its impact on construction industry.

Unit IV :

The sources of finance for construction industry, types of foreign direct investment in infrastructure development of India, project cash flow and numerical problem based on calculation of project cash flow.

Unit V:

Elements of Balance sheet and income statement in construction industry, affordable housing scheme by government of India. numerical problem based on calculation of financial ratios – liquidity ratio, debt/equity ratio, operating profit ratio, return on investment ratio.

Unit VI :

Relevance of capital structure, cost of capital, working capital management in construction projects, factors influencing working capital, the concept and practice of CIBIL in finance, numerical problem based on calculation of working capital for construction project.

***Note** : Numerical problem shall be of 4 to 6 marks .*

References :

1. Tarquin, A.J and Blank L.T, (1976) Engineering economy and behavioral approach. Mc Graw Hill Company.
2. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
3. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
4. Van Horne, J.C. (1990). Fundamentals of Financial Management, Prentice-Hall of India Ltd.
5. Brigham, E.F. (1978). Fundamentals of Financial Management, The Dryden Press, Hinsdale, Illinois.
6. Kolb, R.W. and Rodriguez, R.J. (1992). Financial Management. D.C. Heath & Co.
7. Walker, E.W. (1974). Essentials of Financial Management, Prentice Hall of India Private Limited, New Delhi.
8. Wilfred, N. (1971). Accounting for the Building Trade, Hutchinson Educational, London.
9. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd.
10. Lifson, N.W. and Shalfer, E.F. (1982). Decision and Risk Analysis for Construction Management, John Wiley & Sons.
11. Degoff, R.A. and Friedman, H.A. (1985). Construction Management, John Wiley & Sons.
12. Van Horne, J.C. (1990). Management and Policy, Prentice-Hall of India Ltd.
13. Harris, F. and McCaffer, R. (1989). Modern Construction Management. BSP Professional Books.

BECVE805P Project

BECVE805P **Evaluation Scheme: (75-Internal/75-External)**
(P-2 Hrs/Week); Total Credits-6

Minimum two presentations on the work done, Dissertation copy shall be approved by respective guides.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
Telephone and Fax. : 02140 - 275142
www.dbatu.ac.in

Detailed Syllabus
for
Second Year
B. Tech program in Computer Engineering/ Computer Science/ Computer Science & Engineering

With effective from
Academic year July 2018-19
Approved in the 11th meeting of Academic Council 8th June 2018

Teaching and Evaluation Scheme Second Year B. Tech. (Computer Engineering)

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit
			L	T	P	MSE	CA	ESE	
		Semester III							
1	BTBSC301	Engineering Mathematics -III	3	1	-	20	20	60	4
2	BTCOC302	Discrete Mathematics	2	1	-	20	20	60	3
3	BTCOC303	Data Structures	2	1	-	20	20	60	3
4	BTCOC304	Computer Architecture & Organization	2	1	-	20	20	60	3
5	BTCOC305	Digital Electronics & Microprocessors	2	1	-	20	20	60	3
6	BTHMC306	Basic Human Rights	2	-	-	-	50	-	Audit
7	BTCOL307	Python Programming	1	-	2	-	60	40	2
8	BTCOL308	HTML and Javascript	1		2		60	40	2
8	BTCOL309	Data Structures Lab	-	-	2	-	60	40	1
9	BTCOL310	Digital Electronics & Microprocessor Lab	-	-	2	-	60	40	1
10	BTCOF311	Field Training / Internship/Industrial Training Evaluations	-	-	-	-	-	100	1
		Total	**15**	**5**	**8**	**100**	**390**	**560**	**23**
		Semester IV							
1	BTCOC401	Design & Analysis of Algorithms	2	1	-	20	20	60	3
2	BTCOC402	Probability & Statistics	2	1	-	20	20	60	3
3	BTCOC403	Operating System	2	1	-	20	20	60	3
4	BTCOE404	**Elective-I** A) Object Oriented Programming in C++ B) Object Oriented Programming in Java	2	1	-	20	20	60	3
5	BTCOE405	**Elective-II** A) Numerical Methods B) Physics of Engineering Materials C) Soft Skills and Personality Development	2	1	-	20	20	60	3
6	BTXXC406	Product Design Engineering	2	-	-	20	20	60	2
7	BTCOL407	Design & Analysis of Algorithms Lab	-	-	2	-	60	40	1
8	BTCOL408	Introduction to Data Science with R	1	-	2	-	60	40	2
9	BTCOL409	Object Oriented Programming Lab	-	-	2	-	60	40	1
10	BTCOL410	Operating System Lab	-	-	2		60	40	1
11	BTCOF411	Field Training / Internship/Industrial Training (minimum 4 weeks which can be completed partially in first semester and second Semester or in at one time.)						100	Credits to be evaluated at in V Sem.
		Total	**13**	**5**	**8**	**120**	**360**	**620**	**22**

(BTBSC301) Engineering Mathematics III

Unit 1: Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function. **[07 Hours]**

Unit 2: Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients. **[07 Hours]**

Unit 3: Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms. **[07 Hours]**

Unit 4: Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}\right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$). **[07 Hours]**

Unit 5: Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping. **[07 Hours]**

Unit 6: Functions of Complex Variables (Integral calculus)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs). **[07 Hours]**

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

BTCOC302 Discrete Mathematics

Unit 1 **6 hrs**

Fundamental Structures and Basic Logic: Sets, Venn diagram, Cartesian product, Power sets, Cardinality and countability, Propositional logic, Logical connectives, Truth tables, Normal forms, Validity, Predicate logic, Limitations of predicate logic, Universal and existential quantification, First order logic.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Unit 2 **6 hrs**

Functions and Relations: Subjective, Injective, Bijective and inverse functions, Composition of function, Reflexivity, Symmetry, Transitivity and equivalence relations.

Unit 3 **6 hrs**

Combinatorics: Counting, Recurrence relations, generating functions.

Unit 4 **6 hrs**

Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path problems, Euler and Hamiltonian paths, Representation of graph, Isomorphic graphs, Planar graphs, Connectivity, Matching Coloring.

Unit 5 **6 hrs**

Trees: Rooted trees, Path length in rooted tree, Binary search trees, Spanning trees and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree.

Unit 6 **6 hrs**

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient79 Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

Reference Books:

1. Lipschutz, *Discrete Mathematics*, McGraw-Hill Publication, 3rd Edition, 2009.
2. V. K. Balakrishnan, *Schaum's Outline of Graph Theory*, McGraw-Hill Publication, 1st Edition, 1997.
3. Eric Gossett, *Discrete Mathematics with Proof*, Wiley Publication, 2nd Edition, 2009.

Text Books:

1. C. L. Liu, *Elements of Discrete Mathematics*, McGraw-Hill Publication, 3rd Edition, 2008.
2. Kenneth H. Rosen, *Discrete Mathematics and its Applications*, McGraw-Hill Publication, 6th Edition, 2010.
3. Y. N. Singh, *Discrete Mathematical Structures*, Wiley Publication, 1st Edition, 2010.
4. Dr. Sukhendu Dey, *Graph Theory with Applications*, SPD Publication, 1st Edition, 2012.

BTCOC303 Data Structures

Unit 1 **6 hrs**

Introduction: Data, Data types, Data structure, Abstract Data Type (ADT), representation of Information, characteristics of algorithm, program, analyzing programs.

Unit 2 **6 hrs**

Arrays and Hash Tables: Concept of sequential organization, linear and non-linear data structure, storage representation, array processing sparse matrices, transpose of sparse matrices. Hash Tables, Direct address tables, Hash tables, Hash functions, Open addressing, Perfect hashing.

Unit 3 **6 hrs**

Searching and Sorting: Sequential, binary searching, skip lists – dictionaries, linear list representation, skip list representation, operations – insertion, deletion and searching. Insertion sort, selection sort, radix sort, File handling.

Unit 4 **6 hrs**

Linked Lists: Concept of linked organization, singly and doubly linked list and dynamic storage management, circular linked list, operations such as insertion, deletion, concatenation, traversal of linked list, dynamic memory management, garbage collection.

Unit 5 **6 hrs**

Stacks and Queues: Introduction, stack and queue as ADT, representation and implementation of stack and queue using sequential and linked allocation, Circular queue and its implementation, Application of stack for expression evaluation and expression conversion, recursion, priority queue.

Unit 6 **6 hrs**

Trees and Graphs: Basic terminology, binary trees and its representation, insertion and deletion of nodes in binary tree, binary search tree and its traversal, threaded binary tree, Heap, Balanced Trees. Terminology and representation of graphs using adjacency matrix, Warshall's algorithm.

Reference Books:

1. E. Horowitz, S. Sahani, *Fundamentals of Data Structures*, Galgotia Publication, 1st Edition, 1983.
2. Thomas Cormen, *Introduction to Algorithms*, PHI Publication, 2nd Edition, 2002.
3. Venkatesan & Rose, *Data Structures*, Wiley Publication, 1st Edition, 2015.
4. Goodrich & Tamassia, *Data Structure & Algorithm in C++*, Wiley Publication, 2nd Edition, 2011.
5. R. G. Dromey, *"How to Solve it by Computer"*, 2nd Impression, Pearson Education.
6. Kyle Loudon, *Mastering Algorithms with C: Useful Techniques from Sorting to Encryption*, O'Reilly Media, 1st Edition, 1999.

Text Books:

1. Mark Allen Weiss, *Data structures and algorithms analysis in C++*, Pearson Education, 4th Edition, 2013.
2. S. Lipschutz, *Data Structures*, McGraw-Hill Publication, Revised 1st Edition, 2014.
3. Y. Langsm, M. Augenstin, A. Tanenbaum, *Data Structure using C and C++*, Prentice Hall India Learning Private Limited, 2nd Edition, 1998.
4. Trembley and Sorenson, *Introduction to Data Structures*, PHI Publication, 2nd Revised Edition, 1983.
5. Vishal Goyal, Lalit Goyal, *A Simplified Approach To Data Structure,* SPD Publication, 1st Edition, 2014.

BTCOC304 Computer Architecture and Organization

Unit 1 6 hrs

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

Unit 2 6 hrs

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Unit 3 6 hrs

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

Unit 4 6 hrs

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Unit 5 6 hrs

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

Unit 6 6 hrs

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface.
Instruction pipe-lining: Concepts. Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Reference Books:

- Hennessy and Patterson, *Computer Architecture: A Quantitative Approach*, Morgan and Kaufman Publication, 4th Edition, 2007.
- Morris Mano, *Computer System Architecture*, Pearson Education India, 3rd Edition, 2007.
- Mostafa Abd-El-Barr, Hesham El-Rewini, *Fundamentals of Computer Organization and Architecture*, Wiley Publication, 1st Edition, 2004.
- Miles J. Murdocca, Vincent P. Heuring, *Computer Architecture and Organization: An Integrated Approach*, Wiley Publication, 1st Edition, 2007.
- Sajjan G. Shiva, *Computer Organization, Design, and Architecture*, CRC Press, 5th Edition, 2013.

Text Books:

- William Stalling, *Computer Organization and Architecture: Designing for Performance*, Prentice Hall Publication, 8th Edition, 2009.
- Hayes, *Computer Architecture and Organization*, McGraw-Hill Publication, 3rd Edition, 2012.
- Zaky, *Computer Organization*, McGraw-Hill Publication, 5th Edition, 2011.

BTCOC305 Digital Electronics & Microprocessor

Unit 1 **6 hrs**

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples ofICgates, **Number Systems:** binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

Unit 2 **6 hrs**

Combinational Digital Circuits:
Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker / generator.

Unit 3 **6 hrs**

Sequential circuits and systems:
A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K - T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

Unit 4 **6 hrs**

Fundamentals of Microprocessors:
Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bit microprocessors (80386).
The 8086 Architecture: Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Unit 5 **6 hrs**

Memory Interfacing. I/O Interfacing. Direct Memory Access. (DMA). Interrupts in 8086.

Unit 6 **6 hrs**

8086 Instruction Set and Programming:
Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Text Books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Douglas Hall, *Microprocessors and Interfacing*, McGraw-Hill Publication, Revised 2nd Edition, 2006.

BTHMC306-Basic Human Rights

Unit 1 **6 hrs**

The Basic Concepts:

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

Unit 2 **6 hrs**

Human Rights and Human Duties:

Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India's Charter of freedom.

Unit 3 **6 hrs**

Society, Religion, Culture, and their Inter-Relationship:

Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

Unit 4 **6 hrs**

Social Structure and Social Problems:

Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.

Unit 5 **6 hrs**

State, Individual Liberty, Freedom and Democracy:

The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

Unit 6 **6 hrs**

Human Rights in Indian Constitution and Law:

The constitution of India:
(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission.

Text / Reference Books:

- Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005.
- Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

BTCOL307 Python Programming

One hour per week is for program demonstration and instruction which can be conducted as a classroom session or lab session.

Module 1: **2 Hrs.**

Informal introduction to programming, algorithms and data structures, Downloading and installing Python, run a simple program on Python interpreter.

Module 2: **2 Hrs.**

Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, Passing functions as arguments.

Module 3: **2 Hrs.**

Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, Handling files.

Module 4: **2 Hrs.**

Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

Module 5: **4 Hrs.**

Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

***Programming assignments are mandatory.**

Reference Books:

1. Mark Lutz*, Learning Python,* O'Reilly Media, 5th Edition, 2013.
2. Mark Pilgrim, *Dive into Python 3*, Apress Publication, 2nd Edition, 2009.
3. Allen B. Downey, *Think Python*, O'Reilly Media, 2nd Edition, 2012.
4. Jon Kleinberg and Eva Tardos, *Algorithm Design,* Pearson Education, 1st Edition, 2006.

Text Books:

1. Michael Urban and Joel Murach, *Murach's Python Programming*, Murach's Publication, 2016.
2. Charles Severance, *Python for Informatics: Exploring Information*, University of Michigan, Version 2.7.0, 2014.
3. Dr. R. Nageswara Rao, *Core Python Programming*, Dreamtech Press, 1st Edition, 2016.

BTCOL308 HTML and JavaScript

Unit 1 **2 hrs**

Web Site development Essentials: Overview of Web Design Concepts, Web Development Teams, Web Project Management Fundamentals, Web Site Development Process, Web Page Layout and Elements, Web Site Usability and Accessibility, Configure Browsers Setting, Navigation Concepts, Web Graphics, Multimedia and the Web.

Unit 2 **2 hrs**

Hyper Text Markup Language (HTML): HTML and the Evolution of Markup languages, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames, GUI HTML Editors, Site Content and Metadata.

Unit 3 **2 hrs**

Introduction to Client-Server Model: Features of Dreamweaver Interface, Setting Up a Site with Dreamweaver, FTP -Site Upload Feature of Dreamweaver, Create various types of Links, Insert multimedia including text, image, animation & video, Finding a Home for your WordPress Site, Installing WordPress on Your Site, Content Management using WordPress, Selecting the Right Tools, Image Formats, Fonts and Colors, Designing Your WordPress Site, The WordPress Default Layout, Creating a Custom Site.

Unit 4 **2 hrs**

Cascading Style Sheets: Cascading Style Sheets for Web page design, Creating CSS rules in Dreamweaver, Format Text with CSS, Use of CSS Selectors, Embed Style Sheets, and Attach External Style Sheets.

Using CSS with Tables: Insert and Styling Tables, Import Table Data, Style Tables with CSS, Sort Data in Table.

Unit 5 **4 hrs**

JavaScript first steps; JavaScript first steps overview; What is JavaScript?; A first splash into JavaScript; What went wrong? Troubleshooting JavaScript; Storing the information you need — Variables; Basic in JavaScript — Numbers and operators; Handling text — Strings in JavaScript; Useful string methods; Arrays; Making decisions in your code — Conditionals; Looping code; Functions — Reusable blocks of code; Build your own function; Function return values; Introduction to events

***Programming assignments are mandatory.**

Reference Books:

J. N. Robbins, *Learning Web Design*, O'Reilly Media, 4th Edition, 2012.
Steven M. Schafer, *HTML, XHTML, and CSS Bible*, Wiley India, 5th Edition, 2010.
John Duckett, *Beginning HTML, XHTML, CSS, and JavaScript*, Wiley India, 3rd Edition, 2009.
Hal Stern, David Damstra, Brad Williams, Professional WordPress: Design and Development, Wrox Publication, 3rd Edition, 2015.
E. Robson, E. Freeman, *Head First HTML & CSS*, O’Reilly Media, 2nd Edition, 2012.

BTCOL309 Data Structure Laboratory

List of Experiments:

1. Write a program to implement stack using arrays.
2. Write a program to evaluate a given postfix expression using stacks.
3. Write a program to convert a given infix expression to postfix form using stacks.
4. Write a program to implement circular queue using arrays.
5. Write a program to implement double ended queue (dequeue) using arrays.
6. Write a program to implement a stack using two queues such that the push operation runs in constant time and the pop operation runs in linear time.
7. Write a program to implement a stack using two queues such that the push operation runs in linear time and the pop operation runs in constant time.
8. Write a program to implement a queue using two stacks such that the enqueue operation runs in constant time and dequeue operation runs in linear time.
9. Write programs to implement the following data structures: (a) Single linked list (b) Double linked list.
10. Write a program to implement a stack using a linked list such that the push and pop operations of stack still take O(1) time.
11. Write a program to create a binary search tree (BST) by considering the keys in given order and perform the following operations on it. (a) Minimum key (b) Maximum key (c) Search for a given key (d) Find predecessor of a node (e) Find successor of a node (f) delete a node with given key.
12. Write a program to construct an AVL tree for the given set of keys. Also write function for deleting a key from the given AVL tree.
13. Write a program to implement hashing with (a) Separate Chaining and (b) Open addressing methods.
14. Implement the following sorting algorithms: (a) Insertion sort (b) Merge sort (c) Quick sort (d) Heap sort.
15. Write programs for implementation of graph traversals by applying: (a) BFS (b) DFS

BTCOL310 Digital Electronics and Microprocessor Laboratory

List of Experiments:

1. Simplification, realization of Boolean expressions using logic gates/universal gates.
2. Realization of half/full adder & half/full subtractors using logic gates.
3. Realization of parallel adder/subtractors using 7483 chip, BCD to Excess-3code conversion & vice versa.
4. Realization of binary to gray code conversion & vice versa.
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits & code converter.
6. Realization of one/two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display & b) Priority encoder.
8. Truth table verification of flip-flops: i) JK Master Slave ii) T type iii) D type.
9. Realization of 3-bit counters as a sequential circuit & MOD-N counter design (7476, 7490, 74192, 74193).
10. Writing & testing of sequence generator.
11. Design of FSM: Moore machine, Mealy machine.

BTCOC401 Design and Analysis of Algorithms

Unit 1 6 hrs

Introduction to Algorithms: Definition of Algorithms, Properties of Algorithms, Expressing Algorithm, Flowchart, Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem, Changing Variable, Heap Sort.

Unit 2 6 hrs

Divide and Conquer: Introduction to Divide and Conquer Technique, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Unit 3 6 hrs

Greedy Algorithms: Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithm.

Unit 4 6 hrs

Dynamic Programming: Introduction, Characteristics of Dynamic Programming, Component of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming Techniques, Longest Common Sub-sequence, matrix multiplication, shortest paths: Bellman Ford, Floyd Warshall, Application of Dynamic Programming.

Unit 5 6 hrs

Backtracking: Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.

Branch and Bound: Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.

Unit 6 6 hrs

Tree: Introduction, B-tree, Red-Black Tree (RBT): Insertion, Deletion.
NP Completeness: Introduction, The Complexity Class P, The Complexity Class NP, Polynomial-Time Reduction, The Complexity Class NP-Complete.

Reference Books:

1. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition, 1983.
2. Michel Goodrich, Roberto Tamassia, *Algorithm Design – Foundation, Analysis & Internet Examples*, Wiley Publication, 2nd Edition, 2006.
3. George T. Heineman, Gary Pollice, Stanley Selkow, *Algorithms in a Nutshell*, *A Practical Guide*, O'Reilly Media, 2nd Edition, 2016.

Text Books:

1. Cormen, *Introduction to Algorithms*, PHI Publication, 2nd Edition, 2002.
2. Ellise Horowitz, Sartaj Sahni, S. Rajasekaran, *Fundamentals of Computer Algorithms*, University Press (India) Private Ltd, 2nd Edition, 2008.
3. Sara Base, *Computer algorithms: Introduction to Design and Analysis*, Addison-Wesley Publication, 2nd Edition, 1988.

BTCOC402 Probability and Statistics

Unit 1 **6 hrs**

Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities with proofs, Examples.

Unit 2 **6 hrs**

Random Variable and Mathematical Expectation: Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.

Unit 3 **6 hrs**

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

Unit 4 **6 hrs**

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors.

Unit 5 **6 hrs**

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

Unit 6 **6 hrs**

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Reference Books:

1. Kishor S. Trivedi, *Probability, Statistics with Reliability, Queuing and Computer Science Applications*, Wiley India Pvt. Ltd, 2nd Edition, 2001.
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, *An Introduction To Probability And Statistics*, Wiley Publication, 2nd Edition, 2001.

Text Books:

1. S. C. Gupta, *Fundamentals of Statistics*, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016.
2. G. V. Kumbhojkar, *Probability and Random Processes*, C. Jamnadas and Co., 14th Edition, 2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
5. G. Haribaskaran, *Probability, Queuing Theory and Reliability Engineering*, Laxmi Publications, 2nd Edition, 2009.
6. Murray Spiegel, John Schiller, R. ALU Srinivasan, *Probability And Statistics*, Schaum's Outlines, 4th Edition, 2013.

BTCOC403 Operating System

Unit 1 **6 hrs**

Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components- System Services, Systems Calls, System Programs, System structure. Virtual Machines, System Design and Implementation, System Generations.

Unit 2 **6 hrs**

Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Cooperating processes. Threads, Inter-process Communication, Scheduling criteria, scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Scheduling Algorithms and performance evaluation.

Unit 3 **6 hrs**

Process Synchronization The critical-section problem, Critical regions, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Synchronizations in Solaris.

Unit 4 **6 hrs**

Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

Unit 5 **6 hrs.**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.
Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Unit 6 **6 hrs.**

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, sDevice independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Reference Books:

1. D. M. Dhamdhere, *Systems Programming and Operating Systems*, McGraw-Hill, 2nd Edition, 1996.
2. Garry Nutt, *Operating Systems Concepts*, Pearson Publication, 3rd Edition, 2003.
3. Harvey M. Deitel, *An Introduction to Operating Systems*, Addison-Wesley Publication, 2nd Edition, 1990.
4. Thomas W. Doeppner, *Operating System in Depth: Design and Programming*, Wiley Publication, 2011.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, *Operating System Concepts*, Wiley Publication, 8th Edition, 2008.
2. Andrew S. Tanenbaum, *Modern Operating System*, PHI Publication, 4th Edition, 2015.

BTCOE404(A) Object-Oriented Programming using C++ (Elective I)

Unit 1 **6 hrs**

Introduction to Object Oriented Programming and Objects and Classes: Need of object oriented programming, The object oriented approach, Characteristics of object oriented languages. A class, Objects as data types, Constructors, Objects as function arguments, Returning objects.

Unit 2 **6 hrs**

Operator Overloading and Inheritance: Overloading unary and binary operators, Data conversion. Derived and base class, Public and private inheritance, Levels of inheritance, Multiple inheritance Examples.

Unit 3 **6 hrs**

Polymorphism: Virtual functions, Dynamic binding, Abstract classes and pure virtual functions, Friend functions, this pointer.

Unit 4 **6 hrs**

Streams and Files: Streams, Stream output and input, Stream manipulators, Files and streams, Creating, Reading, Updating sequential and random files.

Unit 5 **6 hrs**

Templates and Exception Handling: Function templates, Overloading function templates, Class templates, Exception handling overview, Need of exceptions, An exception example, Multiple exceptions, Exception specifications.

Unit 6 **6 hrs**

Standard Template Library (STL): Introduction to STL-Containers, Iterators, Algorithms, Sequence containers, Associative containers, Container adapters.

Reference Books:

1. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley Publication, 4th Edition, 2013.
2. P. J. Deitel, H. M. Deitel, *C++ How to Program*, PHI Publication, 9th Edition, 2012.
3. John Hubbard, *Programming with C++*, Schaum's Outlines, McGraw-Hill Publication, 2nd Edition, 2000.
4. Nicolai M. Josuttis, *Object-Oriented Programming in C++*, Wiley Publication, 1st Edition, 2002.

Text Books:

1. E. Balagurusamy, *Object Oriented Programming with C++*, McGraw-Hill Publication, 6th Edition, 2013.
2. Robert Lafore, *Object Oriented Programming in C++*, Sams Publishing, 4th Edition, 2001.
3. Dr. B. B. Meshram, *Object Oriented Paradigms with C++ Beginners Guide for C and C++*, SPD Publication, 1st Edition, 2016.
4. Rajesh R. Shukla, *Object-Oriented Programming in C++*, Wiley India Publication, 1st Edition, 2008.

BTCOE404(B) Object-Oriented Programming using Java (Elective I)

Unit 1 **6 hrs**

Introduction to Computers and Java: Computers: Hardware and Software, Data Hierarchy, Computer Organization, Machine Languages, Assembly Languages and High-Level Languages, Introduction to Object Technology, Operating Systems, Programming Languages, Java and a Typical Java Development Environment, Your First Program in Java: Printing a Line of Text, Modifying Your First Java Program, Displaying Text with printf, Another Application: Adding Integers, Memory Concepts, Arithmetic, Decision Making: Equality and Relational Operators.

Unit 2 **6 hrs**

Introduction to Classes, Objects, Methods and Strings: Introduction, Declaring a Class with a Method and Instantiating an Object of a Class, Declaring a Method with a Parameter, Instance Variables, set Methods and get Methods, Primitive Types vs. Reference Types, Initializing Objects with Constructors Floating-Point Numbers and Type double.

Unit 3 **6 hrs**

Control Statements: Algorithms, Pseudocode, Control Structures, if Single-Selection Statement, if...else Double-Selection Statement, while Repetition Statement, Formulating Algorithms: Counter-Controlled Repetition, Formulating Algorithms: Sentinel-Controlled Repetition, Formulating Algorithms: Nested Control Statements, Compound Assignment Operators, Increment and Decrement Operators, Primitive Types, Essentials of Counter-Controlled Repetition, for Repetition Statement, Examples Using for Statement, do...while Repetition Statement, switch Multiple-Selection Statement, break and continue Statements, Logical Operators.

Unit 4 **6 hrs**

Array: Introduction, Declaring and Creating Arrays, Examples Using Arrays, Case Study: Card Shuffling and Dealing Simulation, Enhanced for Statement, Passing Arrays to Methods, Case Study: Class GradeBook Using an Array to Store Grades, Multidimensional Arrays, ase Study: Class GradeBook Using a Two-Dimensional Array, Variable-Length Argument Lists, Using Command-Line Arguments, Class Arrays.

Unit 5 **6 hrs**

Classes and Objects: Introduction, Controlling Access to Members, Referring to the Current Object's Members with the this Reference, Time Class Case Study: Overloaded Constructors, Time, Default and No-Argument Constructors, Notes on Set and Get Methods, Composition, Enumerations, Garbage Collection and Method finalize, static Class Members, static Import, final Instance Variables, Time Class Case Study: Creating Packages, Package Access.

Unit 6 **6 hrs**

Inheritance: Introduction, Superclasses and Subclasses, protected Members, Relationship between Superclasses and Subclasses, Hierarchy Using private Instance Variables, Constructors in Subclasses Software Engineering with Inheritance, Class Object.

Polymorphism: Introduction, Polymorphism Examples, Demonstrating Polymorphic Behavior, Abstract Classes and Methods, Case Study: Payroll System Using Polymorphism, final Methods and Classes, Case Study: Creating and Using Interfaces.

Reference Book:

1. Paul Deitel and Harvey Detail, *Java: How to Program*, Pearson's Publication, 9th Edition,
2. Joel Murach and Michael Urban, *Murach's Beginning Java with Eclipse*, Murach's Publication, 1st Edition, 2016.
3. Doug Lowe, *Java All-in-One For Dummies*, Wiley Publication, 4th Edition, 2014.
4. Herbert Schildt, *Java The Complete Reference*, McGraw-Hill Publication, 9th Edition,
5. Patrick Niemeyer, Daniel Leuck, *Learning Java,* O'Reilly Media, 4th Edition, 2013.

BTCOE405(A) Numerical Methods (Elective-II)

This course preferably offered as a SWAYAM course

Unit 1 [5 Hrs.]

Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method.

Unit 2 [5 Hrs.]

Solution of Linear Simultaneous Equation: Gauss elimination method, Gauss-Jordan method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method, Relaxation method.

Unit 3 [5 Hrs.]

Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, Newton's interpolation formulae, Newton's forward–backward-central interpolation formulae.

Unit 4 [5 Hrs.]

Differentiation and Integration: Newton-Cortes formula, Trapezoidal rule, Simpson one–third rule, Simpson three- eighth rule.

Unit 5 Numerical Solution of ODE: Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge - Kutta method. [5 Hrs.]

Text Books:

1. B.S Grewal, Higher Engineering Mathematics, 40 th edition, Khanna publication.
2. S. S. Shastri, Introduction to Numerical Methods, PHI publication.
3. V. Rajaraman, Computer Oriented Methods, 3 rd edition, PHI publication.

Reference Books:

1. Conte and De boor, Elementary Numerical Analysis, BPB publication.
2. E. Kreyszig, Advanced Engineering Mathematics, BPB publication.
3. Steven C Chapra, Numerical Methods for Engineers, 5 th edition, McGraw Hill publication.

Equivalent SWAYAM/NPTEL Course

BTCOE405(B) Physics of Engineering Material (Elective-II)

Unit I Magnetic Materials: **5hrs**

Magnetic Materials: Origin of magnetization using atomic theory, classification of magnetic materials and properties, Langevin's theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Ant ferromagnetic and Ferromagnetic materials, Ferrites and Garnets, magnetic bubbles, magnetic recording.

Unit II Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation) **5hrs**

Unit III Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell **5hrs**

Unit IV Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials **5hrs**

Unit V Nano Materials: Nanomaterials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials. **5hrs**

Text Books:

1. C. Kittle ,"***Introduction to Solid state Physics***".

2. C. M. Srivastava , C. Srinivasan , "***Science of Engineering Materials and Carbon Nanotubes***".

3. A. J. Dekker, "***Solid State Physics***".

Reference Books:

1. V. Raghavan, "***Material Science and Engineering***".
2. A. J. Dekker, "***Electrical Engineering Materials***".

BTCOE405(C) Soft Skills and Persnolity Development (Elective-II)

This course preferably offered as a SWAYAM course

UNIT I

Self Management:

Self Management, Self Evaluation, Self discipline, Self criticism, Recognition of one's own limits and deficiencies, dependency, etc.

Self Awareness, Self Management, Identifying one's strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride,- Leadership & Team Dynamics

UNIT II

Time Management Techniques

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time.

UNIT III

Motivation/ Inspiration

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation,

Motivation techniques : Motivation techniques based on needs and field situations

Unit IV

Interpersonal Skills Development

Positive Relationship, Positive Attitudes, Empathies: comprehending others' opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Unit V

Effective Computing Skills

Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference books:

1. Mitra, Barun, "***Personality Development and Soft Skills***", Oxford University Press, 2016.
2. Ramesh, Gopalswamy, "***The Ace of Soft Skills: Attitude, Communication and Etiquette for Success***", Pearson Education, 2013.
3. Covey, Stephen R., "***Seven Habits of Highly Effective People: Powerful Lessons in Personal Change***"
4. Rosenberg Marshall B., "***Nonviolent Communication: A Language of Life***".

BTXXC406 Product Design Engineering

Unit 1 **6 hrs**

Creating Simple Products and Modules.

Unit 2 **6 hrs**

Document Creation and Knowledge Sharing.

Unit 3 **6 hrs**

Self and Work Management.

Unit 4 **6 hrs**

Team Work and Communication.

Unit 5 **6 hrs**

Managing Health and Safety.

Unit 6 **6 hrs**

Data and Information Management.

Text / Reference Books:

1. Model Curriculum for "Product Design Engineer – Mechanical", NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
2. Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw - Hill Higher Education.
3. Green, W., & Jordan, P. W. (Eds.). (1999).Human factors in product design: current practice and future trends. CRC Press.
4. Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design Mc-GRAW- HILL book company.
5. Roozenburg, N. F., &Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc.
6. Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of designs, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design. Rockport Pub.

BTCOL407 Design and Analysis of Algorithm Laboratory

List of Experiments:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling sales person problem).
4. Obtain the Topological ordering of vertices in a given digraph.
5. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
6. Selection: Minimum/ Maximum, K^{th} smallest element.
7. Find optimal ordering of matrix multiplication. (Use Dynamic programming method).
8. Use dynamic programming algorithm to solve optimal binary search tree problem.
9. Compute the transitive closure of a given directed graph using Warshall's algorithm.
10. Write programs to find out a minimum spanning tree of a simple connected undirected graph by applying: (a) Prim’s algorithm (b) Kruskal’s algorithm.
11. Write a program to implement Dijkstra’s algorithm for solving single source shortest path problem using priority queue.
12. Write a program to implement Floyd-Warshall algorithm for solving all pairs shortest path problem.

BTCOL408 Introduction to data science with R

Unit 1: Introduction to Basics **2 hrs**

The basic data types in R. Variables.

Module 2 Vectors and Matrices **4hrs**

Vectors. Create, name and select elements from vectors. Learn how to work with matrices in R. Do basic computations with them and demonstrate your knowledge by analyzing the Star Wars box office figures.

Module 3: Factors & Data Frames **2 hrs**

Storeing Categorical data in factors. Learn how to create, subset and compare categorical data. When working R, you'll probably deal with Data Frames all the time. Therefore, you need to know how to create one, select the most interesting parts of it, and order them.

Module 4: Lists **2 hrs**

Create, name and select elements from Lists

Module 5: Basic Graphics **2 hrs**

Discover R's packages to do graphics and create your own data visualizations.

***Programming assignments are mandatory.**

Reference Books:

1. Joel Grus, *Data Science from Scratch: First Principles with Python*, O'Reilly Media, 1st Edition, 2015.
2. Hadley Wickham, Garrett Grolemund, *R for Data Science Import*, *Tidy, Transform, Visualize, and Model Data*, O'Reilly Media, 1st Edition, 2017.
3. Nina Zumel, John Mount,"Practical Data Science with R", Manning, 2014.

Text Books:

1. Rajendra Patil, Hiren dand, Rupali Dahake, *A practical approach to R Tool*, SPD Publication, 1st Edition, 2017.

BTCOL409 Object Oriented Programming Laboratory

List of Experiments:

1. Programs on Operators, Arithmetic Promotion, Method Calling.
2. Programs on dealing with Arrays.
3. Programs on Classes: String and Math.
4. Programs on Inheritance and Polymorphism.
5. Programs on Garbage collection, packaging, access Modifiers, as well as static and abstract modifiers.
6. Programs on Interfaces, block initializers, final Modifier, as well as static and dynamic binding.
7. Programs on file handling and stream manipulation.
8. Programs on Dynamic Polymorphism.
9. Programs on Dynamic Memory Management.
10. Programs on Exception Handling.
11. Programs on generic programming using templates.
12. Programs on STL-containers and iterators.

BTCOL410 Operating Systems Laboratory

1. Hands on Unix Commands
2. Shell programming for file handling.
3. Shell Script programming using the commands grep, awk, and sed.
4. Implementation of various CPU scheduling algorithms (FCFS, SJF, Priority).
5. Implementation of various page replacement algorithms (FIFO, Optimal, LRU).
6. Concurrent programming; use of threads and processes, system calls (fork and v-fork).
7. Study pthreads and implement the following: Write a program which shows the performance
8. Improvement in using threads as compared with process.(Examples like Matrix Multiplication,
9. Hyper Quick Sort, Merge sort, Traveling Sales Person problem).
10. Implementation of Synchronization primitives – Semaphore, Locks and Conditional Variables.
11. Implementation of Producer-Consumer problem, Bankers algorithm.
12. Implementation of various memory allocation algorithms, (First fit, Best fit and Worst fit), Disk
13. Scheduling algorithms (FCFS, SCAN, SSTF, C-SCAN).
14. Kernel reconfiguration, device drivers and systems administration of different operating systems.
15. Writing utilities and OS performance tuning.

DR.BABASAHEBAMBEDKARTECHNOLOGICALUNIVERSITYLONERE.

ELECTRICALENGINEERINGDEPARTMENT

Second Year B. Tech. Electrical Engineering / Electrical Engineering (Electronics and Power)/ Electrical & Electronics Engg / Electrical& Power Engineering

WitheffectfromNovember 2018

Teaching&EvaluationschemeofsecondyearB.Tech. ElectricalEngineering/ElectricalEngineering(Electronicsand Power)/ Electrical & Electronics Engg / Electrical & Power Engg .

IIISEMESTER.									
S.No	CourseCode	CourseTitle	Teaching Scheme			EvaluationScheme			Credits
			L	T	P	MSE	CA	ESE	
1	BTBSC301	EngineeringMathematics-III	3	1	0	20	20	60	4
2	BTEEC302	NetworkAnalysisandSynthesis	2	1	0	20	20	60	3
3	BTEEC303	FluidMechanicsandThermal Engineering	2	1	0	20	20	60	3
4	BTEEC304	MeasurementandInstrumentation	2	1	0	20	20	60	3
5	BTEEE305A BTEEE305B BTEEE305C	Elective–I (A) ElectricalEngineeringMaterials (B) AppliedPhysics (C) SignalsandSystems	3	0	0	20	20	60	3
6	BTHM3401	BasicHumanRights	2	0	0	-	20	-	Audit
7	BTHM306	EngineeringEconomics	2	0	0	20	20	60	2
8	BTEEL307	NetworkAnalysisandSynthesisLab	0	0	2	-	60	40	1
9	BTEEL308	MeasurementandInstrumentationLab	-	0	4	-	60	40	2
10	BTEEM309	Electricalworkshop/Miniproject	-	-	2	-	60	40	1
11	BTEEF310	FieldTraining/Internship/Industrial TrainingEvaluation						50	1
		TOTAL	16	04	08	120	320	530	23
IVSEMESTER.									
1	BTEEC401	ElectricalMachine-I	3	1	0	20	20	60	4
2	BTEEC402	PowerSystem-I	2	1	0	20	20	60	3
3	BTEEC403	Electrical InstallationandEstimation	2	1	0	20	20	60	3
4	BTEEC404	NumericalMethodsandProgramming	2	1	0	20	20	60	3
5	BTID405	ProductDesignEngineering	1	0	2	30	30	40	2
6	BTEEE-406A BTEEE-406B BTEEE-406C	Elective–II (A) SolidStateDevices (B) AnalogandDigitalelectronics (C) ElectromagneticTheory	2	0	0	20	20	60	2
7	BTEEOE407-A BTEEOE407-B BTEEOE407-C	Elective–III (A) Industrialsafety (B) IntroductiontoNon-Conventionalenergy sources (C) SoftwareTechniques.	2	0	0	20	20	60	2
8	BTEEL408	ElectricalMachine-ILab	0	0	2	-	60	40	1
9	BTEEL409	PowerSystemlab-I	0	0	2	-	60	40	1
10	BTEEL410	NumericalMethodsandProgramming Lab	-	0	2	-	60	40	1
11	BTEEEL411	Elective-IILab	0	0	2	-	60	40	1
12		Field Training / Internship/ IndustrialTraining(minimum4 weeks whichcan becompletedpartiallyinThirdsemester and Fourth Semester or in at one time.)							Credits to be evaluated in VSem
	TOTAL		15	04	10	140	380	580	23

SemesterIII

BTBSC301.EngineeringMathematicsIII

TeachingScheme	**ExaminationScheme**
Theory:03Hrs/Week	Mid-termTest:20Marks
Tutorial : 01 Hr/Week	InternalAssessment:20Marks
	EndSemesterExam:60Marks
	Duration: 03 Hrs.

CourseContents:

Unit1:LaplaceTransform

Definition – conditions for existence; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided byt, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

[07Hours]

Unit2: InverseLaplaceTransform

Introductory remarks;Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplacetransforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

[07Hours]

Unit3: FourierTransform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; ComplexformofFourierintegrals;Fouriersineandcosinetransforms;PropertiesofFouriertransforms;Parseval's identityfor Fourier Transforms.

[07Hours]

Unit4: PartialDifferentialEquationsandTheirApplications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable bydirectintegration;Linearequationsoffirstorder(Lagrange'slinearequations);Methodofseparationofvariables–applicationstofindsolutionsofonedimensionalheatflowequation $(\frac{\partial u}{\partial t}=\square^2\frac{\partial^2 u}{\partial x^2})$,andtwodimensionalheatflow equation(i.e.Laplaceequation:$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$).

[07Hours]

Unit5:FunctionsofComplexVariables(Differentialcalculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

[07Hours]

Unit6:FunctionsofComplexVariables(Integralcalculus)

Cauchy’s integral theorem; Cauchy’s integral formula; Residues; Cauchy’s residue theorem (All theorems withoutroofs).

[07Hours]

TextBooks

1. HigherEngineeringMathematicsbyB.S.Grewal,KhannaPublishers,NewDelhi.
2. AdvancedEngineeringMathematicsbyErwinKreyszig,JohnWiley&Sons,NewYork.
3. ACourseinEngineeringMathematics(VolIII)byDr.B.B.Singh,SynergyKnowledgeware,Mumbai.
4. A TextBook of Applied Mathematics (VolI &II)by P.N. Wartikar andJ. N. Wartikar, Pune VidyarthiGriha Prakashan, Pune.
5. HigherEngineeringMathematicsbyH.K.DasandEr.RajnishVerma,S.Chand&CO.Pvt.Ltd.,NewDelhi.

ReferenceBooks

1. HigherEngineeringMathematicsbyB.V.Ramana,TataMcGraw-HillPublications,NewDelhi.
2. ATextBookofEngineeringMathematicsbyPeterO’Neil,ThomsonAsiaPteLtd.,Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett,Tata Mcgraw-HillPublishing CompanyLtd., New Delhi.
4. IntegralTransformsandTheirEngineeringApplicationsbyDr.B.B.Singh,Synergy.Knowledgeware,Mumbai.
5. IntegralTransformsbyI.N.Sneddon,TataMcGraw-Hill,NewYork.

GeneralInstructions:

1. ThetutorialclassesinEngineeringMathematics-IIIaretobeconductedbatchwise.Eachclassshouldbedivided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. Theminimumnumberofassignmentsshouldbeeightcoveringalltopics.

BTEEC302.NETWORKANALYSISANDSYNTHESIS.

Teachingscheme:
Theory:2hrs
Tutorial:1hr
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Toreviewbasiccomponentsofelectricnetwork. Todesignanddevelopnetworkequationsandtheirsolutions. To apply Laplace theorem for electric network analyses ToanalyzeACcircuit.	
Unit	Contents	Contact Hrs
1	Active&PassiveCircuitElement:Independent& dependentvoltage& currentsources,R,L,C&mutual inductance circuit parameters, Their mathematical modes, Voltage current power relations. Classificationofelement:Lumpeddistributed,Linear&non-linear,Unilateral,Bilateral,Timeinvariant& variant,Paceinvariant&variant,Superposition,Thevenin's,Norton'sReciprocity,Maximumpowertransfer, Substitution, Tellegen's theorem.	6
2	NetworkEquations:Network topology, Graph, Tree,Branches, Chords, Equilibriumequationonloop basis& node basis Number of network equation required, Choice between nodal & loop analysis, Source transformation,Networkmutualinductance, Dotconventions, Conceptofsuper mesh,Supernode Concept of duality&dual networks.	6
3	SolutionofNetworkEquations: Classificationsolutionoffirst, Second orderdifferentialequationsofseries& parallel R-L, R-C, R-L-C circuits, General & particular solutions, Particular integral & complimentary functions, Time constant, Mathematical analysis of circuit transients, initial conditions in network, Procedure ofevaluality,Conditionsinnetworkproblems,SolutionofD.C.resistivenetwork&A.C.sinusoidalsteady statenetworks,Writingloopequations,Nodeequationsdirectlyinmatricesform.Numericals	6
4	Application of Laplace's Transform: Solution of differential equation using Laplace transform, Unit step, Impulse&rampfunctions,Laplacetransformofsingular&shiftedfunction,Convolutionintegral,Conceptof complexfrequency,Transformimpedance&transformadmittance,Series&parallelcombinationofthese transformnetworks.	6
5	Twoportnetwork:Terminals&terminalpairs,Drivingpoints&transferadmittance,Transferfunctions, Conceptofpoles&zeroes,Twoportnetworks,Z,Y&thetransmissionparametersrelationshipbetween parametersets.	6
6	SinusoidalSteadyStateA.C.Circuit:R-L-Cseriescircuits,SeriesresonanceVariationofZwithfrequency, maximum value of VC & VL, Magnification, Bandwidth, Q factor. ParallelResonance:Resonancefrequencyfortankcircuitfrequency,LocusdiagramofseriesR-L,R-Cwith variable R & X. Filter:Introductionclassification,Lowpass,Highpass,Bandpass&bandrejectfilter,active&passive filters.ApplicationofFourierseries,Expansionforperiodic&non-sinusoidalwaveforms.	6
	RefBooks: 1. Mac.EVanValkenburg,"NetworkAnalysis", 2. FranklinFa-Kun.Kuo,"NetworkAnalysis&Synthesis",JohnWiley&Sons. 3. M.L.Soni,J.C.Gupta,"ACourseinElectricalCircuitsand Analysis", 4. Mac.EVanValkenburg,"NetworkSynthesiss", 5. JosephA.Edminister,MahmoodMaqvi,"TheoryandProblemsofElectricCircuits",Schaum'sOutline Series,	

BTEEC303.FLUIDMECHANICSANDTHERMALENGINEERING.

Teachingscheme:
Theory: 2 hrs
Tutorial: 1hr
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	BasicMechanicalengineering	
Course Outcome	TointroducepropertiesoffluidandhydraulicmeasurementTounderstanddynamicsoffluidflowTo understandbasicconceptsofICenginesTounderstandconceptofrefrigerationandairconditioning	
Unit	Contents	Contact Hrs
1	Introductiontopropertiesoffluids&hydraulicmeasurements(pressureatplane&curvedsurfaces,criteriaof pressure),Fluidkinematicsanddynamics&simplenumerical.	6
2	FlowthroughpipeLaminarflow,HaugenPoisellie'sequationTurbulentflow,DarcyWeisbachformula, Frictionfactor,useofModdysDiagramonly,Pipesinseries&parallel,minorlosses.Introductionto reciprocatingandcentrifugalpumps,theircharacteristicsandapplications	6
3	Internal Combustion Engines: Introduction to First Law & second Law of Thermodynamics, Concept of Entropy & Enthalpy Classification Otto, Diesel & air-fuel cycles, Constructional details of two stroke, four stroke engines, studyof various systems suchasfuel supply, ignitioncycle, over heating, cooling, lubrication, calculationofIP,BP,MEP,efficiencies,heatbalance,enginetrial,performance,gasturbine,classification, cycles,performanceimprovement.	6
4	Aircompressors:Classification,principleofoperationofreciprocating&rotarycompressors,Constructional detailsofsingle&multistagecompressor,workinput,P-Vdiagram,efficiencies,improvingcompressor performance, reciprocating type only, use of compressed air	6
5	Refrigeration&Airconditioning:Refrigeration:Differentsystems,principleofcyclesofoperationsofvapour compression&vapourabsorptionsystems,COPcalculationsofvapourcompressionrefrigerationsystem, refrigerants,desirable&undesirableproperties,applicationofrefrigeration.	6
6	Airconditioning:Psychrometry,DBT,WBT,RH,Psychometricchart,airconditioningprocessessuchas heating,cooling,humidification,dehumidification,studyofcentralairconditioningplant&itscontrol, application of air conditioning.	6
	RefBooks: 1. JoelReyner,"EngineeringThermodynamics",(LongmanPublications) 2. NagP.K.,"EngineeringThermodynamics",(TataMcGrawHillPublications) 3. AroraC.P,"Refrigeration&AirConditioning",(TataMcGrawHillPublications) 4. EastopT.D.&McconkeyA.,"AppliedThermodynamicsForEngineeringTechnologists"(Longman Publications) 5. ModiP.N&SethS.M,"HydraulicFluidMechanics",(StandardBookHousePublications) 6. LewittW.,"Hydraulic&FluidMechanics",(SirIssacPitmanPublications),10thEdition	

BTEEC304MEASUREMENTANDINSTRUMENTATION

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Tounderstandphilosophyofmeasurement. Tounderstanddifferentmethodsanaloganddigitalmeasurement. Tostudyprincipleofconstructionandoperationofdifferenttransduceranddismaymethods.	
Unit	Contents	Contact Hrs
1	PhilosophyOfMeasurement-MethodsofMeasurement,MeasurementSystem,Classificationofinstrument system,Characteristicsofinstruments&measurementsystem,Errorsinmeasurement&itsanalysis,Standards.	6
2	Analog Measurement of Electrical Quantities – Electro dynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electro dynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors&remediesinwattmeterandenergymeter.InstrumentTransformerandtheirapplicationsintheextension ofinstrumentrange,Introductiontomeasurementofspeed,frequencyandpowerfactor	6
3	MeasurementofParameters -Differentmethodsofmeasuringlow,mediumandhighresistances,measurement ofinductance&capacitancewiththehelpofACBridges,QMeter	6
4	DigitalMeasurementofElectricalQuantities-Conceptofdigitalmeasurement,blockdiagramStudyofdigital voltmeter,frequencymeterPowerAnalyzerandHarmonicsAnalyzer;ElectronicMultimeter.	6
5	Transducers: Definition-different typesoftransducers– criteria for selection–generalcharacteristics–dynamic characteristics–transducersformeasurementofdisplacement(RVDT&LVDT),speed,angularrotation,altitude, force, torque, humidity and moisture, pressure, strain and temperature (Thermocouple and RTD method), Hall Effect transducer and applications Instrumentation amplifiers – differential amplifiers)Data transmission and telemetry–methodsofdatatransmission,Generaltelemetrysystems–Digitalmethodsoffrequency,phase,time andperiod measurements.	6
6	Displaymethods,recorders:Displaymethodsanddevices–differenttypesofrecorders–galvanometric recorders–pendrivingsystem–magneticrecorders–digitalrecorders,digitalstorageoscilloscope(Block Diagram, theory and applications only)	6
	ReferenceBooks: 1. A.K.Sawhney,AcourseinElect.&ElectronicMeasurementandInstrumentation,DhapatRai&Co. 2. Golding&Widis,ElectricalMeasurementandMeasurementinstrument,WheelarBooks H.S.Kalsi,ElectronicInstruments,TataMc-Grawhill 3. Carr,ElementsofElectronicInstrumentationandMeasurement,PearsonEducation. 4. D.Patranabis,Sensors&Transducers,PHI. 5. A.J.Bouwens,DigitalInstrumentation,TataMc-Grawhill. 6. A.D.Heltric&W.C.Copper,ModernElectronicinstrumentation&Measuringinstruments,Wheeler Publication. 7. H.K.P.Neubert,Instrumenttransducers,OxfordUniversitypress.	

BTHM3401-BasicHumanRights

Teachingscheme: ExaminationScheme:
Theory: 2hrs
Totalcredit:Audit ContinuousAssessment:50Marks

Pre requisite		
Course Objective		
Course Outcome	Tostudyconceptoftimevalueofmoney To study about demand in detail TounderstandMeaningofProductionandfactorsofproduction, To understand dif. Concept about market	
Unit	Contents	ContactHrs
1	TheBasic Concepts: Individual,Group,CivilSociety,State,Equality,Justice,HumanValues:-Humanity,Virtues, Compassion.	6
2	HumanRightsandHumanDuties: Origin,CivilandPoliticalRights,ContributionofAmericanBillofRights,FrenchRevolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India’s Charter of freedom	6
3	Society,Religion,Culture,andtheirInter-Relationship: ImpactofSocialStructureonHumanbehaviour,RollofSocializationinHumanValues, Science and Technology, Modernization, Globalization, and Dehumanization.	6
4	SocialStructureandSocialProblems: Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.	6
5	State,IndividualLiberty,FreedomandDemocracy: The changing of state with special reference to developing countries, Concept ofdevelopment under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.	6
6	HumanRightsinIndianConstitutionandLaw: TheconstitutionofIndia: (i) Preamble (ii) FundamentalRights (iii) Directiveprinciplesofstatepolicy (iv) FundamentalDuties (v) Someotherprovisions UniversaldeclarationofHumanRightsandProvisionsofIndia,ConstitutionandLaw,National Human Rights Commission and State Human Rights Commission	6
	ReferenceBooks: 1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005. 2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.	

BTHM306.ENGINEERINGECONOMICS

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite		
Course Outcome	Tostudyconceptoftimevalueofmoney To study about demand in detail TounderstandMeaningofProductionandfactorsofproduction, Tounderstanddif.Conceptaboutmarket	
Unit	Contents	Contact Hrs
1	Introductiontothesubject:MicroandMacroEconomics,RelationshipbetweenScience,Engineering, TechnologyandEconomicDevelopment.ProductionPossibilityCurve,NatureofEconomicLaws.	4
2	TimeValueofMoney:conceptsandapplication.Capitalbudgeting;Traditionalandmodernmethods,Payback periodmethod,IRR,ARR,NPV,PI(withthehelpofcasestudies)	4
3	MeaningofDemand,LawofDemand,ElasticityofDemand;meaning,factorseffectingitanditspractical applicationandimportance.Demandforecasting(abriefexplanation)	4
4	MeaningofProductionandfactorsofproduction,Lawofvariableproportionsandreturnstoscale.Internaland external economies and diseconomies of scale. Concepts of cost of production, different types of costs; accountingcost,sunk cost,marginalcost,Opportunitycost.Breakeven analysis,MakeorBuydecision(case study).RelevanceofDepreciationtowardsindustry.	5
5	Meaningofmarket,typesofmarket,perfectcompetition,Monopoly,Monopolistic,Oligopoly.(Mainfeatures). Supplyandlawofsupply,Roleofdemandandsupplyinprice determination.	4
6	IndianEconomy,nature andcharacteristics.Basicconcepts;fiscal andmonetarypolicy,LPG,Inflation,Sensex, GATT,WTOandIMF.DifferencebetweenCentralbankandCommercialbanks	2
	ReferenceBooks: 1. ChopraP.N.,PrincipleofEconomics,KalyaniPublishers 2. DewettK.K.,Moderneconomictheory,S.Chand 3. H.L.Ahuja.,Moderneconomictheory,S.Chand 4. DuttRudar&SundhramK. P.M.,IndianEconomy 5. MishraS.K.,ModernMicroEconomics,PragatiPublications	

BTEEE305A.ELECTRICALENGINEERINGMATERIALS.

Teachingscheme:
Theory:3hrs
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,Physics,Chemistry	
Course Outcome	Tostudyaboutcrystalstructure Tounderstandmagneticmaterialstructure Tostudyaboutconductingandsuperconductingmaterials To study dielectric and nano materials.	
Unit	Contents	Contact Hrs
1	Crystallography Crystaldirectionsandplanes,DiatomicCrystal(CsCl,NaCl,Diamond,BaTiO3)Crystalimperfection,Point defects,Linedefects,SurfaceandVolumedefects,Structurepropertiesrelationship,structuredetermination by X-ray diffraction.	6
2	MagneticMaterials Originofmagnetizationusingatomictheory,classificationofmagneticmaterialsandproperties,Langevin's theoryofDia,Paraandferromagnetism,SoftandHardmagneticmaterialsandtheiruses,Domaintheoryof ferromagnetism,Hysteresisloss,AntiferromagneticandFerrimagneticmaterials,FerritesandGarnets, magneticbubbles,magneticrecording.	7
3	ConductingandSuperconductingMaterials Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors,BCStheory,Josephsoneffect,Hightemperaturesuperconductors,Applicationof superconductors(Cryotron,magneticlevitation)	7
4	SemiconductingMaterials Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell	6
5	DielectricMaterials Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials	7
6	NanoMaterials Nanomaterials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.	7
	ReferenceBooks: 1. MaterialScienceandEngineering–V.Raghavan 2. ElectricalEngineeringMaterials–A.J.Dekker 3. SolidStatePhysics–A.J.Dekker 4. ScienceofEngineeringMaterialsandCarbonNanotubes-C.M.SrivastavaandC.Srinivasan	

BTEEE305B.APPLIEDPHYSICS

Teachingscheme:
Theory: 3hrs
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Physics-II	
Course Outcome	1. UnderstandconceptofElectromagnetictheoryandMagnetism 2. UnderstandconceptodDielectricandSuperconductivity 3. Understandconceptofnanomaterial	
Unit	Contents	Contact Hrs
1	Electromagnetic Theory covering, Coulomb‟s law for distribution of charges, Polarization Gauss‟s law, Electric current and equation of continuity, Magnetic induction and Lorentz force, Steady current and Biot-Savertlaw,Ampere‟slaw,Magnetizationandmagneticintensity,Faradayslawofinduction,Generalization ofAmpere‟slaw,Maxwell‟sequations	4
2	Dielectrics:Introductiontodielectrics,ConceptofPolarization;Dipoleanddipolemoment,Electricfielddue to dipole (without derivation); Depolarization field, depolarization factors,Local electric field at an atom, Lorentz field, Lorentz relation; Dielectric constant and polarizability – ClausiusMossotti equation (with derivation); Types of polarization – electronic, ionic, dipolar, space charge; Temperature and frequency dependenceofdielectricconstant	5
3	Magnetism:MagneticfieldandMagnetization;Magneticsusceptibility,Paramagnetism-Paramagnetismdue to partially filled shells, transition elements (3d), rare earths (4f) and actinides, Magnetization and total angular momentum (definition and relationship); Concept of magnetic moment, gyromagnetic ratio, Lande‟s g-factor, Bohr Magneton, Curie‟s Law – derivation for „spin only‟ system (L = 0), expression for non-zero orbital angular momentum system (J = L + S); Ferromagnetism, antiferromagnetism, and ferrimagnetism; Exchangeinteractionbetween magneticions;Molecular field, Expressionfor Curie-Weiss law,conceptofθP ;FerromagnetismandFerrimagnetism–Curietemperature,hysteresis,Hardferromagnets,permanentmagnets – SmCo5, Nd2Fe14B, Sintered Alnico, Sintered Ferrite – 3 etc. – Comparison and applications; Soft ferromagnets –Permalloys, Ferrites etc. – Comparison and applications; Neel temperature, Curie-Weiss law; Magneticresonance,NMRandMRI,MASER;	5
4	Superconductivity :Zero resistance, Critical temperature Tc ,Perfect diamagnetism, Meissner effect, Critical field Hc, Type I and Type II superconductors, Cooper pairs and formation of superconducting gap at Fermi level,Electron-PhononinteractionandBCStheory,Isotopeeffect,Applications–Superconductingmagnets, Transmissionlines,Josephsoneffect(DC&AC,qualitative),SQUID;(7Lectures)	4
5	Physics of Nanomaterials : Nanoscale; Properties of nanomaterials- Optical (SPR, luminescence, tuning band gapofsemiconductornanoparticles),Electrical(SET),Magnetic,Structural,Mechanical;Briefdescriptionof different methods of synthesis of nanomaterials (physical - laser ablation, ball milling; chemical - vapor deposition, sol gel); Reduction of dimensionality, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Density of states and energy spectrum for Zero dimensional solid, One dimensional quantum wire, Two dimensional potential well, Particle in a three dimensional box; Some special nanomaterials like, Aerogels – properties and applications, Carbon nanotubes - properties and applications,Core shell nanoparticles - properties and applications; Applications of nanomaterials: Electronics,Energy,Automobiles,Space,Medical,Textile,Cosmetics;NanotechnologyandEnvironment;	7
6	Quantum Computationand Communication covering, the idea of „qubit‟ and examples of single qubit logic gates- Classical bits, Qubit as a two level system; Bloch vector representation of state of qubit; Polarization statesofphotonandmeasurements;Pauligates,Hadamardgate,Phaseshiftgate,Quantumgatesasrotations in Bloch sphere; EPR paradox, concept of entanglement and Bell‟s inequality- The paradox, joint state of entangled particles; Proof of Bell‟s inequality; Two-qubit controlled gates; entanglement generation and the Bell basis- Generic twoqubit state, Controlled-NOT gate;Quantum circuit for transforming computational basis to Bell basis; Qualitative discussion on the „circuit‟ model of „quantum computation; An overview of classical cryptography: Vernam cypher; Public keycryptosystem; The „Rivest-Shamir-Adleman‟ or „RSA‟ protocol;CommentsonNo-cloningtheoremandimpossibilityoffaster-than-lighttransferofinformation;The	8

	BB84protocolinquantumcryptography-Theprotocol;itsvalidityonthebasisofHeisenberg‟suncertainty principle; Quantum Teleportation-Basic idea; measurement using Bell operator, need for classical communicationchannel;quantumcircuitdescribingteleportationprotocol;	

	RefBooks: 1. KittelC.,IntroductiontoSolidStatePhysics,WileyEastern 2. CallisterW.C.Jr.,MaterialScienceandEngineering:AnIntroduction,6thEdn.,JohnWiley&Sons 3. KulkarniSulabhaK.,Nanotechnology:Principles&Practices,CapitolPublishingCo. **4.** CharlesP.Poole,Jr.,FrankJ.Owens,IntroductiontoNanotechnology,WileyEastern **5.** NielsenM.A.,I.L.Chuang,QuantumComputation&QuantumInformation,CambridgeUniv.Press

BTEEE305C.SIGNALSANDSYSTEMS

Teachingscheme:
Theory:3hrs
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Tostudyclassificationofsignalsandsystem Toanalyzediff.typesoftime signal	
Unit	Contents	Contact Hrs
1	CLASSIFICATIONOFSIGNALS Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse,Impulse,Exponential,ClassificationofCTandDTsignals-periodicandperiodic, random singals,	5
	CLASSIFICATIONOFSYSTEMS CTsystemsandDTsystems,Basicpropertiesofsystems-LinearTime invariant Systems and properties.	5
2	ANALYSISOFCONTINUOUSTIMESIGNALS Fourierseriesanalysis,SpectrumofC.T.singals,FourierTransformandLaplace Transform in Signal Analysi	7
3	LINEARTIMEINVARIANT–CONTINUOUSTIMESYSTEMS Differential equation, Block diagram representation, Impulse response, Convolution integral,frequencyresponse,FourierandLaplacetransformsinanalysis,Statevariable equations and matrix representation of systems	7
4	ANALYSISOFDISCRETETIMESIGNALS SamplingofCTsignalsandaliasing,DTFT andproperties,Z-transformandpropertiesofZ-transform.	7
5	LINEARTIMEINVARIANT-DISCRETETIMESYSTEMS Difference equations, Block diagram representation, Impulse response, Convolution sum,LTIsystemsanalysisusingDTFTandZ-transforms,Statevariableequationsand matrixrepresentationofsystems.	7
	REFERENCES: 1. AllanV.Oppenheim,S.WilskyandS.H.Nawab,SignalsandSystems,Pearson Education, 2007. 2. EdwardWKamen&Bonnie'sHeck,"FundamentalsofSignalsandSystems", Pearson Education, 2007 3. HPHsu,RakeshRanjan"SignalsandSystems",Schaum'sOutlines,TataMcGraw Hill, Indian Reprint, 2007 4. S.Salivahanan,A.Vallavaraj,C.Gnanapriya,DigitalSignalProcessing,McGrawHill International/TMH, 2007. 5. SimonHaykinsandBarryVanVeen,SignalsandSystemsJohnWiley&sons,Inc, 2004. 6. RobertA.GabelandRichardA.Roberts,Signals&LinearSystems,JohnWiley	

BTEEL307.NETWORKANALYSISANDSYNTHESISLABORATORY

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):30 Marks
Pr/oral:20Marks

Pre requisite	Basicelectricalengineering	
Course Objective	Tounderstandprinciplesofvariousnetworktheoremsandnetworkprinciples	
Course Outcome	Verifiesprinciplesofnetwork	
Expt No	TitleofExpt	
1	VerificationofSuperpostiontheorem	
2	VerificationofThevinion'stheorem	
3	VerificationofNorton'stheorem	
4	Verificationofmaximumpowertransfertheorem	
5	Verificationofreciprocating theorem	
6	DeterminationoftransientresponseofcurrentinRL&RCcircuitswithstepvoltageinput	
7	AnalysisofRL/RCandRLCcircuits	
8	DeterminationoftransientresponseofcurrentinRLCcircuitwithstepvoltageinputforunder damped,criticallydampedandoverdamped cases	
9	DeterminationoffrequencyresponseofcurrentinRLCcircuitwithsinusoidalacinput	
10	Determinationofdrivingpointandtransferfunctionsofatwoport laddernetwork andverify withtheoreticalvalues	
11	Determinecharactersticsoffilter	

BTEEL308.MEASUREMENTSANDINSTRUMENTATIONLABORATORY

Teachingscheme:
Labwork:4hrs
Total credit: 2

ExaminationScheme:
ContinuousAssessment(T/W):60 Marks
Pr/oral:40Marks

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	StudyofReyleigh'scurrentbalancemethod	
2	TostudyACbridges	
3	Studyofdifferenttypesofohm meter	
4	Studyofmegger	
5	StudyofinstrumentT/Fandit'stypes	
6	Studyofwattmeter	
7	Constructionofammeterandvoltmeter	
8	Tostudydifferenttypesoftransdusers	
9	Studydigitalfrequencymeteranddigitalvoltmeter	
10	Tostudylinearvariabledifferentialtransformer	
11	Studyofdigitaltorque measurement	

BTEEM309.ELECTRICALWORKSHOP/MINIPROJECT

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):30 Marks
Pr/oral:20Marks

Pre requisite	Basicelectricalengineering	
Course Objective	Toprovidehandsonexperiencetowardsbuildingofprototype	
Course Outcome	Buildandverifiesbasicscientificprinciples.	
Expt No	TitleofExpt	
1	Studyvariousresourcesandcomponentsinelectricalengineeringprojects	
2	Studydatasheetofbasiccircuitcomponentsofaproject	
3-5	Studyvarioussoftware inbuildingofprojectlike:ElectricCircuit,X-Circuit, Electrician app,ElectronicTutorials,Logisim,Circuitsimulator,FreePCBKiCADEDAsoftwersuit, SYC labs, Tina-TI etc	
6	PreparationofPCBforagivenproject	
7	Verificationandanalysisofproject	
8	Reportwriting	

SemesterIV

BTEEC401.ELECTRICALMACHINES–I

Teachingscheme:	**ExaminationScheme:**
Theory:3hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:4	End semester exam: 60 Marks

Pre requisite	Basicelectricaltechnology,	
Course Outcome	Tostudydiff.types,constructionandoperatingprincipleofdiff.typesofelectrical machines	
Unit	Contents	Contact Hrs
1	Single Phase Transformer:Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams,power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, Per Unit system, excitation phenomenon in transformers,switchingtransients,Autotransformers,Variablefrequencytransformer,voltageandcurrent transformers,weldingtransformers,Pulsetransformerandapplications.	7
2	ThreePhaseTransformers:Constructionalfeaturesofthreephasetransformers,Coolingmethodology,Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three windingtransformersanditsequivalentcircuit,Onloadtapchangingoftransformers,Moderntrendsin transformers,Typeandroutinetests,Standards.	8
3	ElectromechanicalEnergyConversionPrinciples:Energyinamagneticsystems,fieldenergyandmechanical force,energyinsinglyand multiplyexcited magnetic systems,determinationofmagnetic forceand torquefrom energyandcoenergy,Forcesandtorquesinmagneticfieldsystems,dynamicequationsofelectromechanical systemsandanalyticaltechniques	6
4	DCGenerators: Constructionofarmature and field systems, Working,types, emfequation, Armature windings, Characteristics and applications, Building of emf, Armature reaction - Demagnetizing and Cross magnetizing mmfsandtheirestimation;Remediestoovercomethearmaturereaction;Commutationprocess,Causesofbad commutationandremedies	9
5	D.C. Motors: Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and SelectionofDCMotors,StartingofDCMotors,SpeedControl,LossesandEfficiency,ConditionforMaximum Efficiency,BrakingofDCMotors,Effectofsaturationandarmaturereactiononlosses;Applications,Permanent MagnetDCMotors,Typeand Routinetests.	9
6	SpecialMachines:Constructionaldetailsofreluctancemachine,variable-reluctancemachines,basicVRM analysis,practicalVRManalysis,steppermotorsandtheiranalysis,BrushlessDCmotors.	6
	REFERENCES: 1. BhattacharyaS.K,“ElectricalMachines”,(TataMcGrawHillPublications) 2. KothariNagrath,“ElectricalMachines”,(TataMcGrawHillPublications) 3. M.N.Bandopadhyay,“ElectricalMachines”,(TataMcGrawHillPublications) 4. Fitzaralda,“ElectricalMachines”,(TataMcGrawHillPublications)	

BTEEC402:POWERSYSTEM-I:

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	ToUnderstandbasicoperationofpowersystem,powersystemcomponentsandtheircharacteristics.	
Unit	Contents	Contact Hrs
1	**Load and Energy survey**: load duration curve, plant factor and plant economics. Introduction to different sources of energy. Construction, principle and working of different thermal power plants with neat block diagram of main parts, fuel economisation, for thermal power plants based on Coal, Oil and nuclear energy. HydroelectricPowerPlant:Advantagesandlimitations,selectionofsite,hydrologicalcyclesandhydrographs, storage and pondage, essential elements of hydroelectric plant, classification, different types of turbines and their selection, layout of hydro-station, simple numerical.	7
2	**Major Electric Equipments**: Descriptive treatment of alternator exciter & excitation systems, Transformers, Control panels, Metering & other control room equipments. Inductance:Definition,Inductanceduetointernalfluxoftwowiresinglephaselineofcompositeconductor line,ConceptofGMD,Inductanceofthreephaselinewithequal&unequalspacing,verticalspacing.	5
3	**Capacitance**:Conceptofelectricfield,Potentialdifferencebetweentwopointsinspace,Effectofearth's surfaceonelectricfield,Computationofcapacitance ofsinglephase,threephasetransmissionlineswith&with outsymmetricalspacingforsolid&compositeconductors.	6
4	**Transmission:**Typesofconductors,Choiceofconductormaterials,Strandedcopper&ACSRconductor, Insulationconsideration,Different types ofinsulator,supports,distributionofvoltage across theinsulatorstring, Stringefficiency,skineffect,Ferrantyeffect,proximityeffect	6
5	**Current and Voltage relation:** Representation of short, medium & long transmission lines, P. U. quantities, evaluation of ABCD parameters and surge impedance loading, power flow through transmission line, circle diagram, evaluation of relation between sending and receiving end current & voltage, Interpretation of transmissionlineequation,Numericals,Linecurrent,%regulation,Transmissionefficiency,numericalsbased on above	7
6	**MechanicalDesignofTransmissionLine**:Effectofwind&icecoatingontransmissionline,sagduetoequal & unequalsupports,with their derivation, Numericals. Corona:Phenomenonofcorona,factorsaffectingthecorona,Powerloss&disadvantagesofcorona.	5
	REFERENCES: 1. GuptaB.R.”PowerPlantEngineering”.(Eurasiapublications) 2. NagP.K.“PowerPlantEngineering”,(TataMcGrawHillPublications) 3. KothariNagrath,“ElectricPowerSystem”,(TataMcGrawHillPublications) 4. WadhvaS.L.,“ElectricPowerSystem”,(TataMcGrawHillPublications) 5. StevensionW.B.,“PowerSystem”,(EnglishLanguageBookSocietypublications)	

BTEEC403ELECTRICALINSTALLATIONANDESTIMATION

Teachingscheme:
Theory: 2 hrs
Tutorial-1hr
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,electricalmeasurementandinstrumentation.	
Course Outcome	Topreparestimatesandcostingofelectricalinstallationsofpowersystem,Tounderstand procedures of contractingandpurchase.	
Unit	Contents	Contact Hrs
1	Estimating and Determination of conductor size for internal wiring, HT and LT Overhead Lines and UndergroundCables:Variousstepsto formanestimate,Pricecatalogue,Scheduleoflabourrates,Scheduleof ratesand estimatingdata, Conductor size, calculations for internal domestic wiring, Permissible voltage drops forlightingandindustrialload,simplenumericals,Conductorsizecalculationforundergroundcables:General considerations,Simplenumericals,ConductorsizecalculationsforoverheadlineswithA.C.S.R.conductors, simplenumericals.	7
2	Preparation of estimate of quantity of material required for wiring of a house (typical plan of house including electriclayoutistobegiven).Drawingofelectricalcircuitforsuchelectrification.Specificationforaccessories likeACenergymeter, mainswitch,Tumblerswitch,Electricheater,Fluorescenttube,Chokesfortubes,starters, bulbs,andInsulationtapes.	5
3	**PrinciplesofContracting**:Purchasingtechniques,Spotquotations,Floatinglimitedenquiry,Typicalexample of quotation form, preparation of comparative statement, Analysis of comparative statement, Tenders types (Single tender, Open tender), Earnest money, Security deposit, Various steps involved in complete purchase, Typical order formats, various criteria for selecting the supplier, General considerations in order form, Procedures to be followed for submitting the tenders & quotations. PurchaseDepartment,Objective,activities,dutiesandfunctions,purchaseorganization,Centralizedand decentralizedpurchasing,relativeadvantagesanddisadvantages,Applications	6
4	**Studyofdifferenttypesofcomponentsinelectricaldistributionsystem:** Cables: Classification, general construction, types of cables, jointing of cables, measurement of insulation resistance,Insulators:Requirements,materialsused,types(Pin,Suspension,Strain,Stay)Substation:Different types, classification, design consideration, various symbols, complete arrangement of substation (Single and double bus bar), key diagrams for typical substations. ReviewofInsulatedWires:Types:RubbercoveredtapedandcompoundedorVIR,Leadalloysheathed,Tough rubber sheathed, Weather proof, Flexible wire splicing, Termination (Twist splicing, Married joint, Tap joint, Pigtailjoint) DifferentTypesofSwitches:Tumbler,flush,pull,grid,architrave,rotarysnap,Pushbutton,Iron cladwaterproof,Quickbreakknifeswitch.Ceilingroses,Mountingblocks,Socketoutletsplugs,Main switches,Distributionfuseboards,MCB(MiniatureCircuitBreakers)	7
5	**DifferentToolsUsed**:Screwdriver,Pliersofvarioustypes, wrench,andblowlamp,Precautionforusingtools	4
6	**WiringSystem**:Selectionoftypesofwiring.Methodsofwiring(Cleat,Casingcapping,Metalsheathedand Conduit)CalculationandEstimationofpowerratingofdifferentACandDCmachines,schematicandwiring diagrams for motor control and protection circuit	6
	REFERENCES: 1. Uppal.S.L–ElectricalWiring,Estimation&Costing(KhannaPublication). 2. Raina&Bhattacharaya–ElectricalDesignEstimating&Costing(WillyEstern).	

BTEEC404.NUMERICALMETHODSANDPROGRAMMING.

Teachingscheme:	**ExaminationScheme:**
Theory: 2 hrs	Mid-term test: 20 Marks
Tutorial-1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Mathematics1,mathematics2,mathematics3,Cprogramming	
Course Outcome	TostudyandunderstandMATLABprogramming. To review mathematical concepts . Todevelopcomputerprogramforlinearandnonlinearequations.	
Unit	Contents	Contact Hrs
1	IntroductiontoMATLABProgramming:Arrayoperations,LoopsandexecutioncontrolLecture.Working withfiles:ScriptsandFunctions,Plottingandprogramoutput	5
2	ApproximationsandErrors:DefiningerrorsandprecisioninnumericalmethodsTaylor's/Maclaurinseries, Truncationandround-offerrors,Errorpropagation,Globalandlocaltruncationerrors.	6
3	NumericalDifferentiationandIntegration:Methodsofnumericaldifferentiationandintegration,trade-off betweentruncationandround-offerrors,errorpropagationandMATLABfunctionsforintegration	6
4	Linear and Nonlinear Equations: numerical methods in linear algebra, and use of MATLAB to solve practical problems. Gauss Elimination ,LU decomposition and partial pivoting,Iterative methods: Gauss Siedel and Special Matrices: Tri-diagonal matrix algorithm, Nonlinearequations:NewtonRaphsonmethodandMATLABroutinesfzeroandfsolve.,Nonlinearequationsin singlevariable,MATLABfunctionfzeroinsinglevariable,Fixed-pointiterationinsinglevariable,Newton-Raphsoninsinglevariable,MATLABfunctionfsolveinsingleandmultiplevariables,Newton-Raphsonin multiplevariab	6
5	RegressionandInterpolation:Linearleastsquaresregression(includinglsqcurvefitfunction),Functionaland nonlinearregression(includinglsqnonlinfunction),InterpolationinMATLABusingsplineandp chip	5
6	Ordinary Differential Equations (ODE) – 1 Explicit ODE solving techniques in single variable, Introduction to ODEs; Implicit and explicit Euler's methods, Second-Order Runge-Kutta Methods, Higher order Runge-Kutta methods, Error analysis of Runge-Kutta method. StiffODEsandMATLABode15salgorithm,PracticalexampleforODE-IVP,SolvingtransientPDEusing MethodofLines	7
	ReferenceBooks: 1. FausettL.V.(2007)AppliedNumericalAnalysisUsingMATLAB,2ndEd.,andPearsonEducation. 2. ChapraS.C.andCanaleR.P.(2006)NumericalMethodsforEngineers,5thEd.,andMcGrawHill. 3. NPTELnotes.http://nptel.ac.in/courses/122106033/	

ProductDesignEngineering

Teaching Scheme:	**ExaminationScheme:**
Lecture-cum-demonstration:1hr/week	ContinuousAssessment 1: 30Marks
DesignStudio:2 hr/week	ContinuousAssessment 2: 30Marks
	FinalAssessment: 40Marks

- Pre-requisites:KnowledgeofBasicSciences,MathematicsandEngineeringDrawing
- DesignStudio:2hr/weektodevelopdesignsketchingandpracticalskills, learningdigitaltools
- ContinuousAssessment:Progress throughaproduct designanddocumentationofsteps inthe selected product design
- FinalAssessment:ProductDesigninStudiowithfinalproductspecifications

CourseOutcomes:Attheendofthecourse,studentswillbeable to

1. Createsimplemechanicalorotherdesigns
2. Createdesigndocumentsfor knowledgesharing
3. Manageownworktomeetdesignrequirements
4. Workeffectivelywithcolleagues

CourseContents:

Unit1.IntroductiontoEngineeringProductDesign:

Trigger for Product/ Process/ System, Problem solving approach for Product Design, DisassemblingexistingProduct(s)andunderstandingrelationship ofcomponents witheachother, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failedproducts, Public/Society’s perception of products, and its input into product design.

Unit2.Ideation:

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or groupofindividuals,Sketchingofproducts, Market researchfor need,competitions,scaleandcost, Initial specifications of products

Unit3.Conceptualisation:

Computer operationprinciplesandimageeditingthroughagraphicalComposition;Computer aided 2D drafting and 3D Modeling through simple exercises.

Designingofcomponents,Drawingsofpartsandsynthesisofaproduct fromitscomponent parts, Rendering the designs for 3-D visualization and to create a photo realistic image, Parametric modelling of product, 3-D Visualization of mechanical products, Detail Engineering drawings of components

BTEEE406A.SOLIDSTATEDEVICES.

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	basicelectricalengineering,	
Course Outcome	1. Tostudyconstructionandcharacteristicsofsolidstatedevices. 2. Toapplyoperationalamplifier modelsincircuitsemployingnegativefeedback. 3. TodesignelectronicscircuitusingTimerICandvoltageregulators. 4. Toperformanalysisofamplifiersusingsmallsignalmodelsforthecircuit elements. 5. TocalculatethefrequencyresponseofcircuitscontainingBJT,Op-Ampetc	
Unit	Contents	Contact Hrs
1	SemiconductorDevicesandtheirapplications:Applicationsofdiodes-clippers,clampers,multipliers,Types of diodes - Zener diode, Tunnel diode, schottky diode, LED, PIN diode, Photodiode etc, BJT- CB, CE, CC configurations,biasing,FETbiasing,MOSFETbiasing,NMOS,PMOS,CMOS,Devicemodeling.	4
2	SignalandPowerAmplifiers:AnalysisofCB,CC,CEandFETamplifiers.Lowand highfrequencyresponse oftransistorandFETamplifier,Feedbackinamplifiers,Oscillators.Transistorpoweramplifiers.	4
3	OperationalAmplifiers:TheidealOp-Amp,equivalentcircuitofOp-Amp,idealvoltagetransfercurve, open loopOp-Ampconfigurations,Op-Ampparameters,blockdiagramrepresentationoffeedbackconfigurations, frequency response, high frequency Op-Amp.	4
4	ActiveFiltersandOscillators:Activefilters:lowpassfilter,highpassfilter,band-passfilters,bandreject filters,allpassfilters,comparatorsandoscillators.	4
5	GeneralizedLinearApplications:DCandACamplifiers,instrumentationamplifier,logarithmicamplifier, voltagetocurrentconverter,currenttovoltageconverter,theintegrator,thedifferentiator.	4
6	Specialized IC Applications: The 555 Timer as monostable, astable multivibrator, phase locked loops operatingprinciples,565PLLapplications,voltageregulators-fixed,adjustable,switching,special.Analog switchandanalogmultiplier.	4
	RefBooks: 1. Millman,HalkiasandSatyabrataJit,”ElectronicDevicesandCircuits”,4thedition,McGrawHill Education (India) Private Limited, 2015. 2. RobertL.BoylestadandLouisNashelsky,”Electronicdevicesandcircuittheory”,11thedition, Prentice Hall India Ltd, 2015. 3. RamakantA.Gayakwad,”Op-AmpsandlinearintegratedCircuits”4thedition,PearsonEducation, 2015.	

BTEEE405B.ANALOGANDDIGITALELECTRONICS

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	basicelectricalengineering,	
Course Outcome	Toreviewbasicnumber system. Tounderstanddeignandcharacteristicsofdigitallogicgates. To studydifferent techniques in use of digital circuits. Todesigndigital systems.	
Unit	Contents	Contact Hrs
1	TransistorasanAmplifier,loadline,Smallsignallowfrequencyanalysisofsinglestageamplifierindifferent configuration, High frequency equivalent circuit of transistor (hybrid pi), Cascade amplifier, High input resistancecircuits-CcoupledamplifierFrequencyresponse,Definitionof3dbbandwidth,Effectofcascading ongain&BW,Classificationofamplifiers	4
2	Block diagram of operational amplifier, Properties of ideal operational amplifier, Explanation of different terms appearing in OP-Amp application (offset, bias, quantities, PSRR, CMRR, Ad, AC, Slew rate etc.), Operation of circuit diagram of OP-Amp using discrete components & I.C.diagram, Different types of current of current sources in I.C. technology, frequency response of OP-Amp, OP-Amp parameters & minimizationtechniqueoftemperatureeffect,Inverting&Non-invertingoperationofOp-Amp&analysisfor AG,RI,RO,Linear&non-linearcircuitapplicationofOP-Amp	4
3	NumberSystems,BasicLogicGates&BooleanAlgebra:BinaryArithmetic&Radixrepresentationof differentnumbers.Sign&magnituderepresentation, fixed pointrepresentation,complementnotation, variouscodes&arithmeticindifferentcodes&theirinter conversion.Featuresoflogic algebra,postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function.Derived logic gates:Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and Vica-versa.Converting logic diagrams to universal logic.Positive, negative and mixed logic. Logic gate conversion	4
4	DigitalLogicGateCharacteristics:TTLlogicgatecharacteristics:Theory&operationofTTLNANDgate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, and C-MOS & MOSFET. Interfacing logic families to one another.SequentialSystems:Latches,flip-flops,R-S,D,J-K,MasterSlaveflipflops.Conversionsof flip-flops Counters:Synchronous&asynchronousrippleanddecadecounters,Moduluscounter, skippingstatecounter,counterdesign,statediagramsandstatereduction techniques.Ring counter. Counterapplications.Registers:bufferregister,shiftregister	4
5	MinimizationTechniques:Minterm,Maxterm,KarnaughMap,Kmapupto4variables.Simplificationof logiConversionoftruthtablesinPOSandSOPform.Incompletespecifiedfunctions.Variable mapping.Quinn-McKlusky minimization techniques. c functions with K-map	4
6	CombinationalSystems:Combinationallogiccircuitdesign,halfandfulladder,subtractor.Binaryserialand parallel adders.BCD adder. Binary multiplier.Decoder: Binaryto Graydecoder, BCD to decimal, BCD to 7- segment decoder' Multiplexer, DE multiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode Switchingmatrix.Designoflogiccircuitsbymultiplexers,encoders,decodersandDEmultiplexers.	4
	RefBooks: 1. Mandal,DigitalElectronics:PrinciplesandApplications,TMH2009 2. Leach,DigitalPrinciplesandApplications,ed.7,TMH2008 3. M.MorrisMano,DigitalLogicandComputerDesign,PearsonEdu. 2014	

BTEEE405C.ELECTROMAGNETICTHEORY

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,machine1,physics	
Course Outcome	Tounderstandvectorrelationsindiff.forms To analyze diff. laws and their solution Tostudyaboutmagneto static Tounderstandtimevaryingfieldandeffectofmagnetismintransmissionline	
Unit	Contents	Contact Hrs
1	Introduction:VectorRelationinrectangular,cylindrical,sphericalandgeneralcurvilinearcoordinatesystem. Conceptandphysicalinterpretationofgradient,Divergenceandcurl,Green'sStoke'sandHelmholztheorems	4
2	Electrostatics:Electricfieldvectors-electricfieldintensity,fluxdensity&polarization.Electricfielddueto variouschargeconfigurations.Thepotentialfunctionsanddisplacementvector.	4
3	Gauss'slaw,Poisson'sandLaplace'sequationandtheirsolution.Uniquenesstheorem.Continuityequation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Fieldmappings and concept of field cells	5
4	Magnetostatics:Magneticfieldvector:Magneticfieldintensity,fluxdensity&magnetization,Bio-Savart'slaw, Ampere'slaw,Magneticscalarand vectorpoten Energy stored in magnetic field, Boundary conditions, Analogybetweenelectricandmagneticfield,Fieldmappingandconceptoffieldcellstial,self&mutual inductance.	5
5	TimeVaryingFields:Faraday'slaw,Displacementcurrentsandequationofcontinuity.Maxwell'sequations, Uniformplanewaveinfree space, dielectricsandconductors,skineffect sinusoidaltimevariations, reflections, refraction&polarizationofUPW,standingwaveratio.Pointingvectorandpowerconsiderations.	4
6	TransmissionLines:Thehigh-frequencycircuit.LCRladdermodel.ThetransmissionLinequation.Solution forloss-lesslines.Wavevelocityandwaveimpedance.ReflectionandTransmissioncoefficientsatjunctions. VSWR	4
	RefBooks: 1. G.S.N.Raju:ElectromagneticFieldTheoryandTransmissionLines,Pearson.2006 2. S.BaskaranandK.Malathi:ElectromagneticFieldandWaves,ScitechPub. 2013 3. R.S.Kshetrimayum,ElectromagneticFieldTheory,CengageLearning.2012 4. J.D.Kraus:Electromagnetic.5thedition,MGH.1999	

BTEEOE407A.INDUSTRIALSAFETY.

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,electricalmeasurementandinstrumentation,machine1	
Course Outcome	Tounderstandimportanceofsafetyinindustrialenvironment. Tounderstanddifferentsafetyproceduresinanindustrialenvironment.	
Unit	Contents	Contact Hrs
1	SAFETYINMETALWORKINGMACHINERYANDWOODWORKINGMACHINESGeneralsafety rules,principles,maintenance,Inspectionsofturningmachines,boringmachines,millingmachine,planning machineandgrindingmachines,CNCmachines,Woodworkingmachinery,types,safetyprinciples,electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards	4
2	PRINCIPLES OF MACHINE GUARDING Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policyfor ZMS –guardingofhazards -point ofoperation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard openin Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawingshearingpresses-forgehammer-flywheels-shafts-couplings-gears-sprocketswheels andchains-pulleysandbelts-authorizedentrytohazardousinstallations-benefitsofgoodguardingsystems.	5
3	SAFETY IN WELDING AND GAS CUTTING Gas welding and oxygen cutting, resistances welding, arc weldingandcutting,commonhazards,personalprotectiveequipment,training,safetyprecautionsinbrazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment andinstruments–safetyingeneration,distributionandhandlingofindustrialgases-colourcoding–flashback arrestor–leakdetection-pipelinesafety-storageandhandlingofgascylinders.	4
4	SAFETY IN COLD FORMING AND HOT WORKING OF METALS Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses,powerpresselectriccontrols,powerpresssetupanddieremoval,inspectionandmaintenance-metal sheers-press brakes.	4
5	Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending ofpipes, hazards and control measures. Safetyingasfurnaceoperation,cupola,crucibles,ovens,foundry healthhazards,work environment,material handlinginfoundries,foundryproductioncleaningandfinishingfoundryprocesses.	4
6	SAFETYINFINISHING,INSPECTIONANDTESTINGHeattreatmentoperations,electroplating,paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoringdevices,radiationhazards,engineeringandadministrativecontrols,IndianBoilersRegulation	4
	References: 1. “AccidentPreventionManual”–NSC,Chicago,1982. 2. “OccupationalsafetyManual”BHEL,Trichy,1988. 3. “SafetyManagementbyJohnV.Grimaldiand RollinH. Simonds,AllIndiaTravelersBookseller,New Delhi, 1989. 4. “SafetyinIndustry”N.V.KrishnanJaicoPublisheryHouse,1996. 5. IndianBoileractsandRegulations,GovernmentofIndia. 6. Safetyintheuseofwoodworkingmachines,HMSO,UK1992. 7. HealthandSafetyinweldingandAlliedprocesses,weldingInstitute,UK,HighTech.PublishingLtd., London, 1989	

BTEEOE407B.INTRODUCTIONTONON-CONVENTIONALENERGYSOURCES,

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Energyandenvironmentalengineering,basicelectricalengineering	
Course Outcome	Toreviewenergyscenario. Tounderstandbasicconcepts,constructionandoperationalfeaturesofdifferentnon-conventionalsources.	
Unit	Contents	Contact Hrs
1	Introduction:Worldenergysituation,conventionalandnon-conventionalenergysources,Indianenergy scene.	2
2	SolarEnergy:Solarradiation,solarradiationgeometry,solarradiationontiltedsurface.Solarenergy collector. Flat- plate collector, concentrating collector- parabolidal and heliostat. Solar pond. Basic solarpower plant. Solar cell, solar cell array, basic photo-voltaic power generating system	4
3	Wind Energy: Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variablespeedconstantfrequencyandvariablespeedvariablefrequencyschemes.Applicationsofwind energy	6
4	GeothermalEnergy:Geothermalfields,estimatesofgeothermalpower.Basicgeothermalsteampowerplant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India. TidalEnergy:Introductiontotidalpower.Componentsoftidalpowerplants,doublebasinarrangement. Powergeneration.Advantagesandlimitationsoftidalpowergeneration.ProspectsoftidalenergyinIndia	5
5	Nuclear Fusion Energy: Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasmaconfinement–magneticconfinementandinertialconfinement.BasicTokamakreactor,laserfusion reactor.Advantagesofnuclearfusion.Fusionhybridandcoldfusion	4
6	BiomassEnergy:Introduction,biomasscategories,bio-fuels.Introductiontobiomassconversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragatidesignbiogasplant.Utilizationofbiogas.Energyplantation.Pyrolysisscheme.Alternativeliquid fuels–ethanolandmethanol.Ethanolproduction	4
	RefBooks: 1. A.N.Mathur:Non-ConventionalResourcesofEnergy.2010 2. V.V.N.Kishore:RenewableEnergyEngineeringandTechnology,TERI.2006	

BTEEOE407C.SOFTWARETECHNIQUES.

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	BasicCprogramming	
Course Outcome	Tounderstanddifferenttechniquesofsoftwaremodels. To understand verification and validation of software. Toanalyzesoftwareprojectmanagement.	
Unit	Contents	Contact Hrs
1	Introduction- Notion of SoftwareasaProduct– characteristicsof agoodSoftwareProduct.Engineering aspects ofSoftwareproduction–necessityofautomation.JobresponsibilitiesofProgrammersandSoftwareEngineers as Software developers	3
2	ProcessModelsandProgramDesignTechniques-SoftwareDevelopmentProcessModels–Code&Fixmodel, Waterfallmodel,Incrementalmodel,RapidPrototypingmodel,Spiral(Evolutionary)model.	3
3	GoodProgramDesignTechniques–StructuredProgramming,CouplingandCohesion,Abstractionand InformationHiding,AutomatedProgramming,DefensiveProgramming,RedundantProgramming,Aesthetics. SoftwareModellingTools–DataflowDiagrams,UMLandXML.JacksonSystemDevelopment	7
4	VerificationandValidation:TestingofSoftwareProducts–Black-BoxTestingandWhite-BoxTesting,Static Analysis, Symbolic Execution and Control Flow Graphs – Cyclomatic Complexity. Introduction to testing of Real-time Software Systems.	5
5	Software Project Management: Management Functions and Processes, Project Planning and Control, Organization and Intra-team Communication, RiskManagement. Software Cost Estimation – underlyingfactors ofcriticalconcern.Metricsforestimatingcostsofsoftwareproducts–FunctionPoints.Techniquesforsoftware costestimation–Expertjudgement,Delphicostestimation,Workbreak-downstructureandProcessbreak-downstructure,COCOMOandCOCOMO-II.	6
6	Advanced Topics: Formal Methods in Software Engineering – Z notation, Hoare‟s notation. Formalization of FunctionalSpecifications–SPEC.SupportenvironmentforDevelopmentofSoftwareProducts.Representative Tools for Editors, Linkers, Interpreters, Code Generators, Debuggers. Tools for Decision Support and Synthesis, ConfigurationcontrolandEngineeringDatabases,ProjectManagement.Petrinets.IntroductiontoDesign Patterns,AspectorientedProgramming.	7
	Referencebooks: 1. FundamentalsofSoftwareEngineering–CarloGhezziet.al.2.SoftwareEngineering–Design, Reliability Management – Pressman. 2. SoftwareEngineering–IanSommerville.2.SoftwareEngineering-Shoeman.3.Software EngineeringwithAbstraction–BerzinsandLuqi	

BTEEL408.ELECTRICALMACHINE-ILABORATORY

Teachingscheme: **ExaminationScheme:**

Lab work : 2 hrs ContinuousAssessment(T/W):60 Marks

Total credit: 1 Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	Toverifyturnratio oftransformer	
2	TodetermineequivalentcircuitdiagramoftransformerthroughOCandSCtest	
3	Todetermineefficiencybydirectloadtestonsinglephasetransformer	
4	ToverifyV-Irelation&todrawphasordiagramofi)star-starii)star-deltaiii)delta-star iv)delta-deltaconnectionof3phasetransformer	
5	Toverifyrelationini)scottconnectionii)opendelta connection	
6	Tostudytheparalleloperationof3phasetransformer	
7	Tostudyconstructionofstatorand rotorofDCmachine	
8	Todeterminemagnetization,internalandexternalcharacteristicsofaseriesgenerator	
9	Todetermineinternalandexternalcharacteristicsofdcmachine	
10	TodetermineST characteristicsofDCmotor	
11	TodetermineefficiencyofDCmotor	
12	TocontroltheSpeedofDCmotor	
13	ToconductbrakingtestonDCmotor	

BTEEL409.POWERSYSTEM-ILABORATORY

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):60 Marks
Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	StudyofThermalpowerplantlayoutanditscomponents	
2	StudyofHydropowerplantlayoutanditscomponents	
3	Studyofalternatorexciter systems	
4	Studyofcontrolpanelandmeteringequipment	
5	StudyofdifferentOHTSystemconductors	
6	StudyofdifferentOHTSysteminsulator	
7	Determinationofperformanceparameterofshorttransmissionline	
8	Determinationofperformanceparameterofmediumtransmissionline	
9	Determinationofperformanceparameteroflongtransmissionline	
10	DeterminationofABCDparametersoftransmissionline	
11		
12		

PS:Avisittonearbytypicalpowerplantwhichincludesstudyofexpt1-6isrecommended.

BTEEL410.NUMERICALMETHODSANDPROGRAMMINGLABORATORY

Teachingscheme:	ExaminationScheme:
Labwork:2hrs	ContinuousAssessment(T/W):60 Marks
Total credit: 1	Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	Programforscanconversionofastraightline	
2	Programforscanconversionofacircle	
3	Programforscanconversionofanellipse	
4	Programforscanconversionofarectangle	
5	Programforscanconversionofanarc	
6	Programforscanconversionofasector	
7	Programforfindingrootsoff(x)=0bynewtonraphsonmmethod	
8	Programforfindingrootsoff(x)=0bybisectionmethod	
9	Programforsolvingnumericalintegrationbysimpson’s1/3rule	
10	Programforsolvingordinarydifferentialequationbyrungekuttamethod	

BTEEL411.ELECTIVE-IILABORATORY

Teachingscheme:	ExaminationScheme:
Lab work : 2 hrs	ContinuousAssessment(T/W):60 Marks
Total credit: 1	Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

AnaloganddigitalElectronicsLab

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	MeasurementofopAmpparameters	
2	Designandimplementationofintegrator,differentiatorandcomparator	
3	Designandimplementationofphasedlockedloopanditsapplications	
4	Designandimplementationofvarioussignalgenerator	
5	Designandimplementationofinstrumentamplifier	
6	Designandimplementationofarithmeticcircuits	
7	Designandimplementationofvariouscodeconvertersanditsapplications.	
8	Designandimplementationofmultiplexeranddemultiplexeranditsapplications.	
9	Designandimplementationofencodersanddecodersanditsapplications	
10	Designandimplementationofsynchronousandasynchronouscountersanditsapplications	
11	Designandimplementationofnon-sequentialcounters.	
12	Designandimplementationofshiftregistersanditsapplications.	
13	ImplementationandverificationsofCombinationalcircuitsonprogrammablelogicdevices	

Dr. Babasaheb Ambedkar Technological University, Lonere.

B. Tech (Electronics & Telecommunication Engineering) / B. Tech (Electronics Engineering)

Curriculum for Semester III [Second Year]

Sr. No.	Course Code	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
			L	T	P	MSE	CA	ESE		
1	BTBSC301	Engineering Mathematics-III	3	1	0	20	20	60	100	4
2	BTEXC302	Analog Circuits	2	1	0	20	20	60	100	3
3	BTEXC303	Electronic Devices & Circuits	2	1	0	20	20	60	100	3
4	BTEXC304	Network Analysis	2	1	0	20	20	60	100	3
5	BTEXC305	Digital Logic Design	2	1	0	20	20	60	100	3
6	BTHM3401	Basic Human Rights	2	0	0	--	50	--	50	(Audit)
7	BTEXL307	Analog Circuits Lab	0	0	2	--	60	40	100	1
8	BTEXL308	Electronic Devices & Circuits Lab	0	0	2	--	60	40	100	1
9	BTEXL309	Network Analysis Lab	0	0	2	--	60	40	100	1
10	BTEXL310	Digital Logic Design Lab	0	0	2	--	60	40	100	1
11	BTEXW311	Electronics Workshop	0	0	2	--	60	40	100	1
12	BTES211P	Field Training/ Internship/Industrial Training Evaluation	--	--	--	--	--	50	50	1
		Total	**13**	**05**	**10**	**100**	**450**	**550**	**1100**	**22**

Dr. Babasaheb Ambedkar Technological University, Lonere.

B. Tech (Electronics & Telecommunication Engineering) / B. Tech (Electronics Engineering)

Curriculum for Semester IV [Second Year]

Sr. No	Course Code	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
			L	T	P	MSE	CA	ESE		
1	BTEXC401	Electrical Machines and Instruments	2	1	0	20	20	60	100	3
2	BTEXC402	Analog Communication Engineering	2	1	0	20	20	60	100	3
3	BTEXC403	Microprocessor	2	1	0	20	20	60	100	3
4	BTEXC404	Signals and Systems	2	1	0	20	20	60	100	3
5	BTID405	Product Design Engineering	1	0	2	30	30	40	100	2
6	BTBSC406	Numerical Methods and Computer Programming	2	1	0	20	20	60	100	3
7	BTEXL407	Electrical Machines and Instruments Lab	0	0	2	--	60	40	100	1
8	BTEXL408	Analog Communication Engineering Lab	0	0	2	--	60	40	100	1
9	BTEXL409	Microprocessor Lab	0	0	2	--	60	40	100	1
10	BTEXL410	Signals and Systems Lab	0	0	2	--	60	40	100	1
11	BTHML411	Soft-Skill Development	0	0	2	--	60	40	100	1

12	BTEXF412	Field Training/ Internship/Industrial Training (Minimum 4 weeks which can be completed partially in third semester or fourth semester or in at one time)	--	--	--	--	--	--	--	1 (To be evaluated in Vth Semester)
Total			**11**	**05**	**12**	**130**	**430**	**540**	**1100**	**22**

BTBSC301 Engineering Mathematics-III 4 Credits

Second Year B. Tech Classes (Common to all Branches) Semester: III

Prerequisites: Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and first degree, Fourier series, Vector algebra, Algebra of complex numbers.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
2. Transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Vector differentiation and integration required in Electromagnetics and Wave theory.
4. Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

Course Outcomes:

On completion of the course, students will be able to:

1. Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
2. Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
4. Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields.
5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

UNIT - 1 07 Hours

Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT - 2 07 Hours

Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT - 3 07 Hours

Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval‟s identity for Fourier Transforms.

UNIT - 4 07 Hours

Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange‟s linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation ($\frac{6u}{6t} = c^2 \frac{{}^2u}{6x^2}$), and two dimensional heat flow equation (i.e. Laplace equation : $\frac{{}^2u}{6x^2} + \frac{{}^2u}{6y^2} = 0$).

UNIT - 5	07 Hours

Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

UNIT - 6	07 Hours

Functions of Complex Variables (Integral calculus)

Cauchy"s integral theorem; Cauchy"s integral formula; Residues; Cauchy"s residue theorem (All theorems without proofs).

TEXT BOOKS

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O" Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.

5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

GENERAL INSTRUCTIONS

1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

BTEXC302 Analog Circuits 3 Credits

Course Objectives:

1. To understand characteristics of IC and Op-Amp and identify the internal structure.
2. To introduce various manufacturing techniques.
3. To study various op-amp parameters and their significance for Op-Amp.
4. To learn frequency response, transient response and frequency compensation techniques for Op-Amp.
5. To analyze and identify linear and nonlinear applications of Op-Amp.
6. To understand functionalities of PLL.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand the characteristics of IC and Op-Amp and identify the internal structure.
2. Understand and identify various manufacturing techniques.
3. Derive and determine various performances based parameters and their significance for Op-Amp.
4. Comply and verify parameters after exciting IC by any stated method.
5. Analyze and identify the closed loop stability considerations and I/O limitations.
6. Analyze and identify linear and nonlinear applications of Op-Amp.
7. Understand and verify results (levels of V & I) with hardware implementation.
8. Implement hardwired circuit to test performance and application for what it is being designed.
9. Understand and apply the functionalities of PLL.

UNIT - 1	06 Hours

OP-AMP Basics

Block diagram of OP-AMP, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations, Need and types of level shifter, current mirror circuits. Feedback topologies: Voltage series and voltage shunt feedback amplifier and its effect on R_i, R_o, bandwidth and voltage gain.

UNIT - 2	06 Hours

Linear Applications of OP-AMP

Inverting and non-inverting amplifier configurations, voltage follower, summing, averaging scaling amplifier, difference amplifier, integrator, differentiator, and instrumentation amplifiers.

UNIT - 3	06 Hours

Non-linear Applications of OP-AMP

Introduction to comparator, characteristics and applications of comparator, Schmitt trigger, clippers and clampers, voltage limiters, square wave generator, triangular wave generator, Need of precision rectifiers, Half wave and Full wave precision rectifiers.

UNIT - 4	06 Hours

Converters using OP-AMP

V-F, I-V and V-I converter, Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash type.

UNIT - 5	06 Hours

Oscillators

Principle of Oscillators, Barkhausen criterion, Oscillator types: RC oscillators (design of phase shift, Wien bridge etc.), LC oscillators (design of Hartley, Colpitts, Clapp etc.), non-sinusoidal oscillators, and voltage controlled oscillators.

UNIT - 6	06 Hours

Active filters and PLL

Design guidelines of Active filters: Low pass, high pass, band pass and band stop filters, block diagram of PLL and its function.

TEXT/REFERENCE BOOKS

1. Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education 2000.
2. Salivahanan and Kanchana Bhaskaran, “Linear Integrated Circuits”, Tata McGraw Hill, India 2008.
3. George Clayton and Steve Winder, “Operational Amplifiers”, 5th Edition Newnes.
4. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill.
5. Bali, “Linear Integrated Circuits”, McGraw Hill 2008.
6. Gray, Hurst, Lewise, Meyer, “Analysis & Design of Analog Integrated Circuits”, Wiley Publications on Education.

BTEXC303 Electronic Devices & Circuits 3 Credits

Prerequisites:

Basic knowledge of Semiconductor Physics.

Course Objectives:

1. To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications
2. To introduce concepts of both positive and negative feedback in electronic circuits
3. To analyze and interpret FET and MOSFET circuits for small signal at low and high frequencies
4. To simulate electronics circuits using computer simulation software and verify desired results
5. To study the different types of voltage regulators.

Course Outcomes:

On completion of the course, students will be able to:

1. Comply and verify parameters after exciting devices by any stated method.
2. Implement circuit and test the performance.
3. Analyze small signal model of FET and MOSFET.
4. Explain behavior of FET at low frequency.
5. Design an adjustable voltage regulator circuits.

UNIT - 1	06 Hours

JFET

Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self).FET as an amplifier and its analysis (CS) and its frequency response, Small signal model, FET as High Impedance circuits

UNIT - 2	06 Hours

MOSFET& its DC Analysis

Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFET configurations: DC Analysis, constant current source biasing, MOSFET as switch, diode/active resistor, Current sink and source, current mirror, Voltage references, Basic principle of band gap reference, CMOS Inverter as amplifier: Active load, Current source and Push pull configurations.

UNIT - 3	06 Hours

Electronics Amplifiers

Classification of amplifiers, Fundamentals of Low noise and Power amplifiers. Feedback amplifiers: Feedback concept and topologies, Effect of feedback on terminal characteristics of amplifiers, feedback amplifier analysis, cascade amplifiers, DC Amplifiers.

UNIT - 4	06 Hours

Oscillators

Barkhausen criterion, stability with feedback. Classification of oscillators, RC Oscillators: FET RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator.

UNIT - 5	06 Hours

Multivibrators

IC555 Block diagram, Types of Multivibrators: Astable, Monostable and Bistable, Operation of Multivibrators using FETs and IC555. Applications of IC555 in Engineering.

UNIT - 6	**06 Hours**

Voltage Regulator

Block diagram of an adjustable three terminal positive and negative regulators (317,337) typical connection diagram, current boosting, Low drop out voltage regulators, Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.

TEXT/REFERENCE BOOKS

1. Millman Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw Hill, 2000
2. Donald Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill
3. Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, "Electronics Devices & Circuits", Synergy Knowledgeware Mumbai, 2017. ISBN:9789383352616
4. David A. Bell, "Electronic Devices and Circuits",5th Edition, Oxford Press
5. R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9thEdition, Prentice Hall of India, 2006.

BTEXC304	**Network Analysis**	**3 Credits**

Course Objectives:

1. To learn about the basic laws of electric circuits as well as the key fundamentals of the communication channels, namely transmission lines.
2. To understand the need of simplification techniques of complicated circuits
3. To learn about the comprehensive insight into the principle techniques available for characterizing circuits, networks and their implementation in practice.
4. To learn about the use of mathematics, need of different transforms and usefulness of differential equations for analysis of networks.
5. To train the students for handling analog filter design through theory of NA along with practical, this is basic requirement of signal processing field.

Course Outcomes:

On completion of the course, students will be able to:

1. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
2. Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters.
3. Identify issues related to transmission of signals, analyze different RLC networks.
4. Find technology recognition for the benefit of the society.

UNIT - 1	06 Hours

Basic Circuit Analysis and Simplification Techniques

Basic circuit elements, Simplification of networks, Equivalent „T‟ and „Π‟ networks of any complicated network, Voltage and Current laws (KVL/KCL), Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Principle of duality, Source transformation and source shifting, Network Theorems such as Superposition, Thevenin‟s, Norton‟s and Maximum Power Transfer Theorems.

***Note**: Above circuit analysis, mentioned in this Unit-1, is for AC network only.*

UNIT - 2	06 Hours

Frequency Selective Networks

Significance of Quality factor, Series Resonance: Resonating frequency, Reactance curves, Variation of circuit parameters such as impedance, phase angle, voltage and current with frequency; Bandwidth, Selectivity, Magnification factor, Parallel resonance: Resonant frequency, Variation circuit parameters such as admittance, phase angle, voltage and current with frequency; Bandwidth and selectivity. Analysis of parallel resonating circuit with resistance present in both branches (inductive and capacitive branches) and tank circuit, Effect of generator resistance on BW & Selectivity, Comparison and applications of series and parallel resonant circuits.

UNIT - 3	06 Hours

Electrical Network Parameters and Passive Filters

Classifications: Symmetrical and Asymmetrical networks. Properties of two port Network :(i) Symmetrical Networks (T and Π only): Characteristics impedance and propagation constant in terms of circuit components, open and short circuit parameters (ii) Asymmetrical

Networks: Image Impedance and Iterative Impedance. Passive Filters: Filter fundamentals, Introduction to Neper and Decibel, Relation between Neper and Decibel, Constant K-LPF, HPF, BPF and BSF, m-derived LPF and HPF, Terminating half sections, Concept of composite filters. Attenuators: Symmetrical T and Π type attenuators, Ladder attenuator.

UNIT - 4 06 Hours

Steady State and Transient Response

DC and AC response of R-L, R-C and RLC circuits, Analysis of electrical circuits using Laplace Transform.

UNIT - 5 06 Hours

Two Port Network Parameters and Functions

Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.

UNIT - 6 06 Hours

Transmission Line Theory

Types of Transmission lines, Transmission Line Equation, Equivalent circuits, Primary and Secondary line constants, Terminations of transmission lines, VSWR and Reflection Coefficient, Impedance matching, Transmission line measurements using Smith chart.

TEXT/REFERENCE BOOKS

1. D Roy Choudary, “Network and Systems” 1st edition, New Age International, 1988
2. John D. Ryder, “Network Lines and Fields” 2nd edition, PHI, 1955
3. C. P. Kuriakose, “Circuit Theory Continuous and Discrete Time System, Elements of Network Synthesis” PHI
4. W.H. Hayt Kemmerly, “Engineering Circuit Analysis”, 5th Edition, Tata McGraw Hill Publications, 1993.
5. M. E. Van Valkenburg, “Network Analysis”, 3rd Edition, Pearson, 2004. 6. Boylestead, “Introductory Circuit Analysis”, 4th edition, Charles & Merrill, 1982. 7. Royal Signal Handbook on Line Communication.

BTEXC305	Digital Logic Design	3 Credits

Course Objectives:

1. To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2. To lay the foundation for further studies in areas such as communication, VHDL, computer.

Course Outcomes:

On completion of the course, students will be able to:

1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design combinational and sequential circuits.
3. Design and implement hardware circuit to test performance and application.
4. Understand the architecture and use of VHDL for basic operations and Simulate using simulation software.

UNIT - 1	06 Hours

Combinational Logic Design

Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don„t care conditions, Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Design of Multiplexers and De-multiplexers, Decoders.

UNIT - 2	06 Hours

Sequential Logic Design

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops. Application of Flip-flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, definitions of lock out, Clock Skew, and Clock jitter.

UNIT - 3 06 Hours

State Machines

Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

UNIT - 4 06 Hours

Digital Logic Families

Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL, Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I^2L and DCTL

UNIT - 5 06 Hours

Programmable Logic Devices and Semiconductor Memories

Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

UNIT - 6 06 Hours

Introduction to VHDL

Behavioral – data flow, and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples, combinational circuit design examples in VHDL and simulation.

TEXT/REFERENCE BOOKS

1. R.P. Jain, ―Modern digital electronics‖, 3rd edition, 12threprint Tata McGraw Hill Publication, 2007.

2. M. Morris Mano, ―Digital Logic and Computer Design‖ 4th edition, Prentice Hall of India, 2013.
3. Anand Kumar, ―Fundamentals of digital circuits‖ 1st edition, Prentice Hall of India, 2001.
4. Pedroni V.A., "Digital Circuit Design with VHDL", Prentice Hall India, 2nd 2001 Edition.

BTHM3401	Basic Human Rights	Audit

Course Objectives:

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency
3. To recognize democratic institutions as a fundamental human right
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture
11. To study the effects of draconian laws and unlawful use of State's machinery and force by the enforcement agencies.

Course Outcomes:

On completion of the course, students will be able to:

1. Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.
2. Strengthen the respect for human rights and fundamental freedoms.
3. Enable all persons to participate effectively in a free society.
4. Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights.
5. Learn about regional, national, state, and local law that reinforces international human rights law.
6. Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights.

UNIT - 1	06 Hours

The Basic Concepts

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

UNIT - 2	06 Hours

Human Rights and Human Duties

Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India‟s Charter of freedom

UNIT - 3	06 Hours

Society, Religion, Culture, and their Inter-Relationship

Impact of Social Structure on Human behavior, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

UNIT - 4	06 Hours

Social Structure and Social Problems

Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged

UNIT - 5 06 Hours

State, Individual Liberty, Freedom and Democracy

The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

UNIT - 6 06 Hours

Human Rights in Indian Constitution and Law

The constitution of India:
(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission.

TEXT/REFERENCE BOOKS

1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005.
2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

BTEXC401 Electrical Machines and Instruments 3 Credits

Course Objectives:

1. Model and Analyze the performance of different types of DC machines
2. Learn the applications of DC generators
3. Analyze the performance of different types of DC motors
4. Analyze the performance of different types of Sensors and Transducers

5. Familiarize with the applications of DC machines
6. To prepare students to perform the analysis of any electromechanical system.
7. To empower students to understand the working of electrical equipment used in everyday life.

Course Outcomes:

On completion of the course, students will be able to:

1. The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
2. The skill to analyze the response of any electrical machine.
3. The ability to troubleshoot the operation of an electrical machine.
4. The ability to select a suitable measuring instrument for a given application.
5. The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument.

UNIT - 1	06 Hours

DC Machines

DC machines construction, working principle (motor & generator), EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), back emf, starters of dc machine, Speed control of DC motor Breaking of DC motor, applications of DC machines (motor and generator).

UNIT - 2	06 Hours

Induction Motor and Synchronous Motor

Induction Motor: Construction, working principle, types, torque equation, torque slip characteristics, power stages, losses and efficiency, starters speed control, breaking, applications. **Synchronous motor:** Construction, working principle, starting methods, effect of load, hunting, V-curve, synchronous condenser, applications.

UNIT - 3	06 Hours

Special Purpose Machines

Construction, working and application of steeper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM.

UNIT - 4	06 Hours

Sensors and Transducers

Classification selection of transducers strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types, interfacing techniques of transducers with microprocessor and controller.

UNIT - 5	06 Hours

Industrial Measurement and Industrial Applications

Measurement of vibration, electrical telemetry thickness, humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, object counter level measurement, on /off timers, RTC, sound level meter, tachometer, VAW meter.

UNIT - 6	06 Hours

I/O Devices

Recorder X- Y plotters and its applications, optical oscillograph.

TEXT/REFERENCE BOOKS

1. A course in Electrical and Electronic Measurement and Instrumentation" by A. K. Sawhney (Publisher name: Dhanpat Rai & Co.)
2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
4. Instrumentation Devices System edition C. S. Rajan, G. R. sharma
5. Abhijit Chakrabarti & Sudipta Debnath, “Electrical Machines”, Tata McGraw-hill Publication.
6. William H Hayt, Jack E Kimmerly and Steven M. Durbin, “Engineering Circuit Analysis”, Tata McGraw Hill.
7. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, “Electrical Machinery”, Tata McGraw-hill Publication 6th Edition.
8. I.J Nagarath & D.P Kothari, “Electrical Machines”, Tata McGraw-hill Publication 4th Edition.

9. T. J. E. Miller, “Brushless permanent-magnet and reluctance motor drives”, Oxford University Press (1989).
10. Ned Mohan, “Electric Machines and Drives”: A first course, Wiley.
11. B. L. Theraja, “Electrical technology” volume 2, S. Chand.

BTEXC402	Analog Communication Engineering	3 Credits

Course Objectives:

1. To introduce the concepts of analog communication systems.
2. To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
3. To understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase)

Course Outcomes:

On completion of the course, students will be able to:

1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Understand the concepts of modulation and demodulation techniques.
3. Design circuits to generate modulated and demodulated wave.
4. Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
5. Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase).
6. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
7. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

UNIT - 1	06 Hours

Introduction to Communication System

Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.

UNIT - 2	06 Hours

Amplitude Modulation

Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator.

Types of AM: DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.

UNIT - 3	06 Hours

Angle Modulation

Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM.

UNIT - 4	06 Hours

Radio Receivers and Demodulators

Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and IFRR, Tracking and Double spotting, TRF, Super heterodyne receivers, RF amplifier, Local oscillator and mixer, IF amplifier, AGC.

UNIT - 5	06 Hours

AM and FM Detectors

AM Detectors: Envelop detector and practical diode detector.

FM Detectors: Slope detector, phase discriminator and ratio detector.

UNIT - 6	06 Hours

Noise

Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature.

TEXT/REFERENCE BOOKS

1. Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition.
2. Anokh Singh, "Principles of communication engineering" S.Chand
3. Roddy & Coolen, "Electronic communication" PHI
4. Taub & Schilling "Principles of communication systems" Tata Mc Graw Hill
5. Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition.
6. Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition.
7. R. G. Gupta, "Audio & Video Systems" Tata McGraw-Hill New Delhi-2008.

BTEXC403 Microprocessor 3 Credits

Course Objectives:

1. Objective of this course is to introduce to the students the fundamentals of microprocessor.
2. After learning Microprocessor course, students will get advantage to pursue higher studies in Embedded Systems or employment in core industries.
3. The learner can design microprocessor based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.
4. The students can design and develop processor which can be used in Robotics, Automobiles, Space and many research areas.
5. The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.
6. The students will get acquainted with recent trends in microprocessor like pipelining, cache memory etc.
7. To understand the applications of Microprocessors.
8. To learn interfacing of real world input and output devices.
9. To study various hardware and software tools for developing applications.

Course Outcomes:

1. Learner gains ability to apply knowledge of engineering in designing different case studies.

2. Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.
3. Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.
4. Students can identify and formulate control and monitoring systems using microprocessors.
5. Students will design cost effective real time system to serve engineering solution for Global, social and economic context.
6. This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation.
7. Learn use of hardware and software tools.
8. Develop interfacing to real world devices.

UNIT - 1	07 Hours

Fundamentals of Microprocessor

Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals.

UNIT - 2	07 Hours

Programming with 8085

Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs.

UNIT - 3	07 Hours

Interrupts

Interrupt structure of 8085 microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts.

UNIT - 4	07 Hours

Interfacing

Memory Interfacing, Interfacing with 8255 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8279 Display controller, Interrupt controller 8259.

UNIT - 5	**07 Hours**

Introduction of 8086 Microprocessor

Detail Architecture of 8086, Addressing Modes, Assembler directives, Co-Processor

TEXT/REFERENCE BOOKS

1. Microprocessor and interfacing 8085, Douglas V Hall, Tata Mc Gram Hill.
2. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
3. Short K. L., "Microprocessors and Programmed Logic", 2nd Ed.,Pearson Education, 2008..
4. D V kodavade, S. Narvadkar, 8085-86 microprocessors Architecture progg and interfaces, wiley.
5. Rout 8085 microcontroller-architecture, programming and application, 2nd edi, penram international.

BTEXC404	**Signals and Systems**	**3 Credits**

Course Objectives:

1. To understand the mathematical description of continuous and discrete time signals and systems.
2. To classify signals into different categories.
3. To analyze Linear Time Invariant (LTI) systems in time and transform domains.
4. To build basics for understanding of courses such as signal processing, control system and communication.
5. To develop basis of probability and random variables.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand mathematical description and representation of continuous and discrete time signals and systems.
2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.

3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

UNIT - 1	06 Hours

Introduction to Signals and Systems

Introduction and Classification of signals: Definition of signal and systems, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power, elementary signals used for testing: exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding, Sampling Theorem and reconstruction of sampled signal, Concept of aliasing, examples on under sampled and over sampled signals.

Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

UNIT - 2	06 Hours

Time domain representation of LTI System

System modeling: Input-output relation, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method, Computation of convolution sum. Properties of convolution, properties of the system based on impulse response, step response in terms of impulse response.

UNIT - 3	06 Hours

Fourier Series

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, FS representation of CT signals using exponential Fourier series, Fourier spectrum representation, properties of Fourier series, Gibbs phenomenon, Discrete Time Fourier Series and its properties.

UNIT - 4	**06 Hours**

Fourier transform

Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, FT of standard periodic CT signals, Introduction to Fourier Transform of DT signals, Properties of CTFT and DTFT, Fourier Transform of periodic signals. Concept of sampling and reconstruction in frequency domain, sampling of bandpass signals.

UNIT - 5	**06 Hours**

Laplace and Z-transform

Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC and its properties, properties of Laplace transform, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, Application of Laplace transforms to the LTI system analysis.

Introduction to Z-transform, and its properties, Inverse Z-transform, different methods of inverse Z-transform, Z-transform for discrete time system LTI analysis.

UNIT - 6	**06 Hours**

Probability and Random Signals

Probability: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, Random variables: Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Definitions: Statistical averages, mean, moments and expectations, standard deviation and variance, Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

TEXT/REFERENCE BOOKS

1. Alan V. *Oppenheim*. Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, PHI
2. Dr. S. L. Nalbalwar, A.M. Kulkarni and S.P. Sheth, “Signals and Systems”, 2nd Edition, Synergy Knowledgeware, 2017
3. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
4. Shaila Apte, “Signals and Systems-principles and applications”, Cambridge University press, 2016.

5. Mrinal Mandal and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
6. Peyton Peebles, “Probability, Random Variable, Random Processes”, 4th Edition, Tata McGraw Hill.
7. A. Nagoor Kanni “Signals and Systems”, 2nd edition, McGraw Hill.
8. NPTEL video lectures on Signals and Systems.

BTID405	**Product Design Engineering**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture-cum-demonstration: 1 hr/week	Continuous Assessment 1: 30 Marks
Design Studio: 2 hr/week	Continuous Assessment 2: 30 Marks
	Final Assessment: 40 Marks

- Pre-requisites: Knowledge of Basic Sciences, Mathematics and Engineering Drawing
- Design Studio : 2 hr/week to develop design sketching and practical skills, learning digital tools
- Continuous Assessment: Progress through a product design and documentation of steps in the selected product design
- Final Assessment: Product Design in Studio with final product specifications

Course Outcomes: At the end of the course, students will be able to

1. Create simple mechanical or other designs
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively with colleagues.

UNIT - 1	04 Hours

Introduction to Engineering Product Design:

Trigger for Product/ Process/ System, Problem solving approach for Product Design, Disassembling existing Product(s) and understanding relationship of components with each other, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failed products, Public/Society"s perception of products, and its input into product design.

UNIT - 2	04 Hours

Ideation:

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or group of individuals, Sketching of products, Market research for need, competitions, scale and cost, Initial specifications of products.

UNIT - 3	04 Hours

Conceptualisation:

Computer operation principles and image editing through a graphical Composition; Computer aided 2D drafting and 3D Modeling through simple exercises.

Designing of components, Drawings of parts and synthesis of a product from its component parts, Rendering the designs for 3-D visualization and to create a photo realistic image, Parametric modelling of product, 3-D Visualization of mechanical products, Detail Engineering drawings of components.

UNIT - 4	04 Hours

Detailing:

Managing assembling, Product specifications- data Sheet, Simple mechanical designs, Workshop safety and health issues, Create documents for knowledge sharing.

Hands-on Activity Charts for Use of Digital Tools

Activity 1	Learn the basic vector sketching tools.	2
Activity 2	General understanding of shading for adding depth to objects. Understanding of editing vectors	2
Activity 3	Begin developing a thought process for using digital sketching.	3
Activity 4	Create a basic shape objects sphere, box cylinders	3
Activity 5	Create Automotive wheel concepts	3
Activity 6	Understanding Navigation and Data Panel Interface	2
Activity 7	Solid and Surface modelling, Rendering 3-D models	4
Activity 8	Product market and Product Specification Sheet	3
Activity 9	Documentation for the product	2

TEXT/REFERENCE BOOKS

1. Model Curriculum for “Product Design Engineer – Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
2. Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw - Hill Higher Education.
3. Green, W., & Jordan, P. W. (Eds.). (1999).Human factors in product design: current practice and future trends. CRC Press.
4. Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design McGRAW- HILL book company.

5. Roozenburg, N. F., &Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc.
6. Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of designs, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design. Rockport Pub.

BTBSC406 Numerical Methods and Computer Programming 3 Credits

Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programmes and to work in research institutes.
2. To understand different numerical techniques used for solving algebraic and transcendental equations.
3. To understand numerical methods to solve a system of linear equations.
4. To understand numerical integration and differentiation techniques.
5. To understand various difference operators and interpolation techniques.
6. To understand object-oriented programming fundamentals and features.
7. To mold students professionally by course contents and sufficient problem solving and programming exercises and to acquaint them with different types of numerical techniques and programming concepts.

Course Outcomes:

On completion of the course, students will be able to:

1. Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem.
2. Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques.
3. Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values.
4. Prepare them to write computer programs for the numerical computational techniques.

5. Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc.
6. Understand procedure-oriented and object oriented programming concepts.
7. Capable of writing C and C++ programs efficiently.

UNIT - 1	06 Hours

Introduction to Computational Methods and Errors

Computational Methods: General principles of computational techniques, Introduction, common ideas and concepts of computational methods, various computational techniques. Errors: Types and sources of errors, Concept in error estimation, Error propagation, Error due to floating point, Representation of errors, Elementary uses of series in calculation of errors.

UNIT - 2	06 Hours

Solution of Transcendental / Polynomial Equations and System of Linear Equation

Solution of Transcendental / Polynomial Equations: Finding root of polynomial equations deploying computational methods such as Bisection, Regula-falsi, Newton-Raphson, Seccant, Successive approximation. System of linear equation: Solving linear equations deploying computational methods such as Gauss elimination, Gauss Jordan, Partial pivoting, Matrix triangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods.

UNIT - 3	06 Hours

Interpolation and Polynomial Approximation

Least square approximation, Orthogonal polynomials Chebyshev polynomials, Finite difference operator and their relations, Forward, backward, central and divided difference, Newton's forward divided difference, Backward difference interpolation, Sterling interpolation, Lagrange"s interpolation polynomials, Spline interpolation, Least square approximation.

UNIT - 4	06 Hours

Numerical Integration and Differentiation

Numerical Integration: Methods based on interpolation such as Trapezoidal rule, Simsons 1/3 and 3/8 rules. Numerical differentiation: Euler's method, Modified Euler's method, Taylor's series, Runge Kutta $2^{nd}$and 4^{th} order, Stability analysis of above methods.

UNIT - 5	06 Hours

Object Oriented Programming

Software Evaluation, Object oriented programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, Object oriented languages, Applications of OOP Beginning with C++: Structure of C++ program, Creating the source file, Compiling & linking, Basic data types, User defined data types, Symbolic constants, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Type cast operator. Functions in C++: Function prototyping, Inline functions, Function overloading, Friend and virtual functions. Classes and Objects: Specifying a class, Defining member functions, C++ program with class, Arrays within a class, Memory allocation for objects, Constructors, Multiple constructor in class, Dynamic initialization of objects, Dynamic constructor, Destructors.

UNIT - 6	06 Hours

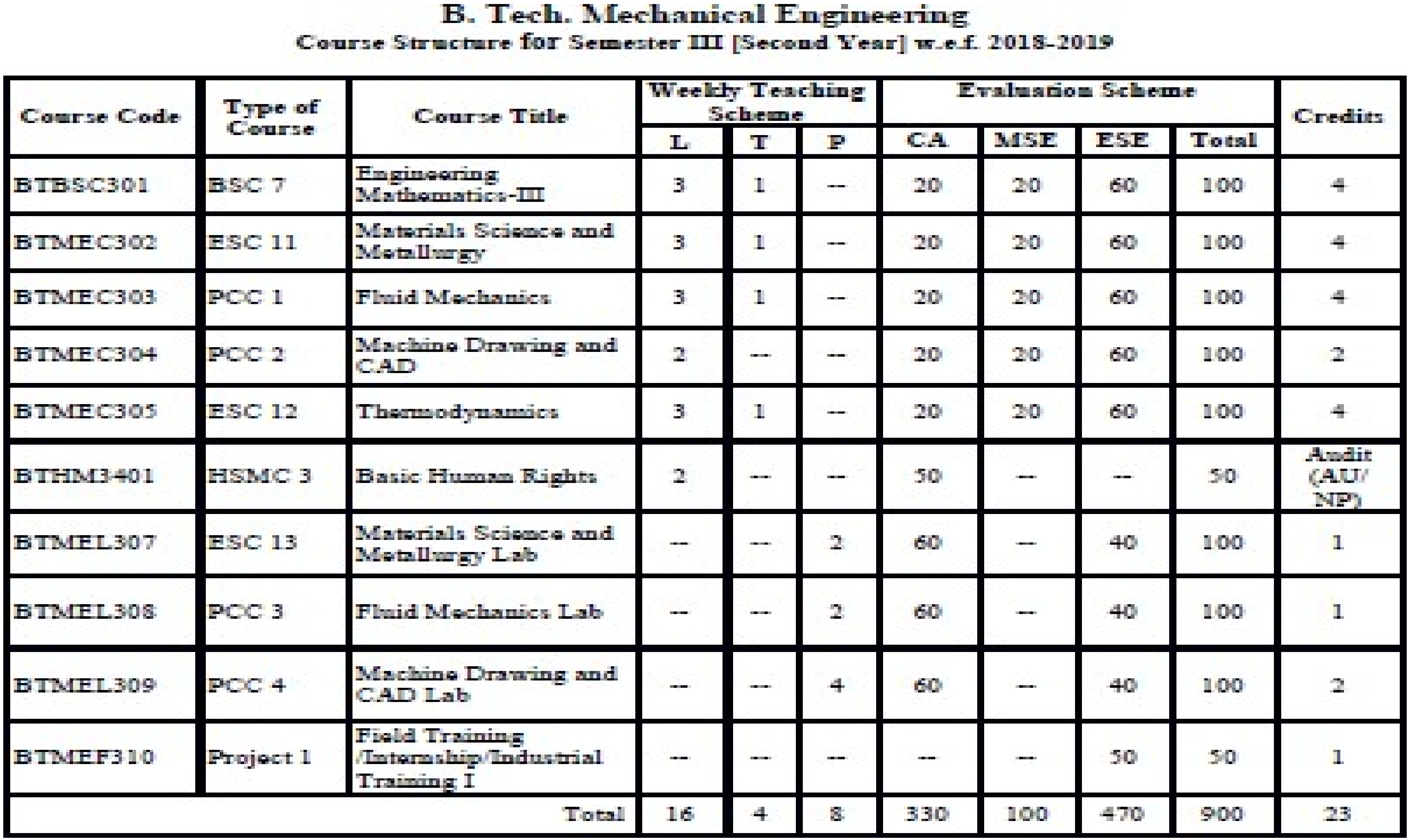
Operator Overloading and Type Conversions

Defining operator overloading, Overloading unary operators, Overloading binary operators, Manipulation of strings operators, Rules for overloading operators. Inheritance: Extending Classes: Defining derived classes, Single inheritance, multilevel inheritance, multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Member classes: Nesting of classes Pointers Virtual Functions and Polymorphism: Pointers to objects, Pointers to derived classes, Virtual functions, pure virtual functions Managing Console I/O Operations C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Managing output with manipulators.

TEXT/REFERENCE BOOKS

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI, 1990, 3rd edition.
2. V. Rajaraman, "Computer Oriented Numerical Methods, PHI, New Delhi", 2000, 3rd Edition.
3. E. V. Krishnamurthy, and Sen S. K., "Numerical Algorithm: Computations in Science and Engg", Affiliated East West, New Delhi, 1996.
4. D. Ravichandran, "Programming with C++", TMH
5. E. Balagurusamy, "Object-Oriented Programming with C++", TMH, New Delhi, 2001,2ndEdition

DBATU-3RD-SEMSETER-SCHEME

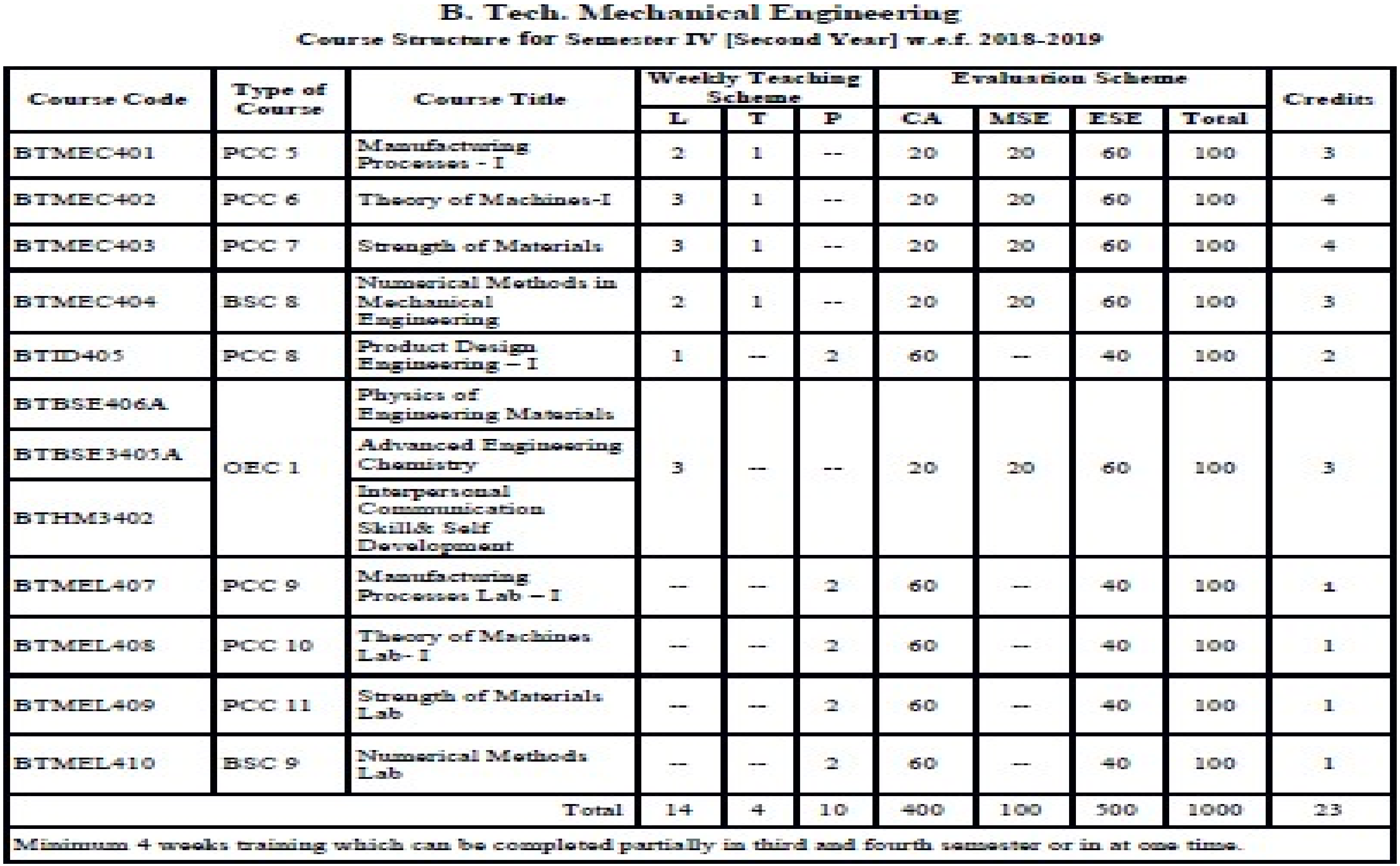


B. Tech. Mechanical Engineering

Course Structure for Semester III [Second Year] w.e.f. 2018-2019

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	CA	MSE	ESE	Total	
BTBSC301	BSC 7	Engineering Mathematics-III	3	1	--	20	20	60	100	4
BTMEC302	ESC 11	Materials Science and Metallurgy	3	1	--	20	20	60	100	4
BTMEC303	PCC 1	Fluid Mechanics	3	1	--	20	20	60	100	4
BTMEC304	PCC 2	Machine Drawing and CAD	2	--	--	20	20	60	100	2
BTMEC305	ESC 12	Thermodynamics	3	1	--	20	20	60	100	4
BTHM3401	HSMC 3	Basic Human Rights	2	--	--	50	--	--	50	Audit (AU/ NP)
BTMEL307	ESC 13	Materials Science and Metallurgy Lab	--	--	2	60	--	40	100	1
BTMEL308	PCC 3	Fluid Mechanics Lab	--	--	2	60	--	40	100	1
BTMEL309	PCC 4	Machine Drawing and CAD Lab	--	--	4	60	--	40	100	2
BTMEF310	Project 1	Field Training /Internship/Industrial Training I	--	--	--	--	--	50	50	1
		Total	16	4	8	330	100	470	900	23

DBATU-4TH -SEMSETER-SCHEME



B. Tech. Mechanical Engineering

Course Structure for Semester IV [Second Year] w.e.f. 2018-2019

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	CA	MSE	ESE	Total	
BTMEC401	PCC 5	Manufacturing Processes - I	2	1	--	20	20	60	100	3
BTMEC402	PCC 6	Theory of Machines-I	3	1	--	20	20	60	100	4
BTMEC403	PCC 7	Strength of Materials	3	1	--	20	20	60	100	4
BTMEC404	BSC 8	Numerical Methods in Mechanical Engineering	2	1	--	20	20	60	100	3
BTID405	PCC 8	Product Design Engineering – I	1	--	2	60	--	40	100	2
BTBSE406A	OEC 1	Physics of Engineering Materials	3	--	--	20	20	60	100	3
BTBSE3405A		Advanced Engineering Chemistry								
BTHM3402		Interpersonal Communication Skill& Self Development								
BTMEL407	PCC 9	Manufacturing Processes Lab – I	--	--	2	60	--	40	100	1
BTMEL408	PCC 10	Theory of Machines Lab- I	--	--	2	60	--	40	100	1
BTMEL409	PCC 11	Strength of Materials Lab	--	--	2	60	--	40	100	1
BTMEL410	BSC 9	Numerical Methods Lab	--	--	2	60	--	40	100	1
		Total	14	4	10	400	100	500	1000	23
Minimum 4 weeks training which can be completed partially in third and fourth semester or in at one time.										

Annexure - B

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

V Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME501T	Industrial Economics and Entrepreneurship Development	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME502T	Design of Machine Elements	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME503T	Advanced Production Processes	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504T	Heat Transfer	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504P	Heat Transfer	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME505T	Mechanical Measurement & Metrology	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME505P	Mechanical Measurement & Metrology	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME506P	Computer Applications – I	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME507P	Industrial Visit	-	-	02	Audit Course									
Total		**15**	**07**	**08**		-	**400**	**100**	**500**	-	**100**	**100**	**200**	-
Semester Total		**30**			**26**	**Marks 700**								

Industrial Economics and Entrepreneurship Development (BEME501T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering.

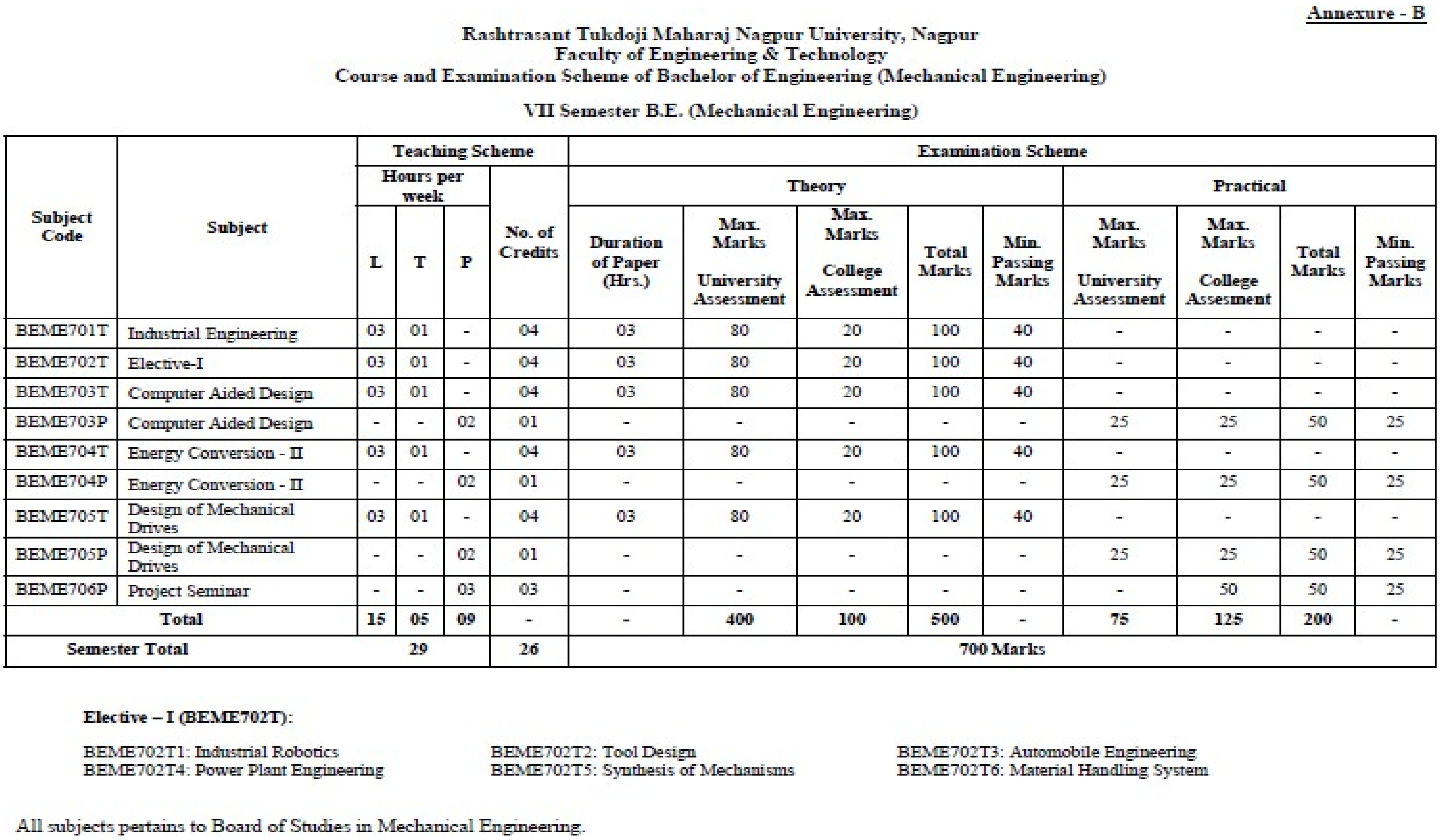
Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VI Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME601T	Energy Conversion- I	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME602T	Control Systems Engineering	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME603T	Operations Research	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604T	Mechatronics	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604P	Mechatronics	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME605T	Dynamics of Machines	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME605P	Dynamics of Machines	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME606T	Functional English	02	-	-	02	02	40	10	50	20	-	-	-	-
BEME607P	Computer Applications - II	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME608P	Industrial Case Study	-	-	02	02	-	-	-	-	-	-	50	50	25
Total		**17**	**07**	**08**	-	-	**440**	**110**	**550**	-	**100**	**150**	**250**	-
Semester Total		**32**			**30**	**800 Marks**								

Functional English (BEME606T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering. Mechatronics (BEME604T/P) subject can also be taught by a teacher from Electronics/Instrumentation/Mechatronics/relevant disciplines.

RTMNU-7TH -SEMSETER-SCHEME



Annexure - B

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VII Semester B.E. (Mechanical Engineering)

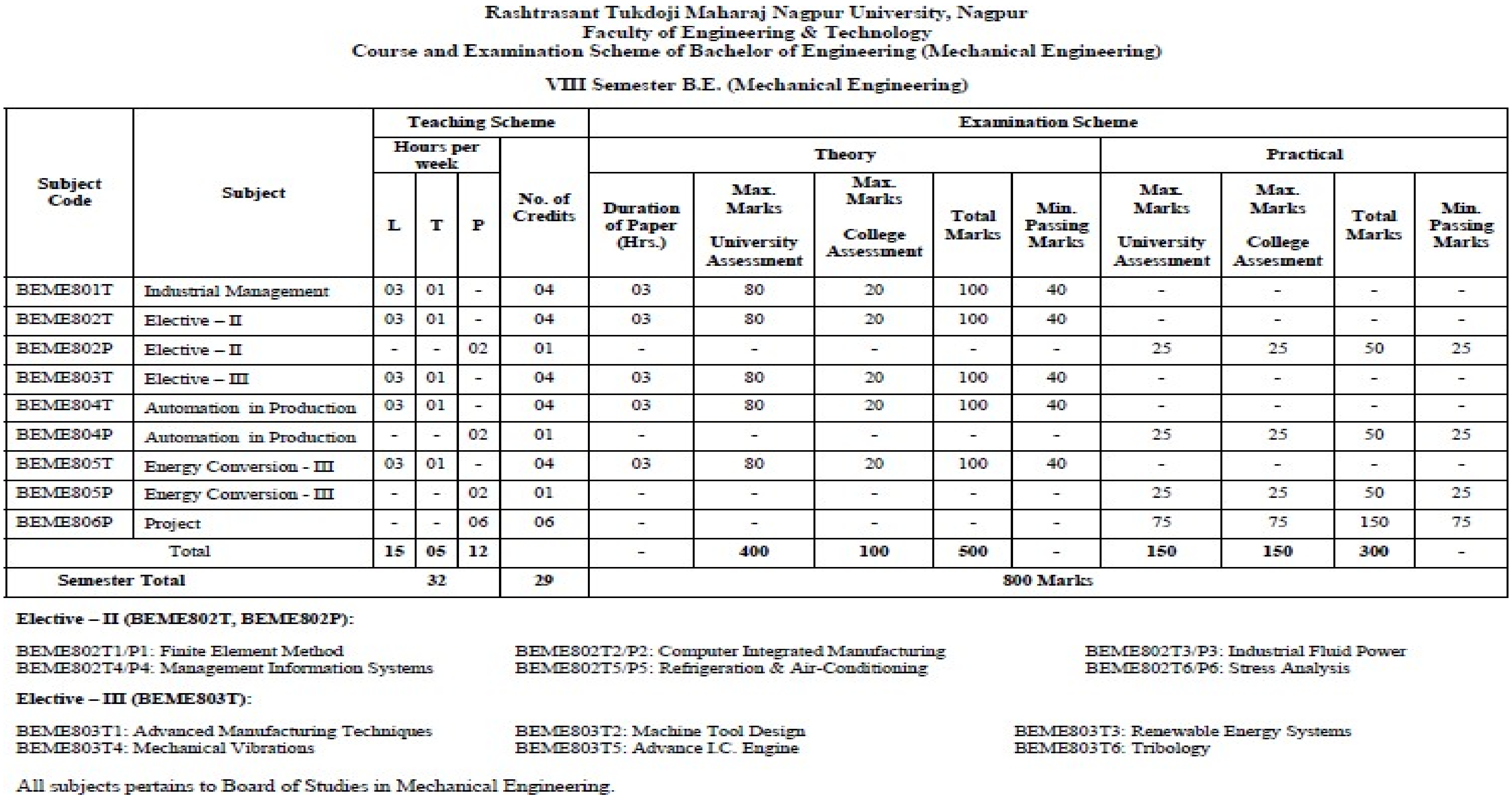
Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME701T	Industrial Engineering	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME702T	Elective-I	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME703T	Computer Aided Design	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME703P	Computer Aided Design	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME704T	Energy Conversion - II	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME704P	Energy Conversion - II	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME705T	Design of Mechanical Drives	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME705P	Design of Mechanical Drives	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME706P	Project Seminar	-	-	03	03	-	-	-	-	-	-	50	50	25
Total		**15**	**05**	**09**	**-**	**-**	**400**	**100**	**500**	**-**	**75**	**125**	**200**	**-**
Semester Total		**29**			**26**	**700 Marks**								

Elective – I (BEME702T):

BEME702T1: Industrial Robotics
BEME702T4: Power Plant Engineering
BEME702T2: Tool Design
BEME702T5: Synthesis of Mechanisms
BEME702T3: Automobile Engineering
BEME702T6: Material Handling System

All subjects pertains to Board of Studies in Mechanical Engineering.

RTMNU-8TH -SEMSETER-SCHEME



Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VIII Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME801T	Industrial Management	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME802T	Elective – II	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME802P	Elective – II	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME803T	Elective – III	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME804T	Automation in Production	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME804P	Automation in Production	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME805T	Energy Conversion - III	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME805P	Energy Conversion - III	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME806P	Project	-	-	06	06	-	-	-	-	-	75	75	150	75
Total		15	05	12		-	400	100	500	-	150	150	300	-
Semester Total		32			29	800 Marks								

Elective – II (BEME802T, BEME802P):

BEME802T1/P1: Finite Element Method
BEME802T2/P2: Computer Integrated Manufacturing
BEME802T3/P3: Industrial Fluid Power
BEME802T4/P4: Management Information Systems
BEME802T5/P5: Refrigeration & Air-Conditioning
BEME802T6/P6: Stress Analysis

Elective – III (BEME803T):

BEME803T1: Advanced Manufacturing Techniques
BEME803T2: Machine Tool Design
BEME803T3: Renewable Energy Systems
BEME803T4: Mechanical Vibrations
BEME803T5: Advance I.C. Engine
BEME803T6: Tribology

All subjects pertains to Board of Studies in Mechanical Engineering.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin- 402 103, Maharashtra
Telephone and Fax. : 02140 - 275142
www.dbatu.ac.in

Detailed Syllabus
for
Second Year, Third Year and Final Year
B. Tech. Programme in Information Technology

Effective from
Academic Year 2018-19
Approved in the 11th meeting of Academic Council dated 8th June, 2018

Teaching and Evaluation Scheme Second Year B. Tech. (Information Technology)

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
		Semester III								
1	BTBSC301	Engineering Mathematics III	3	1	-	20	20	60	4	4
2	BTESC302	Switching Theory and Logic Design	2	1	-	20	20	60	3	3
3	BTITC303	Object Oriented Paradigm with C++	2	1	-	20	20	60	3	3
4	BTCOC304	Computer Architecture and Organization	2	1	-	20	20	60	3	3
5	BTBSCOE305A BTHSMCOE305B BTITOE305C BTITOE305D	**Elective I** A) Advanced Engineering Chemistry B) Interpersonal Communication Skills and Self Development for Engineers C) Programming in Java D) Introduction to Web Technology	1	1	-	20	20	60	2	2
6	BTHM306	Basic Human Rights	2	-	-	-	50	-	Audit	2
7	BTESCL307	Switching Theory and Logic Design Lab	-	-	2	-	60	40	1	2
8	BTITL308	Object Oriented Paradigm with C++ Lab	-	-	4	-	60	40	2	4
9	BTITL309	Programming Lab (Python)	-	-	4	-	60	40	2	4
10	BTITOEL310	**Elective I Lab** A) Advanced Engineering Chemistry Lab B) Interpersonal Communication Skills and Self Development for Engineers Lab C) Programming in Java Lab D) Introduction to Web Technology Lab	-	-	2	-	60	40	1	2
11	BTITF311	Field Training / Internship/Industrial Training Evaluation	-	-	-	-	-	100	1	-
		Total	**12**	**5**	**12**	**100**	**390**	**560**	**22**	**29**
		Semester IV								
1	BTITC401	Microprocessors and Microcontrollers	2	1	-	20	20	60	3	3
2	BTITC402	Data Structures and Applications	3	1	-	20	20	60	4	4
3	BTITC403	Discrete Structures and Applications	2	1	-	20	20	60	3	3
4	BTITC404	Internetworking Protocols	2	1	-	20	20	60	3	3
5	BTBSCOE405A BTHMOE405B BTXXOE405C	**Elective II** A) Physics of Engineering Materials B) Organizational Behavior C) Development Engineering	2	1	-	20	20	60	3	3
6	BTXX406	Product Design Engineering	2	-	-	20	20	60	2	2
7	BTITL407	Microprocessors and Micro-controllers Lab	-	-	2	-	60	40	1	2
8	BTITL408	Data Structures and Applications Lab	-	-	4	-	60	40	2	4
9	BTITL409	Internetworking Protocols Lab	-	-	2	-	60	40	1	2
10	BTITF410	Field Training / Internship/Industrial Training (minimum 4 weeks which can be completed partially in third semester and fourth semester or at one time.)						100	To be evaluated in V Semester	-
		Total	**13**	**5**	**8**	**120**	**300**	**580**	**22**	**26**

Programme Objectives:

The program educational objectives for the B. Tech. programme in Information Technology describes accomplishments that graduates are expected to attain within the four years of graduation. Graduates will be able to apply their expertise to contemporary problem solving, be engaged professionally, and have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives are:

1. PEO1: To enable graduates gain strong skills for employment in multidisciplinary domains driven by IT
2. PEO2: To enable graduates to pursue higher education and research
3. PEO3: To enable graduates to develop entrepreneurship and leadership skills
4. PEO4: To enable graduates to contribute to the society in accordance with highest standards of ethics
5. PEO5: To develop breakthrough solutions enabling transformations in a rapidly changing IT world

Programme Outcomes:

The graduates of this programme will be able to demonstrate:

1. PO1: An Understanding of IT architecture, software and hardware concepts, functionalities and applications
2. PO2: An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages
3. PO3: Competency of business domains and functional processes that employ IT systems and applications
4. PO4: Practical use of communication protocols and their applications in the field of Internet and World Wide Web
5. PO5: Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century
6. PO6: An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains
7. PO7: Thought leadership to design and implement practical solutions for global industry needs.
8. PO8: Acumen to embrace and adopt futuristic IT technological developments
9. PO9: Sound knowledge of entrepreneurship traits to succeed
10. PO10: Adoption of practices that are ethical ensuring transparency and accountability
11. PO11: Capability to provide solutions that are socially empowering and environment friendly
12. PO12: Effective communication and collaboration techniques with stakeholders to achieve best results

Course Title:	**Engineering Mathematics – III**	**Semester III**	
Course Code	**BTBSC301**	**Course Type**	**Compulsory**
Prerequisite	**MATH201**	**L – T – P**	**3 – 1 – 0**
Stream	**Basic Science**	**Credits**	**4**

Course Objectives:

1. To provide in depth knowledge of complex numbers
2. To find the solution of differential equations
3. To find an in-depth knowledge of Fourier series analysis of periodic function

Course Outcomes:

After learning the course the students should be able:

1. To develop an ability to use characteristics of complex numbers in problem pertaining to electric circuits
2. To develop an acquaintance with the method of finding solution of differential equations
3. To develop an in depth knowledge of vector differentiation and vector integration
4. To develop Fourier series expansion of different periodic functions

Course Content:

UNIT I

Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT II

Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT III

Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms.

UNIT IV

Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}\right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$).

UNIT V

Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

UNIT VI

Functions of Complex Variables (Integral calculus)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books:

1. B. S. Grewal, ***"Higher Engineering Mathematics"***, Khanna Publishers, New Delhi.
2. H. K. Das, Er. RajnishVerma, ***"Higher Engineering Mathematics"***, S. Chand & CO. Pvt. Ltd., New Delhi.
3. Dr. B. B. Singh, **"A course in Engineering Mathematics (Volume-III)"**, Synergy Knowledge ware, Mumbai.
4. B. V. Ramana, ***"Higher Engineering Mathematics"***, Tata McGraw-Hill Publications, New Delhi.

Reference Books:

1. Erwin Kreyszig, ***"Advanced Engineering Mathematics"***, John Wiley & Sons, New York.
2. Peter O' Neil, ***"A Text Book of Engineering Mathematics"***, Thomson Asia Pvt. Ltd., Singapore.
3. C. R. Wylie, L. C. Barrett, ***"Advanced Engineering Mathematics"***, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. C. R. Wylie & L. C. Barrett, ***"Integral Transforms and their Engineering Applications"***, Synergy Knowledge ware, Mumbai.
5. I. N. Sneddon, ***"Integral Transforms"***, Tata McGraw-Hill, New York.

General Instructions:

1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

Course Title:	**Switching Theory and Logic Design**	**Semester III**	
Course Code	**BTESC302**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn numbering systems used in digital world and its representation, arithmetic operations, error detection and correction methods.
2. To learn Boolean algebra, logic gates, logic families, realization of Boolean expressions and minimization techniques.
3. To study the sequential logic circuits design used in synchronous and asynchronous modes.
4. To describe various programmable logic devices.

Course Outcomes:

After learning the course the students should be able to:

1. Illustrate theory of Boolean algebra and the underlying features of various numbering systems.
2. Design various combinational & sequential logic circuits.
3. Demonstrate working of flip-flop.

Course Content:

UNIT I

Number Systems and Codes: Number systems: Binary, Octal, Hexadecimal number systems, Binary arithmetic, Codes: Binary code, Excess-3 code, Gray code, Error detection and correction codes.

UNIT II

Boolean algebra and Logic Functions: Boolean algebra: Postulates and theorems, Logic functions, Minimization of Boolean functions using algebra, Karnaugh map and Quine – McClusky methods, Realization using logic gates.

UNIT III

Classification of logic families, Characteristics of digital ICs- Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements, TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs, Tri-State logic, CMOS logic, CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output, Interfacing CMOS and TTL.

UNIT IV

Combinational Functions: Realizing logical expressions using different logic gates, Design of combinational circuits using combinational IC’s, Realization of adders and subtractors, Design of code converters, Comparators and decoders, Design of multiplexers, Demultiplexers.

UNIT V

Introduction to Sequential Circuits: Moore and mealy machines, Introduction to flip-flops like SR, JK, D and T with truth tables, Logic diagrams and timing relationships, Conversion of flip-flops, Excitation table, State tables, Realization of state stables.

UNIT VI

Programmable Logic Devices: Semiconductor memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM, PLA, PAL, Memory System design.

Text Books:

1. M. M. Mano, ***“Digital Logic and Computer Design”***, Prentice Hall of India Publication, 4th Edition, 2006.
2. R.P. Jain, ***“Modern Digital Electronics”***, Tata McGraw Hill Publication, 4th Edition, 2010.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, ***“Digital Principles and Applications”***, Tata McGraw Hill Publication, 8th Edition, 1993.
2. Comer, ***“Digital Logic & State Machine Design”***, Oxford Universities Press, 3rd Edition, 2014.

Course Title:	**Object Oriented Paradigm with C++**	**Semester III**	
Course Code	**BTITC303**	**Course Type**	**Compulsory**
Prerequisite	**ICT106**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. This course focuses on principles of object oriented programming paradigm. The course also includes practice of writing programs in C++ and Java

Course Outcomes:

After learning the course, the students should be able:

1. To draw the control flow of a program.
2. To understand the storage concepts in a simple program.
3. To program using basic concepts of OO languages i.e. objects, encapsulation, data hiding etc.
4. To program using advanced concepts of OO languages i.e. associations, packages, interfaces, exception handling etc.
5. To work with functional, Logic programming paradigms.

Course Content:

UNIT I

Elements of computer systems, DOS commands and Linux environment, Language processors, Algorithms, Flowcharts, Object-Oriented Programming Paradigm: Benefits, Applications, Object-Oriented Systems Development, Object-Oriented Analysis: Static and dynamic modeling, Object-Oriented Design: Class design and algorithm.

UNIT II

Beginning with C++: Tokens, Data types, Operators, Expressions, and Control structures, Array, Functions, Structures and Unions, Class and Objects, specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions.

UNIT III

Constructors and Destructors: Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructor. Programming for class diagram and relationship.

UNIT IV

Inheritance: Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.

UNIT V

Polymorphism: Operator overloading, Function overloading, Virtual functions, pure virtual functions, Abstract class, Working with Files: Classes for file stream operations and I/O stream operation, Opening and closing a file, Detecting end-of-file, More about Open(): File Modes, Sequential input and output operations.

UNIT VI

Exception Handling: Fundamentals, Types of exceptions, Catching exceptions, Multiple catching, Nested try statements, Uncaught exceptions, Throw and throws, Built-in exceptions, Creating exception subclasses, Using exceptions.

Text Books:

1. Robert Lafore, ***"Object Oriented Programming in C++"***, Pearson Education, 4th Edition, 2008.
2. E. Balagurusamy, ***"Object Oriented Programming with C++"***, Tata McGraw Hill Publication, 6th Edition, 2013.

Reference Books:

1. J. R. Hubbard, ***"Programming with C++: Schaum's Outlines"***, Tata McGraw-Hill publication, 2005.
2. P. J. Deitel, H.M.Deitel, ***"C++ How to Program"***, Pearson Education, 9th Edition, 2016.

Course Title:	**Computer Architecture and Organization**	**Semester III**	
Course Code	**BTCOC304**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand the structure, functions and characteristics of computer systems.
2. To learn basics of Parallel Computer Architecture.
3. To study hierarchical memory system including cache memories and virtual memory.
4. To identify input / output devices and their data transfer mechanism.

Course Outcomes:

After learning the course, the students should be able:

1. To identify components of a computer system, including CPU, memory, and input/output units.
2. To explain instruction types, its execution and interrupt mechanism.
3. To illustrate numerical and character representations in digital logic and floating point arithmetic.

Course Content:

UNIT I

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

UNIT II

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

UNIT III

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

UNIT IV

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems, External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

UNIT V

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

UNIT VI

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface.

Instruction pipe-lining: Concepts, Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Text Books:

1. William Stalling, ***"Computer Organization and Architecture: Designing for Performance"***, 8th Edition, Prentice Hall Publication, 2009.
2. Hayes, ***"Computer Architecture and Organization"***, 3rd Edition, McGraw-Hill Publication, 2012.
3. Zaky, ***"Computer Organization"***, 5th Edition, McGraw-Hill Publication, 2011.

Reference Books:

1. Morgan and Hennessy and Patterson, ***"Computer Architecture: A Quantitative Approach"***, 4th Edition, Kaufman Publication, 2007.
2. Morris Mano, ***"Computer System Architecture"***, 3rd Edition, Pearson Education India, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, ***"Fundamentals of Computer Organization and Architecture"***, 1st Edition, Wiley Publication, 2004.
4. Miles J. Murdocca, Vincent P. Heuring, ***"Computer Architecture and Organization: An Integrated Approach"***, 1st Edition, Wiley Publication, 2007.

Course Title:	**Advanced Engineering Chemistry**	**Semester III**	
Course Code	**BTBSCOE305A**	**Course Type**	**Elective**
Prerequisite	**CHM103**	**L – T – P**	**1 – 1 – 0**
Stream	**Basic Science**	**Credits**	**2**

Course Objectives:

1. To introduce this subject of Advanced Engineering Chemistry.
2. To impart the basic and advanced knowledge to the students.
3. To understand, remember and capable to explain and apply this knowledge in the field of Engineering/ Technology.

Course Outcomes:

After learning the course, the students should be able:

1. To classify and explain various types of Corrosion and should apply methods to minimize the rate of Corrosion.
2. To apply concepts of Photochemical and Thermal reactions.
3. To explain basic concepts of Polymers, Polymerization.
4. To determine molecular weight of High-Polymer.
5. To apply the basic techniques in Chemistry and capable to explain concept of Solvent Extraction.
6. To explain concept of Thermo Gravimetric Analysis (TGA).

Course Content:

UNIT I

Corrosion and its Control:

Introduction, Fundamental reason, Electrochemical Corrosion, Direct Chemical Corrosion, Factors affecting the rate of corrosion, types of corrosion-Galvanic, Pitting Corrosion, Stress corrosion, methods to minimize the corrosion- Proper design, Cathodic and Anodic protection.

UNIT II

Photochemical and Thermal Reactions

Introduction, Laws of Photochemistry, Measurement of absorbed intensity, Quantum yield or efficiency, Jablonski Diagram, Photosynthesis reaction of Hydrogen Bromide, Brief discussion on Thermal Reactions- Cope Rearrangement.

UNIT III

Polymers

Introduction, Nomenclature of polymers, types of polymerisation, molecular weight determination by osmotic pressure and viscosity method. Plastic and its classification, Constituents of Plastic, Moulding of plastic by Injection method.

UNIT IV

Reaction Mechanism and Reaction Intermediates

Introduction of reaction mechanism, Brief introduction of reactivity of substrate (Inductive effect, Mesomeric effect, Electromeric Effect, Hyperconjugative effect), Bond fission: Homolytic and Heterolytic bond fission, Reaction Intermediates: Carbocation(Structure, Stability and applications), Carbanion (Structure, Stability and applications).

Rearrangement reactions:

Intramolecular Rearrangement: Isomerisation, Beckmann Rearrangement, Benzidine Rearrangement
Intermolecular Rearrangement: Orton Rearrangement, Diazoamino Rearrangement

UNIT V

Spectroscopy

Brief introduction to spectroscopy, UV – Visible Spectroscopy: Laws of absorption, instrumentation and application. IR spectroscopy: introduction, theory, instrumentation and application. Brief discussion on NMR Spectroscopy, AAS (Atomic Absorption Spectroscopy)

UNIT VI

Instrumental Methods of Analysis

Introduction to Chromatography, Types of Chromatography (Adsorption and partition chromatography), Thin Layer Chromatography, Gas Chromatography – introduction, theory, instrumentation. Brief discussion of Thermo gravimetric analysis (TGA).

Text Books:

1. Bhal and Bhal, ***“Advance Organic Chemistry”***, S. Chand & Company, New Delhi, 1995.
2. Jain P.C & Jain Monica, ***“Engineering Chemistry”***, Dhanpat Rai & Sons, New Delhi, 1992.
3. Bhal & Tuli, ***“Text book of Physical Chemistry”,*** S. Chand & Company, New Delhi, 1995.
4. Chatwal Anand, **“Instrumental Methods of Analysis”**, Himalaya Publication.
5. Rakesh K. Parashar, V.K. Ahluwalia, “***Text Book of Organic Chemistry***”.

Reference Books:

1. Finar I.L., ***“Organic Chemistry (Vol. I & II)”***, Longman Gr. Ltd & English Language Book Society, London.
2. Barrow G.M., ***“Physical Chemistry”***, McGraw-Hill Publication, New Delhi.
3. Shikha Agarwal, ***“Engineering Chemistry- Fundamentals and Applications”***, Cambridge Publishers, 2015.
4. O. G. Palanna, ***“Engineering Chemistry”***, Tata McGraw-Hill Publication, New Delhi.
5. WILEY, ***“Engineering Chemistry”***, Wiley India, New Delhi, 2014.
6. Willard, Dean, Merrit, ***“Instrumental Methods of Analysis”***, McGraw - Hill.
7. Glasstone, ***“Physical Chemistry”***.
8. Peter Atkins, ***“Physical Chemistry”***, W.H. Freeman & Co. 9th Edition, 2009.

Course Title:	**Interpersonal Communication Skills and Self Development for Engineers**	**Semester III**	
Course Code	**BTHSMCOE305B**	**Course Type**	**Elective**
Prerequisite	**HS202**	**L – T – P**	**1 – 1 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**2**

Course Objectives:

1. To build the skills like team building so that they can work efficiently in groups.
2. To provide knowledge of conflict management while working in large organizations.
3. To develop management skills required in routine work environment.
4. To polish the personality of the learners in order to make them good leaders and employees.

Course Outcomes:

1. Learners will acquire interpersonal communication skills.
2. Learners will develop the ability to work independently.
3. Learners will develop the qualities like self-discipline, self-criticism and self-management.
4. Learners will have the qualities of time management and discipline.

UNIT I

Development of Proficiency in English

Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws & 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis

UNIT II

Self Management

Self Management, Self Evaluation, Self discipline, Self criticism, Recognition of one’s own limits and deficiencies, dependency, etc.

Self Awareness, Self Management, Identifying one’s strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride,- Leadership & Team Dynamics

UNIT III

Time Management Techniques

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time.

UNIT IV

Motivation/ Inspiration

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation,

Motivation techniques: Motivation techniques based on needs and field situations

UNIT V

Interpersonal Skills Development

Positive Relationship, Positive Attitudes, Empathies: comprehending others' opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

UNIT VI

Effective Computing Skills

Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference books:

1. Mitra, Barun, ***"Personality Development and Soft Skills"***, Oxford University Press, 2016.
2. Ramesh, Gopalswamy, ***"The Ace of Soft Skills: Attitude, Communication and Etiquette for Success"***, Pearson Education, 2013.
3. Covey, Stephen R., ***"Seven Habits of Highly Effective People: Powerful Lessons in Personal Change"***.
4. Osenberg Marshall B., ***"Nonviolent Communication: A Language of Life"***.

Course Title:	**Programming in Java**	**Semester III**	
Course Code	**BTITOE305C**	**Course Type**	**Elective**
Prerequisite	**ICT106**	**L – T – P**	**1 – 1 – 0**
Stream	**Professional Core**	**Credits**	**2**

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

After learning the course, the students should be able to:

1. Know the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies.
3. Develop software in the Java programming language (application).

UNIT I

Introduction to Java

Fundamentals of Object-oriented Programming, Evolution of Java, Overview of Java Language: Data types in Java, Operators and expressions, Decision Making and Branching: Control Statements such as If Else, Do statement, For statement, The Else if ladder, Jumps in loops, Labelled loops, While repetition statement, Switch statement, Break and continue statement, Arrays, Strings and Vectors: Creating one dimensional and multidimensional array, Strings, Vectors, Wrapper classes, Enumerated types, Annotations.

UNIT II

Object Oriented Programming

Classes , Objects And Methods: Defining class , Methods, Creating objects , Accessing Class members, Static Methods , Finalize Methods, Visibility Control, Method overloading, Method Overriding, Recursion. Interfaces, Constructors and finalizes Methods.

UNIT III

Packages and Applet Programming

Java API Packages, Using System Packages, Naming conventions, Creating Packages and Jar Files, Accessing and using a package, Hiding Classes, Applet Programming.

UNIT IV

Multithreading

Creating threads, Extending Thread Class, Stopping and Blocking a thread, Life cycle of a thread, Using thread method, Thread exceptions, Implementing the Run able interface, Interthread communication.

Managing Errors and Exceptions: Types of errors, Exceptions, Syntax of exception handling code, Multiple catch statements, Throwing your own exception, Using exceptions for debugging.

UNIT V

Graphics Programming

The Graphics class, Lines and Rectangles, Circles, Arc and ellipses, Polygons, Drawing Bar charts, AWT Package and Swings.

UNIT VI

Managing Files & I/O Handling

Files and Streams, Stream classes, Byte Stream Classes , Character Stream Classes, Using Streams, Reading / writing bytes and characters , Interactive Input and Output, Other Stream classes.

Text Books

1. E. Balagurusamy, ***“Programming with Java – A Primer”***, Tata – McGraw-Hill Publication, 4th Edition, 2010.
2. Steven Holzner et al. ***“Java 2 Programming”***, Black Book, Dreamtech Press, 2009.

Reference Books

1. H.M. Deitel, P.J. Deitel, ***“Java - How to Program”***, PHI Publication, 6th Edition, 2005.
2. Bruce Eckel, ***“Thinking in Java”***, PHI Publication.
3. Patric Naughton, Michael Morrison, ***“The Java Handbook”***, McGraw Hill Publication.
4. Tim Lindholm, Frank Yellin, Bill Joy, Kathi Walrath, ***“The Java Virtual Machine Specification”***, Addison Wesley Publication.

Course Title:	**Introduction to Web Technology**	**Semester III**	
Course Code	**BTITOE305D**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**1 – 1– 0**
Stream	**Professional Core**	**Credits**	**2**

Course Objectives:

1. Overview of modern Web technologies.
2. To use different web scripting technology.
3. To understand web hosting, server type, debugging, and performance driven application development.
4. To understand user interface and awareness of real-world knowledge.

Course Outcomes:

1. To understand World Wide Web and latest trends in web-development.
2. Real world knowledge of design and development.
3. Design and development of web application with all industrial standards.
4. Awareness of web hosting, server type, debugging.

UNIT I

Introduction to World Wide Web, Features of web, HTTP, Web Servers, Introduction to Scripting Language, Browser, Integrated Development Environment.

UNIT II

HTML: Introduction to HTML, Basics of HTML, Formatting and fonts, Commenting code, HTML heading, Block element, Inline element, Comment, Attributes, Hyperlink, Lists, Tables, Images, Forms, Meta tags, Character entities, Frames sets.

UNIT III

Advance HTML: Overview and features of HTML5, Includes External File, Responsive Layout with Media Queries, Marquee, Semantic Tags, HTML Symbol, URL Encode, Cashing, Video Tags, Audio Tags, Image Maps.

UNIT IV

CSS: Introduction To CSS, Selector, Basic Syntax And Structure, Padding, Margin, Manipulating Texts, Display, Height, Width, Border, Color, Fonts, Positioning Using CSS, Overview And Features Of CSS3.

UNIT V

PHP: Introduction to PHP, Features of PHP, Basics of PHP, Syntax, Variable, Printing Output, Array, String, Function, Data types, Operator, Loops, Conditional Statement, Introduction To Advance PHP, Form Processing, Files, PHP Cookies, PHP Sessions, Constant, PHP Magic Function, PHP Global Variable, Error Handling, Exception, Connection with Database, Curd Operation in PHP.

UNIT VI

Web Hosting, Debugging and Unit Testing, Browser Compatibility.

Text Book

1. Snehal Joglekar, ***“HTML and CSS- Web Technologies”***, Nirali Prakashan, 2013.

Reference Books

1. Thomas Powell, ***“HTML & CSS: The Complete Reference”***, 5th Edition, McGraw Hill Publication.
2. Steven Holzner, ***“PHP: The Complete Reference”***, 1st Edition, McGraw Hill Publication.

Course Title:	**Basic Human Rights**	**Semester III**	
Course Code	**BTHM306**	**Course Type**	**Audit**
Prerequisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**Audit**

Course Objectives:

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency.
3. To recognize democratic institutions as a fundamental human right.
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur.
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights.
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture.
11. To study the effect of draconian laws and unlawful use of State’s machinery and force by the enforcement agencies.

Course Outcomes:

After learning the course, the students should be able to:

1. Appreciate the importance of the values of human rights.
2. Strengthen respect for human rights and fundamental freedoms and respect others caste, religion, region and culture.
3. Know about regional, national, state, and local law that reinforces international human rights law.
4. Understand being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights.
5. Be aware of rights as Indian citizen.
6. Understand the importance of groups and communities in the society.
7. Realize the philosophical and cultural basis and historical perspectives of human rights.
8. Make students aware of their responsibilities towards the nation.

Course Content:

UNIT I

Introduction: Magna Carta, English bill of rights, American/French declaration, Universal declaration of human rights: Background, Content and relevance, Theories/Justification/Perspectives on Human Rights, Natural, Moral, Legal and human rights, Natural rights, Positivist, Liberal, Marxist, Feminist, Asian perspectives.

UNIT II

Debates: Universality of rights, Rights vs. duties, Individual vs. group rights, Civil and political rights vs. social, The notion of rights in various religious traditions (Hindu, Muslim, Buddhist traditions), Western Influence (especially the impact of the British rule), National freedom movement, The roles of Gandhi, Ambedkar and Nehru.

UNIT III

Constitutional provisions (especially fundamental rights vs. directive principles of state policy and emergency), Intergovernmental Organization, The United Nations (study of specific UN agencies related to human rights), Regional instruments.

UNIT IV

International NGO - Amnesty international: It’s working and impact on India, Case studies of selected national NGOs, Case studies of selected regional NGOs, The government: Role of some of its agencies including the army, Police and paramilitary forces.

UNIT V

National Human Rights Commission of India - Background, Structure and functioning, International humanitarian law, International refugee law, The judiciary including public interest litigation, The medical profession and human rights, The role of the media in human rights.

UNIT VI

Some Issues in Human Rights : Violence and terrorism, Women’s rights, Child rights, Dalit rights, Minority rights, Tribal rights, Refugee rights, Capital punishment, Euthanasia, Rights of the elderly, Gay Rights.

Text Books

1. D. D. Basu, V. R. Manohar, B. P. Banerjee, S.A. Khan, ***“Introduction to the Constitution of India”***, 20th Edition, Lexis Nexis Butterworths publication, 2008.
2. A. R. Desai, ***“Violation of Democratic Rights in India”***, Bombay Popular Prakashan.

Reference Books:

1. M. Mohanty, P. N. Mukherji, O. Tornquist, ***“People’s Rights: Social Movements and the State in the Third World”***, New Delhi, Sage Publications, 1998.
2. Nanda, P. Ved, J. R. Scarritt, G. W. Shepherd, ***“Global Human Rights: Public Policies Comparative Measures and NGO Strategies”***, Boulder Westview Press Inc., 1981.
3. Nirmal, J. Chiranjivi, ***“Human Rights in India: Historical, Social and Political Perspectives”***, New Delhi, Oxford University Press, 2000.
4. Kothari, Smitu, Harsh Sethi, ***“Rethinking Human Rights: Challenges for Theory and Action”***, Lokayan, Delhi, 1991.
5. A. J. M. Milne, ***“Human Rights and Human Diversity: An Essay in the Philosophy of Human Rights”***, New York State University of New York Press, 1986.

Course Title:	**Switching Theory and Logic Design Lab**	**Semester III**	
Course Code	**BTESCL307**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. Implement Flip-Flops, Multiplexer and De-multiplexer, Counters and arithmetic operations

Lab Experiments List:

1. Study of basic and Universal gates
2. Implementation of Boolean functions using Gates
3. Implementation of following code conversions:
    a) Binary to gray
    b) Gray to binary
    c) Excess –3 to BCD
    d) BCD to Excess –3.
4. Implementation of half adder, full adder
5. Implementation of half subtractor, full subtractor
6. Implementation of K-map examples
7. Implementation of Quine- McClusky examples
8. Implementation of Multiplexer and Demultiplexer
9. Implementation of BCD adder using 4 bit adder IC
10. Study of flip flops:
    a) RS flip-flop
    b) D flip-flop
    c) T flip-flop
    d) J-K flip-flop

Course Title:	**Object Oriented Paradigm with C++ Lab**	**Semester III**	
Course Code	**BTITL308**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. Programming using C++

Lab Experiments List:

1. Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called power () that takes a double value for n and an int value for p, and returns the result as double value. Use a default argument of 2 for p, so that if this argument is omitted, the number will be squared. Write a main () function that gets values from the user to test this function.

2. A point on the two-dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4,5) represents point 4 units to the right of the origin along the X axis and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of the X coordinates of the points and whose Y coordinate is the sum of their Y coordinates. Write a program that uses a structure called point to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:

```
Enter coordinates for P1: 3 4
Enter coordinates for P2: 5 7
Coordinates of P1 + P2 are: 8, 11
```

   Create the equivalent of a four-function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally, it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be Y or N. Some sample interaction with the program might look like this:

```
 Enter first number, operator, second number: 10/ 3
Answer = 3.333333
 Do another (Y/ N)? Y
Enter first number, operator, second number 12 + 100
Answer = 112
Do another (Y/ N)? N
```

3. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store

these three parts of a phone number separately. Call the structure phone. Create two structure variables of type phone. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

```
Enter your area code, exchange, and number: 415 555 1212
My number is (212) 767-8900
Your number is (415) 555-1212
```

Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results maybe a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

4. Create a class rational which represents a numerical value by two double values- NUMERATOR and DENOMINATOR. Include the following public member Functions: constructor with no arguments (de-fault), constructor with two arguments, void reduce () that reduces the rational number by eliminating the highest common factor between the numerator and denominator.

Overload + operator to add two rational numbers
Overload - operator to enable input through cin
Overload * operator to enable output through cout
Write a main ( ) to test all the functions in the class.

5. Consider the following class definition:

```
class father {
protected age;
public;
father (int x) {age = x;}
virtual void iam()
{
cout<<“I AM THE FATHER ” ;
cout << “My age is : ” <<age<< endl;}
};
```

Derive the two classes son and daughter from the above class and for each, define iam () to write similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main() that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.

6. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll number, name (a string of 30 or lesser number of characters) and marks.

7. A hospital wants to create a database regarding its indoor patients. The information to store include

   Name of the patient
   Date of admission
   Disease
   Date of discharge

   Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the patients to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

8. Imagine a tollbooth with a class called toll Booth. The two data items are a type Unsigned Int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar ( ) increments the car total and adds 0.50 to the cash total. Another function called nopayCar( ), increments the car total but adds nothing to the cash total. Finally, a member function called display() displays the two totals i.e. total cars and total cash. Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.

Course Title:	**Programming Lab (Python)**	**Semester III**	
Course Code	**BTITL309**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. To learn Python programming

Lab Experiments List:

1. Program to find the union of two lists.
2. Program to find the intersection of two lists.
3. Program to remove the “i” th occurrence of the given word in a list where words repeat.
4. Program to remove all tuples in a list of tuples with the USN outside the given range.
5. Program to count the occurrences of each word in a given string sentence.
6. Program to check if a substring is present in a given string.
7. Program to map two lists into a dictionary.
8. Program to count the frequency of words appearing in a string using a dictionary.
9. Program to create a dictionary with key as first character and value as words starting with that character.
10. Program to find the length of a list using recursion.
11. Program to read a file and capitalize the first letter of every word in the file.
12. Program to read the contents of a file in reverse order.
13. Program to create a class in which one method accepts a string from the user and another prints it.
14. Program to create a class and get all possible subsets from a set of distinct integers.

Course Title:	**Advanced Engineering Chemistry Lab**	**Semester III**	
Course Code	**BTITOEL310**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Basic Science**	**Credits**	**1**

List of Experiments: (Perform any 8 – 9 Experiments)

1. To determine λmax of given solutions.
2. To Verify Beer's Lambert's law.
3. Experiments on Paper and Thin Layer Chromatography. (two experiments)
4. Determination of rate of corrosion of metal.
5. Experiments related with Organic Chemistry. (three experiments)
6. Experiments on pH metry.
7. Experiments on Conductometry.
8. Experiments on Flame Photometry.
9. Experiments on Solvent Extraction.
10. Estimation of Metals from Solution/ Alloys. (two experiments)
11. Synthesis of materials by various techniques. (two experiments)

Reference Books:

1. A. Sethi, "***Systematic experiments in Chemistry***", New Age International Publication, New Delhi.
2. A. I. Vogel, "***Practical Inorganic Chemistry"***, ELBS Publication.
3. S. S. Dara, ***"Practical in Engineering Chemistry"***.
4. A. I. Vogel, "***Practical Organic Chemistry***", ELBS Publication.

Course Title:	**Interpersonal Communication Skills and Self Development for Engineers Lab**	**Semester III**	
Course Code	**BTITOEL310**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Humanities, Social Science and Management**	**Credits**	**1**

List of Experiments:

1. General etiquettes and manners
2. Team building and group dynamics
3. Presentation Skills
4. Conducting meetings
5. Leadership Development
6. Skills in dealing with difficult people/situations
7. Persuasive writing
8. Negotiation skills
9. Conflict Resolution
10. Y-O-U-R-N-M-A-M-E Activity

Course Title:	**Programming in Java Lab**	**Semester III**	
Course Code	**BTITOEL310C**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Professional Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn Java Programming

Lab Experiment Lists:

1. To create simple application to access data base using JDBC.
2. To read and write the files.
3. To implement polymorphism and method overriding in java.
4. To write programs implementing exception handling.
5. To write programs to illustrate interfaces in java.
6. To write programs to create package in java.
7. To design multi threaded programs in java.
8. To write programs to manipulate strings.
9. To write programs to draw various shapes using java applets.

Course Title:	**Introduction to Web Technology Lab**	**Semester III**	
Course Code	**BTITOEL310D**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Professional Core**	**Credits**	**1**

Lab Experiments List:

1. Download XAMPP or WAMPP server, IDE, browsers to run HTML program
2. Develop page to display fruits list with different color with heading on top of the page and link each fruit with fruit description page
3. Develop using semantic element, page having menu bar in header section
4. Develop user personal info form using HTML5 input control and decorate with CSS
5. Develop responsive page layout using media queries
6. Write a PHP program to print list of user info using array
7. Write a PHP program to fetch user info from MYSQL database
8. Write a PHP program to perform crud operation
9. Write a PHP function to check palindrome string
10. Write a PHP program using for loop to add all the integers between 0 and 30 and display the total
11. Create a script to construct the pyramid of asterisk ('*') using nested for loop
12. Write a program to calculate factorial of a number using for loop
13. Write a program which will count the specific characters in the text
14. Debug web site using developer tools, inspect element

Course Title:	**Microprocessors and Microcontrollers**	**Semester IV**	
Course Code	**BTITC401**	**Course Type**	**Compulsory**
Prerequisite	**BTCOC304**	**L – T – P**	**2– 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand 8086 microprocessor Architecture.
2. To understand design aspects of I/O and Memory Interfacing circuits.
3. To acquaint with instruction set and logic required to build assembly language programs.
4. To learn micro-controller architecture, its instruction set and interfaces.

Course Outcomes:

After learning the course the students should be able:

1. To design and implement programs on 8086 microprocessor.
2. To design I/O circuits and Memory Interfacing circuits.
3. To exhibit knowhow on micro-controller interfaces & programming.
4. To experiment with MCS51 and PIC18 micro-controller.

Course Content:

UNIT I

Intel 8086/8088 Microprocessor Family: Architecture and organization of 8086/8088 microprocessor family, Instruction set, Assembly language programming, Introduction to mixed language programming using C and Assembly language, 8086 family minimum and maximum mode operation, Timing diagram for 8086 family, Detailed study of maximum mode connection: Study of 8288 bus controller, 8086 interrupt structure.

UNIT II

8086 Instruction Set and Programming: Addressing modes, Instruction Set, ALP, Mixed language programming, Stacks, Strings, Procedures, Macros, Timers, Counters and delay, Programming examples using DOS and BIOS Interrupts, Device drivers programming.

UNIT III

8086 Interrupt System: 8086 Interrupt structure, Types and applications: Study of Interrupt Controller 8259A and Interrupt Priority Management using 8259A.

UNIT IV

Memory System Design and I/O Interfacing: Interfacing SRAM, ROM and DRAM to 8086, Address decoding and Timing Considerations, I/O interfacing in 8086: Serial communication interface includes Synchronous and Asynchronous, Protocols, Parallel communication interface includes I/O Mapped I/O, Memory Mapped I/O, and Handshaking Signals, 8087 Math Co-processor: Study of architecture of 8087, Floating point coprocessor, Data types supported by 8087, Host and coprocessor interface, Assembly language Programming for 8086 - 8087 based systems.

UNIT V

Intel MCS 51 Family: Introduction to Single chip microcontrollers of Intel MCS 51 family, Architectural and operational features, Instruction set, CPU timing and machine cycles, Interrupt structure and priorities, Internal Timer / counters, Serial interface, Connection of external memory, Power saving modes, Interfacing of 8051 with EPROM, Programming for EPROM versions, 8051 variation.

UNIT VI

Introduction to the PIC18 Microcontroller: Overview of the PIC18 MCU, The PIC18 Memory Organization, The PIC18 CPU Register, The PIC18 Pipelining, PIC18 Instruction Format, Addressing Modes, A Sample of PIC18 Instruction, Overview of the 8-Bit MCU Market.

Text Books:

1. Douglas Hall, ***“Microprocessors and Interfacing: Programming and Hardware”***, Tata McGraw-Hill, 2nd Edition.
2. Han-Way Huan, ***“An Introduction to Software and Hardware Interfacing”***, Delmar Cengage Learning, 2nd Edition, 2006.

Reference Books:

1. Peter Norton, ***“IBM PC, Assembly Language programming”***, BPB publication.
2. John Uffenback, ***“8086/8088 Interfacing, Programming and Design”***, Prentice Hall of India Publication.
3. A. K. Ray, K. M. Bhurchandi, ***“Advanced Microprocessors and Peripherals”***, Tata McGraw Hill, 2000.
4. John Uffenback***, “8086/8088 Interfacing, Programming and Design”,*** Prentice Hall of India Publication.

Course Title:	**Data Structures and Applications**	**Semester IV**	
Course Code	**BTITC402**	**Course Type**	**Compulsory**
Prerequisite	**BTITC303**	**L – T – P**	**3 – 1 – 0**
Stream	**Core**	**Credits**	**4**

Course Objectives:

1. To assess how the choice of data structures and algorithm design methods affects the performance of programs.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, branch and bound and writing programs for these solutions.

Course Outcomes:

After learning the course, the students should be able:

1. To write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.
2. To think of all possible inputs to an application and handle all possible errors properly.
3. To analyze clearly different possible solutions to a program and select the most efficient one.
4. To write an application requiring an effort of at least 1000 lines of code to demonstrate a good working solution.
5. To demonstrate the ability to write reusable code and abstract data types in C, using object-based way of thinking.

Course Content:

UNIT I

Introduction to Data Structures and Analysis of Algorithms: Need of data structures, Types of data structures, Recursion, ADT (Abstract Data Types), Basics of algorithm, Analysis of algorithm through time complexity and space complexity, Asymptotic notations, Pseudo code analysis, Recurrence relations and solving recurrences using substitution, Recursion tree and master method.

UNIT II

Stack and Queue: Stack: Representation, Stack operation, Application. Queue: Representation, Queue operation, Circular and priority queue, Applications.

UNIT III

Linked list: Operation on linked list, Linked stacks and Queues, Array implementation of linked list, Linked list using dynamic variable, doubly linked list, Circular linked list.

UNIT IV

Binary Tree: Basic tree concept, Binary tree operations, Binary tree representation, Binary tree traversals, Binary search tree and operations, Balanced tree: AVL trees and operations, Applications of binary trees, implementing priority queue using binary heap data structure.

UNIT V

Graphs: Basics concepts of graphs, Representation of graphs, Graph traversals BFS and DFS, Minimum spanning tree algorithms: Kruskal’s algorithm and Prim’s algorithm, Applications of graphs.

UNIT VI

Searching Techniques and Hashing: Linear search and binary search, Hashing: Direct-address tables, Hash tables, Open addressing, Perfect Hashing, Sorting techniques: Various sorting methods and their time complexity analysis: Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort.

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, ***“Fundamentals of Data Structures in C++”***, Silicon Press, 2nd Edition, 2008.
2. R.S. Bichkar, ***“Programming with C and Data structures”***, Universities Press, 1st Edition, 2014.

Reference Books:

1. Goodrich, Tamassia, “***Data Structures and Algorithm in Java***”, Wiley publication, 6th Edition, 2014.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, “***Introduction to Algorithms***”, MIT Press, 3rd Edition, 2009.
3. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, “***Data structures using Java***”, Pearson Education, 2003.
4. J. Murach, “***Murach’s Java Programming***”, Shroff Publishers, 4th Edition, 2012.
5. V. Goyal, L. Goyal, P. Kumar, “***A Simplified Approach to Data Structures***”, Shroff Publishers, 1st Edition, 2014.

Course Title:	**Discrete Structures and Applications**	**Semester IV**	
Course Code	**BTITC403**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To develop a foundation of set theory concepts, notation and applications.
2. To inculcate the habit of logical and mathematical thinking and its application to computer science and IT.
3. Understand logic, basic counting principles, relations, induction, sequences and summations.
4. To be able to present a coherent and mathematically accurate argument.
5. To understand the theory of graphs and algebraic structures and their applications.

Course Outcomes:

After learning the course the students should be able:

1. To perform operations on various discrete structures such as sets functions, relations, and sequences.
2. To solve problems using counting techniques, permutation and combination, recursion and generating functions
3. To construct and verify correctness of a Boolean expression using K-Maps and truth tables.
4. To use graphs as tools to visualize and simplify Problems.
5. To solve problems using algebraic structures (Rings, Monoids and Groups).

Course Content:

UNIT I

The Foundations: Sets theory and its applications sets, Set operations, Laws of set theory, Power sets, Partitions, Multi-sets, Cardinality, Principle of inclusion and exclusion, Algebra of sets and duality, Applications of sets: Problems on set operations and principle of inclusion-exclusion, Logics and proofs, Propositional logic, Propositional equivalences, Propositional algebra, Basic logical operations, De Morgan’s laws, Predicates and quantifiers, Nested quantifiers, Rules of inference, Proof methods and strategy, Applications of logic: Translating English statements into propositions, Boolean searches in web pages, Bit operations.

UNIT II

Induction, Sequences and Summations: Induction and recursion: Mathematical induction, Strong induction, Recursive definitions, Re-cursive algorithms, Applications: Proofs using mathematical induction, Program correctness, Well formed formula, Functions, Sequences and summations, Definition and types of functions: Injective, subjective and bijective , Composition, Identity and inverse of function, Re-cursively defined functions, Applications of functions, Job scheduling problem, Countability of rational numbers.

UNIT III

Basic Counting Principles: Permutations, Combinations, Binomial coefficients, Generalized permutations and combinations, Combinations and permutations with repetition, Generating permutations and combinations, Recurrence relation, Solving linear recurrence relations with constant coefficients, Applications of counting principles, Pigeonhole principle and its applications.

Relations: Properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations and partitions, Partial ordering relations and lattice application of relations: N-ary relations and their applications, Databases and relations.

UNIT V

Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path in weighted graph, Hamiltonian and Euler paths and circuits, Factors of a graph, Shortest path algorithm, Traveling salesman problem, Transport networks, Special types of graphs and applications: Job assignment, LAN, Interconnection networks for parallel computation, Mesh networks, Graph coloring and applications.

UNIT VI

Algebraic Structures: Algebraic systems, Groups, Semi groups, Monoid, Subgroups, Permutation groups, Codes and group codes, Isomorphism and automorphisms, Homomorphism, Fermat's little theorem, Polynomial rings, Applications of groups.

Text Books:

1. K. H. Rosen, ***"Discrete Mathematics and Its Applications"***, Tata McGraw Hill Publication, 7th Edition, 2012.
2. J. P. Tremblay, R. Manohar, ***"Discrete Mathematical Structures with Applications to Computer Science"***, 1st Edition, McGraw Hill Publication, 2001.

Reference Books:

1. B. Kolman, R. Busby, S. Ross, ***"Discrete Mathematical Structures"***, Pearson Education, 6th Edition, 2009.
2. R. K. Bisht, H. S. Dhami, ***"Discrete Mathematics"***, Oxford University Press, 2015.

Course Title:	**Internetworking Protocols**	**Semester IV**	
Course Code	**BTITC404**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand the basic concepts of TCP/IP Architecture.
2. To Understand Network Layer and Applications.
3. To learn UDP and TCP applications.
4. To learn Transport Layer Reliability.

Course Outcomes:

After learning the course, the students should be able:

1. To compare and contrast TCP and UDP in terms of the application that uses them.
2. To design network-based applications using the socket mechanism.
3. To work with IPv4 addresses in terms of subnetting and supernetting.
4. To setup a host and network in terms of IP addressing.

Course Content:

UNIT I

Introduction and Underlying Technologies : ARPANET, Birth of the Internet, Transmission Control Protocol/Internetworking Protocol (TCP/IP) , MILNET , CSNET , NSFNET ,ANSNET, The Internet Today ,World Wide Web, Time Line, Growth of the Internet, Protocols and Standards, Standards Organizations: Internet Standards Internet Administration.

The OSI Model and the TCP/IP Protocol Suite:

Protocol Layers: Hierarchy Services, The OSI Model: Layered Architecture , Layer-to-Layer Communication, Encapsulation, Layers in the OSI Model, TCP/IP Protocol Suite: Comparison between OSI and TCP/IP Protocol Suite, Layers in the TCP/IP Protocol Suite, Addressing: Physical Addresses, Logical Addresses, Port Addresses, Application-Specific Addresses, Wired Local Area Networks: IEEE Standards, Frame Format, Addressing, Ethernet Evolution, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Ten-Gigabit Ethernet.

UNIT II

Wireless LANS: IEEE, MAC Sublayer, Addressing Mechanism, Bluetooth, Point-to-Point WANS, DSL Technology, Cable Modem, ATM, Connecting devices: Repeaters, Bridges and Routers.

Introduction to Network Layer: Switching: Packet Switching, Circuit Switching, Packet Switching at Network Layer, Network Layer Services, Other Network Layer Issues.

IPv4 Addresses, Address Space Notation, Range of Addresses, Operations, Classful Addressing: Classes, Classes And Blocks, Two-Level Addressing, Three-Level Addressing: Subnetting, Supernetting, Classless Addressing: Variable-Length Blocks, Two-Level Addressing, Block Allocation, Special Addresses: Special Blocks, Special Addresses in Each block, NAT, Address Translation, Translation Table.

UNIT III

Delivery and Forwarding of IP Packets: Delivery: Direct Delivery, Indirect Delivery, Forwarding: Forwarding Based on Destination Address, Forwarding Based on Label, Structure of a Router: Components.

Internet Protocol Version 4(IPv4): Datagrams, Fragmentation, Maximum Transfer Unit (MTU), Fields Related to Fragmentation, Options: Format, Option Types, Checksum: Checksum Calculation at the Sender, Checksum Calculation at the Receiver, Checksum in the IP Packet, IP PACKAGE : Header-Adding Module, Processing Module, Queues, Routing Table, Forwarding Module, MTU Table, Fragmentation Module, Reassembly Table, Reassembly Module

Address Resolution Protocol (ARP): Address Mapping: Static Mapping, Dynamic Mapping, The ARP Protocol: Packet Format, Encapsulation, Operation, Proxy ARP, ARP Package: Cache Table, Queues, Output Module, Input Module, Cache-Control Module.

UNIT IV

Internet Control Message Protocol (ICMP): Messages: Message Format, Error Reporting Messages, Query Messages, Checksum, Debugging Tools: Ping, Traceroute, ICMP Package: Input Module, Output Module.

Unicast Routing Protocols (RIP, OSPF, and BGP), Static versus Dynamic Routing Tables, Routing Protocol, Intra- And Inter-Domain Routing, Distance Vector Routing :Bellman-Ford Algorithm, Distance Vector Routing Algorithm, Count to Infinity, RIP: RIP Message Format, Requests and Responses Timers in RIP, RIP Version, Encapsulation , Link State Routing: Building Routing Tables, OSPF, Areas, Metric Types of Links, Graphical Representation OSPF Packets, Link State Update Packet, Other Packets, Encapsulation, Path Vector Routing: Reachability , Routing Tables, BGP: Types of Autonomous Systems, Path Attributes, BGP Sessions, External and Internal BGP, Types of Packets, Packet Format, Encapsulation.

UNIT V

Introduction to Transport Layer: Transport-Layer Services: Process-to-Process communication, Addressing: Port Numbers, Encapsulation and Decapsulation , Multiplexing and Demultiplexing, Flow Control, Error Control , Combination of Flow and Error Control, Congestion Control, Connectionless and Connection-Oriented Services.

User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control, Error Control, Congestion Control, Encapsulation and Decapsulation, Queuing, Multiplexing and Demultiplexing, Comparison between UDP and Generic Simple Protocol, UDP Applications: UDP Features, Typical Applications, UDP Package: Control-Block Table, Input Queues, Control-Block Module, Input Module, Output Module.

UNIT VI

Transmission Control Protocol (TCP): TCP Services: Process-to-Process Communication, Stream Delivery Service, Full-Duplex Communication, Multiplexing and Demultiplexing, Connection-Oriented Service, Reliable Service. TCP Features: Numbering System, Flow Control, Error Control, Congestion Control, Segment: Format, Encapsulation, A TCP Connection: Connection Establishment, Data Transfer, Connection Termination, Connection Reset, State Transition Diagram, Scenarios ,Windows in TCP ,Send Window, Receive Window, Flow Control : Opening and Closing Windows, Shrinking of

Windows, Silly Window Syndrome, Error Control :Checksum, Acknowledgment, Retransmission, Out-of-Order Segments, Data Transfer in TCP, Some Scenarios, Congestion Control : Congestion Window, Congestion Policy, TCP Timers: Retransmission Timer, Persistence Timer, Keepalive Timer, Time-Wait Timer, TCP Package: Transmission Control Blocks (TCBs), Timers, Main Module, Input Processing Module, Output Processing Module.

Text Books:

1. Douglas E. Comer, ***"Internetworking with TCP/IP: Principles, Protocols and Architecture"***, Volume 1, 6th Edition, PHI publication, 2013.
2. Behrouz A. Forouzan, ***"TCP-IP Protocol Suite"***, 4th Edition, McGraw Hill publication, 2010.

Reference Books:

1. Comer, ***"Internetworking with TCP-IP"***, Volume 3, 5th Edition, Pearson publication, 2013.
2. W. Richard Stevens, ***"UNIX Network Programming: Interprocess Communications"***, Volume 2, 2nd Edition, PHI publication, 1999.
3. William Stalling, ***"SNMP, SNMPv2, SNMPv3, and RMON 1 and 2"***, 2nd Edition, Pearson education publication, 2001.
4. Hunt Craig, ***"TCP-IP Network Administration"***, 3rd Edition, O'Reilly publication, 2002.
5. Loshin, Harwurt, ***"TCP-IP Cleanly Explained"***, BPB publication.

Course Title:	**Physics of Engineering Materials**	**Semester III**	
Course Code	**BTBSCOE405A**	**Course Type**	**Elective**
Prerequisite	**PHY203**	**L – T – P**	**1 – 1 – 0**
Stream	**Basic Science**	**Credits**	**2**

Course Objectives:

1. To impart the basic and advanced knowledge to the students.
2. To understand, remember and capable to explain and apply this knowledge in the field of Engineering/ Technology.

Course Outcomes:

After learning the course, the students should be able:

1. To explain the concepts of Crystallography, X -rays, Conducting Materials, Magnetic Materials.

Course Content:

UNIT I

Crystallography: Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO3) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction.

UNIT II

Magnetic Materials: Origin of magnetization using atomic theory, classification of magnetic materials and properties, Langevin’s theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Ant ferromagnetic and Ferromagnetic materials, Ferrites and Garnets, magnetic bubbles, magnetic recording.

UNIT III

Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation)

UNIT IV

Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell

UNIT V

Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials

UNIT VI

Nano Materials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.

Text Books:

1. C. Kittle, ***“Introduction to Solid state Physics”***.
2. C. M. Srivastava, C. Srinivasan, ***“Science of Engineering Materials and Carbon Nanotubes”***.
3. A. J. Dekker, ***“Solid State Physics”***.

Reference Books:

1. V. Raghavan, ***“Material Science and Engineering”***.
2. A. J. Dekker, ***“Electrical Engineering Materials”***.

Course Title:	**Organizational Behavior**	**Semester IV**	
Course Code	**BTHMOE405B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**3**

Course Objectives:

1. To explore the organization as a micro-social system - a medium to facilitate and improve the interpersonal relationships in the context of organizational functioning.

Course Outcomes:

1. Students will become more self aware and will have identified areas of development for long term effectiveness.
2. Students will understand the role that individuals play collectively to perform in organizations.

Course Content:

UNIT I

Introduction to Organizational Behavior: Definition of organization and behavior, Historical Development of OB, Human relations movement, Impact of technology on organizational behavior.

Organizational Design: Key factors in organizational design, Types of organizational design, Need and significance of a sound organizational design, Organizational Structures - traditional and contemporary structures.

UNIT II

Organizational Culture: Meaning and dimensions, Role of founders' values and vision in creating and sustaining culture, Types of organizational cultures, Impact of culture on image and performance of the organization, Organizational Communication - Tool and Techniques, Johari window transactional analysis, Lateral thinking, Brain storming, Delphi technique, Power of grapevine and other informal communication techniques.

UNIT III

Groups and Organizations: Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, Five stages of group/team development, Determinants of group behavior, Typical teams in organizations.

Leadership: Leadership as a concept and its essence, Leaders versus managers, Blake and Mouton's managerial grid, Hersey and Blanchard's situational leadership, Transactional versus Transformational leadership, Women as leaders, Leadership in entrepreneurial and family business, organizations.

UNIT IV

Foundations of Individual Behavior: Factors affecting individual behavior - personal, environmental and organizational, Nature and Determinants of Personality, Personality Traits - Big Five, Locus of Control, Self-esteem, Type A/ Type B Personality, Risk Taking, Machiavellianism, Self Monitoring, Personality and OB

Motivation: Power and purpose of motivation, Theories of motivation - Locke's goal setting theory, Vroom's expectancy theory, Porter and Lawler's model, Adam's equity theory, McClelland's theory of needs, Motivational Techniques – Job design/enlargement /enrichment / rotation, Managing rewards - Job status based rewards, Competency based rewards, performance based rewards, Empowerment and Self Managed Teams.

UNIT V

Work Related Attitudes, Values and Perception: Meaning and definitions, Factors influencing perception Social and Person perception, When perception fails, Perception and OB.

Organizational Outcomes: Power and Politics, Power - Dynamics, Sources and Tactics, Politics - Essence, Types of political activities, Ethics of power and politics.

UNIT VI

Conflicts and Negotiations, Nature of conflict, Functional and Dysfunctional conflict, Conflict resolution and negotiations, Managing conflict during change initiatives.

Stress: Meaning and definition, Work stress model, Sources of stress, Stress Management - Individual and organizational strategies, Impact of stress on performance.

Text books:

1. Uma Sekaran, ***"Organization Behaviors"***, McGraw Hill Company, New Delhi, 2011.
2. LM Prasad, ***"Organization Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
3. Nair, Banerjee, Agarwal, ***"Organization Behavior"***, Prgathi Prakashan, New Delhi, 2006.

Reference books:

1. Rosy Joshi and Sashi K Gupta, ***"Organization Behaviors"***. Kalyani publishers, New Delhi, 2005.
2. S.S. Khanka, ***"Organization Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
3. Fred Luthans, ***"Organizational Behavior",*** McGraw Hill Book Co., 2005.

Course Title:	**Development Engineering**	**Semester IV**	
Course Code	**BTXXOE405C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Interdisciplinary**	**Credits**	**3**

Course Objectives:

1. Development Engineering prepares students to develop, pilot, and evaluate technological interventions designed to improve human and economic development within complex, low-resource settings.
2. Students can include topics related to the application of technology to address the needs of people living in poverty.

Course Outcomes:

After learning the course, the students should be able:

1. To understand the core disciplines issues in development.
2. To understand certifications.
3. To understand the planning of developing of rural areas.

Course Content:

UNIT I

Introduction to Development Engineering: Introduction to development engineering, need of development engineering, core disciplines and concept, major issues in development, urban development, rural development, socioeconomic development, scientific social research, formulation of research problem, field work and data collection, report drafting.

UNIT II

Design of Sustainable Communities: Concept and development of sustainable communities, Sustainable design principles, Building regulations, Codes and standards – ANSI, ASTM, ASHRAE, Approval process, Green buildings – green building techniques-energy solutions, Site solutions, Exterior and interior solutions, Certification – BREEAM, GRIHA, NAHB, LEED, IGBC.

UNIT III

Town/City Planning: Town Planning, History of town planning in India, Characteristics of city/town, Town planning at national, Regional and local levels, Planning standards, Master plan, Site layout and development, Zoning and density control, Green belt, Slum redevelopment, Smart city planning, Introduction to city planning, Infrastructure elements of smart city planning, Dimensions of smart cities global standards and performance benchmark, Smart solutions e-governance, Waste management, Water management, Energy management, Urban mobility, Citizen services, Other services such as telemedication and education, Trade facilitation, Skill development, GIS for Planning.

UNIT IV

Planning and Development of Rural Areas: District administration, District Planning, Introduction to various sectors of rural areas such as drinking water, Waste water treatment, Electricity, Public transport, Irrigation, Sanitation and cooking energy, Issues and challenges associated with these sectors, People's participation and role in development of rural areas, Various schemes and policies floated by state and central government – phases in the schemes; life cycle costing of these schemes.

UNIT V

GeoInformatics for Planning and Development: Introduction to GeoInformatics, Advantages, Benefits and limitations, Interdisciplinary applications, Data extraction, Use of GeoInformatics for planning, Mapping and preparation of layouts.

UNIT VI

Development aspects: Urban and Rural: Planning and designing of a model town / city and using Auto-CAD and/or GIS, Visit to a village or small town – The project will be carried out in groups, Problem faced by the villagers pertaining to various sectors or existing schemes, Define the need, method, Tools and techniques for development, Deliver technology based solution.

Text Books

1. Chand M. and Purr U.K., ***"Regional Planning in India"***, Allied Publisher, New Delhi, 1983.
2. Kaiser E. J., et.al, ***"Urban Land use Planning"***, 4th Edition Urbana, University of Illinois Press.
3. Sundaram K. V., ***"Geography Planning"***, Concept Publishing Co., New Delhi.
4. Ayyar C.P.V., ***"Town Planning in Early South India"***, Mittal Publications, Delhi.
5. Reeder, Hoboken, ***"Guide to green building rating systems"***, John Wiley and Sons Inc.
6. Longley, et.al, ***"Geographic Information Systems and Science"***, John Wiley and Sons, New York.
7. Desai V., ***"Rural Development of India"***, Himalaya Publishing House, Mumbai.
8. Rau S. K., ***"Global Search for Rural Development"***, NIRD, Hyderabad.

Reference Books:

1. Institute of Town Planners, India, Ministry of Urban Affairs and Employment, Government of India, New Delhi, UDPFI Guidelines, 1996.
2. Miles R. Simon, 1970, ***"Metropolitan Problems"***, Methuen Publications, Canada.
3. B.I.S., 1980, ***"National Building Code of India"***, ISI, New Delhi.
4. ANSI/ASHRAE/USGBC/IES Standard 189.1, Standard for the Design of High – Performance Green Buildings Except Low-Rise Residential Buildings.
5. ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

Course Title:	**Product Design Engineering**	**Semester IV**	
Course Code	**BTXX406**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Interdisciplinary**	**Credits**	**2**

Course Outcomes:

After completing this programme, participants will be able to:

1. Create simple mechanical designs.
2. Create documents for knowledge sharing.
3. Manage own work to meet requirements.
4. Work effectively with colleagues.
5. Maintain a healthy, safe and secure working environment.
6. Provide data/information in standard formats.
7. Develop their knowledge, skills and competence.

Course Content:

UNIT I

Creating simple products and modules Document Creation and Knowledge Sharing

UNIT II

Self and work Management

UNIT III

Team Work and Communication

UNIT IV

Managing Health and Safety

UNIT V

Data and Information Management

UNIT VI

Learning and Self Development

Course Title:	**Microprocessors and Microcontrollers Lab**	**Semester IV**	
Course Code	**BTITL407**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn assembly language.
2. To program microprocessor and microcontroller for arithmetic operations.
3. To interface microprocessor and microcontroller with I/O devices.

Lab Experiments List:

1. 8085 and 8086 kit familiarization and basic experiments
2. Arithmetic operation of 16 bit binary numbers
3. Programming exercise: sorting, searching and string
4. Interfacing with A/D and D/A converters
5. Interfacing with stepper motors
6. Keyboard interfacing to 8086
7. 8255 interface to 8086
8. Assembly language programming of 8051
9. Timer programming of 8051, using interrupts
10. LCD interfacing to 8051 – project

Course Title:	**Data Structures and Applications Lab**	**Semester IV**	
Course Code	**BTITL408**	**Course Type**	**Compulsory**
Prerequisite	**BTITL308**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. To implement all linear and non-linear data structures in C++/Java.

Lab Experiments List:

1. To implement a character stack data type and use it to reverse a string
2. To implement an integer stack data type that grows on demand
3. To write a program using appropriate stacks for evaluating an infix expression with parenthesis
4. To write a program, using a queue data type, to simulate a bank where customers are served on a first-come-first-serve basis
5. To write one program for each of the following operations with singly linked lists:
    - Concatenate two linked list and create third one
    - Free all nodes in a linked list
    - Reverse a linked list

   Given two linked list, create a third list which is set-intersection of the elements in the two.
6. To delete every third element from the linked list
7. To copy a given linked list into another (new) list
8. To implement a queue using a doubly linked list
9. To write the following recursive functions for a singly-linked NULL-terminated list: insert(), traverse(), search()

Course Title:	**Internetworking Protocols Lab**	**Semester IV**	
Course Code	**BTITL409**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments List:

1. Conversion of IP addresses
   (e.g. I/P: 10.24.164.254 O/P: 00001010.00011000.10000000.11111110 and I/P:binary dotted O/P: decimal dotted)
2. Introduction to Wireshark
3. Wireshark Lab: Ethernet and ARP
4. Wireshark Lab: IP
5. Wireshark Lab: ICMP, study of ping and traceroute command
6. Wireshark Lab: UDP
7. Wireshark Lab: TCP
8. Study of ftp, telnet tools and network configuration files
9. DHCP server configuration
10. Socket programming for UDP and TCP

Teaching and Evaluation Scheme Third Year B. Tech. (Information Technology)

Sr. No	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
Semester V										
1	BTITC501	Database Management Systems	3	-	-	20	20	60	3	3
2	BTITC502	Design and Analysis of Algorithms	3	-	-	20	20	60	3	3
3	BTITC503	Software Engineering	3	-	-	20	20	60	3	3
4	BTITOE504	Open/Departmental Elective - Group 1	3	-	-	20	20	60	3	3
5	BTITSE505	Stream Elective - Group 1	3	-	-	20	20	60	3	3
6	BTITS506	Seminar	-	2	-	-	-	50	2	2
7	BTITL507	Programming Lab – Minor (R Programming)	-	-	2	-	25	25	1	2
8	BTHM508	Constitutions of India/ Essence of Indian Traditional Knowledge	-	-	-	-	-	-	-	Audit
9	BTITL509	Database Management Systems Lab	-	-	2	-	25	25	1	2
10	BTITL510	Design and Analysis of Algorithms Lab	-	-	2	-	25	25	1	2
Summary of Semester Assessment Marks, Credit & Hours			**15**	**2**	**6**	**100**	**175**	**425**	**20**	**23**
Semester VI										
1	BTITC601	Operating Systems	3	-	-	20	20	60	3	3
2	BTITC602	Compiler Construction	3	-	-	20	20	60	3	3
3	BTITC603	Object Oriented Software and Web Engineering	3	-	-	20	20	60	3	3
4	BTITOE604	Open/Departmental Elective Group 2	3	-	-	20	20	60	3	3
5	BTITSE605	Stream Elective - Group 2	3	-	-	20	20	60	3	3
6	BTITL606	Programming Lab – Major (Web Technologies)	-	-	4		25	25	2	4
7	BTITL607	Operating Systems Lab	-	-	2	-	25	25	1	2
8	BTITL608	Object Oriented Software and Web Engineering Lab	-	-	2	-	25	25	1	2
9	BTITSEL609	Departmental Elective - Group 2 Lab	-	-	2	-	25	25	1	2
Summary of Semester Assessment Marks, Credit & Hours			**15**	**-**	**10**	**100**	**200**	**400**	**20**	**25**

List of Open/Departmental Electives – Group 1

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITOE504A	Graph Theory	Nil
2	BTITOE504B	Human Computer Interaction	Nil
3	BTITOE504C	Probability and Queuing Theory	Engineering Mathematics III

List of Stream Electives – Group 1

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTIT SE505A	Embedded Systems	Microprocessors and Microcontrollers
2	BTIT SE505B	IT Service Management	Nil
3	BTIT SE505C	Information Storage Management	Computer Architecture &Organization
4	BTIT SE505D	Network Management	Internetworking Protocols
5	BTIT SE505E	Data Visualisation	Database Management Systems

List of Open/Departmental Electives – Group 2

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITOE604A	Enterprise Resource Planning	Database Management Systems
2	BTITOE604B	Decision Support System	Database Management Systems
3	BTITOE604C	Software Project Management	Software Engineering

List of Stream Electives – Group 2

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE605A	Software Testing	Software Engineering
2	BTITSE605B	Data Storage Technologies & Networks	Internetworking Protocols, Operating Systems
3	BTITSE605C	Service Oriented Architecture	Nil
4	BTITSE605D	Network Programming	Internetworking Protocols, Operating Systems
5	BTITSE605E	Advanced Database Technology	Database Management Systems

Course Title:	**Database Management Systems**	**Semester V**	
Course Code	**BTITC501**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand architecture and functioning of database management systems.
2. To learn relational mode.
3. To use structured query language (SQL) and its syntax, transactions, database recovery and techniques for query optimization.
4. To acquaint with various normalization forms and query processing.
5. To learn indexing methods.

Course Outcomes:

After learning the course the students should be able:

1. To explain need of database management.
2. To design and implement a database schema for a given problem-domain.
3. To normalize a database.
4. To create and query a database using SQL DML/DDL commands, stored procedures and functions.
5. To declare and enforce integrity constraints on a database.
6. To illustrate understanding of indexing methods.

Course Content:

UNIT I

Introduction: Basic concepts, Advantages of DBMS over file-processing systems, Data abstraction, Data models and data independence, Components of DBMS and overall structure of DBMS, Data modeling, Entity, Attributes, Relationships, Constraints, Keys E-R diagrams, Components of E-R Model.

UNIT II

Relational Model: Basic concepts, Attributes and domains, Concept of integrity and referential constraints, Schema diagram. Relational query languages, Relational Algebra and Relational Calculus: Tuple relational and domain relational calculus.

UNIT III

Structured Query Language-I: Introduction, Characteristics and advantages, Data types and literals, DDL, Tables: creating, modifying, deleting, Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT query and clauses.

UNIT IV

Structured Query Language- II: Set operations, Predicates and joins, Set membership, Tuple variables, Set comparison, Ordering of tuples, Aggregate functions, Nested queries, Database modification using SQL Insert, Update and Delete queries, Dynamic and embedded SQL and concept of stored procedures, Query-by-example.

UNIT V

Relational Database Design: Notion of normalized relations, Functional dependency, Decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued dependency and join dependency. Storage and File Systems: Secondary storage, RAID, File organization, Indices, Static and dynamic hashing, B-Trees and B+ Trees.

UNIT VI

Query Processing and Transaction Management: Measures of query cost, Selection operation, Sorting and join operation, Transaction concept, Components of transaction management, Concurrency and recovery sys-tem, Different concurrency control protocols such as timestamps and locking, Validation, Multiple granularity, Deadlock handling, Different crash recovery methods such as log-based recovery, Shadow-paging, Buffer management and Remote backup system.

Text Books

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, ***“Database System Concepts”***, , McGraw Hill Education, 6th Edition, 2011.
2. Ramez Elmasri and Shamkant B. Navathe, ***“Fundamental Database Systems”***, Pearson Education, 7th Edition, 2015.
3. Raghu Ramkrishnan, Johannes Gehrke, ***“Database Management Systems”***, McGraw Hill Education, 3rd Edition, 2007.

Reference Books:

1. Carlos Coronel, Steven Morris ***“Database systems: Design Implementation and Management”***, Cengage Learning Press, 11th Edition, 2014.
2. J. Murach, ***“Murach’s MySQL”***, Shroff Publication, 2nd Edition, 2016.
3. J. Murach, ***“Murach’s Oracle SQL and PL/SQL: Works with All Versions Through 11g”***, Shroff Publication, 2008.

Course Title:	**Design and Analysis of Algorithms**	**Semester V**	
Course Code	**BTITC502**	**Course Type**	**Mandatory**
Pre-requisite	**Data Structures**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn fundamentals of algorithms design techniques.
2. To understand basic knowledge of computational complexity, approximation and randomized algorithms, selection of the best algorithm to solve a problem.
3. To analyze the performance of algorithms, to compare algorithms with respect to time and space complexity.
4. To develop proficiency in problem solving and programming.

Course Outcomes:

After learning the course the students should be able:

1. Develop efficient algorithms for simple computational tasks.
2. Gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.
3. Design standard algorithms such as sorting, searching, and problems involving graphs.
4. Compute complexity measures of algorithms, including recursive algorithms using recurrence relations.

Course Content:

UNIT I

Introduction: Instruction counts, Growth functions, Necessity of time and space analysis of algorithms, Order notations (O, Θ, Ω notations), Problem instance size, frequently occurring recurrence relations in analysis of algorithms.

UNIT II

Design Techniques-I: Divide and Conquer: Binary search, finding maximum and minimum, Merge sort, Quick sort, Strassen’s matrix multiplication. Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal storage on tapes, Optimal merge pattern, Single source shortest paths.

UNIT III

Design Techniques-II: Dynamic Programming: Multistage graphs, All pairs shortest paths, 0/1 Knapsack, Travelling salesman problem.

UNIT IV

Design Techniques: Backtracking: 8-Queens Problems, Sum of subsets, Graph coloring. Branch-and-bound: Least cost (LC) search, Control abstractions for LC search, FIFO branch and bound, LC branch and bound.

UNIT V

Selected Algorithms from Various Areas: Graph Theory, Elementary Algorithms: DFS, BFS, Topological Sort, Minimum spanning trees (Kruskal and Prim's algorithms), Shortest Paths: Single source shortest paths, all pairs shortest paths, String Matching: The naive string-matching algorithm, The Robin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

UNIT VI

Complexity Theory: Lower-bound arguments, NP-completeness: Introduction to NP-Complete, Reducibility (SAT, Independent Set, 3VC, Subset Sum and Partition, Hamiltonian Circuit).

Text Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, ***"Introduction to Algorithms"***, MIT Press, 3rd Edition, 2009.
2. E. Horowitz, S. Sahni and S. Rajsekaran, ***"Computer Algorithms"***, Silicon Press, 2nd Edition, 2008.

Reference Books:

1. B. K. Joshi, ***"Data Structures and Algorithms in C++"***, Tata McGraw Hill Education, 2010.
2. G. T. Heineman, Gary Pollice, Stanley Selkow, ***"Algorithms in a Nutshell"***, Shroff Publication, 1st Edition, 2008.
3. Kyle Loudon, ***"Mastering Algorithms with C"***, Shroff Publication, 1st Edition, 2008.

Course Title:	**Software Engineering**	**Semester V**	
Course Code	**BTITC503**	**Course Type**	**Core**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand software lifecycle development models.
2. To understand and apply software requirements engineering techniques, software design principles, modeling and software testing techniques.
3. To understand the use of metrics in software engineering.
4. To understand software project management.

Course Outcomes:

After learning the course the students should be able:

1. To use the techniques, skills, and modern engineering tools necessary for engineering practice.
2. To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. To identify, formulate and solve engineering problems.

Course Content:

UNIT I

Software Development Process: Software crisis and myths, Software process and development: Generic view of process, Software life cycle and models, Analysis and comparison of varies models, an agile view of process.

UNIT II

Requirement Engineering: Requirements engineering tasks, Initiating requirement engineering process, Eliciting requirement, developing use-cases, Building the analysis model, Negotiating and validating requirement, Building the analysis model.

UNIT III

System Design Overview: Design process and design quality, Design concepts, Design model, Pattern based software design, Architectural design, User interface design. UML: Different methods: Rambaugh / Booch / Jakobsons, Need for standardization. Developing diagrams in UML (Use CASE, Class, Interaction, State diagrams) CASE TOOLS.

UNIT IV

Validation and Testing: Strategic approach to Software testing, Strategic issues, Test strategies for conventional software, Validation testing, System testing, Debugging. White box testing and Black box testing.

UNIT V

Web Engineering: WebApps engineering layers, Web engineering processes planning for web engineering projects, Project management issue for web engineering. Metrics, Requirement analysis, Analysis models for web engineering design for WebApps, testing for WebApps.

UNIT VI

Planning and Management of Project: Project management, Metrics for process and projects, Estimation, Project scheduling, Risk management, Importance of software quality and measurements software engineering techniques for quality assurance, and Change management. ISO 9000 and CMM/PCMM.

Text Books

1. Roger S. Pressman, “***Software Engineering”***, Tata McGraw-Hill, 6th Edition, 2006.
2. G. Booch, J. Rambaugh, and I. Jacobson, ***“The Unified Modeling Language User Guide”***,
3. Addison Wesley, 2nd Edition, 2005.

Reference Books:

1. Shari Pfleeger, ***“Software Engineering”***, Pearson Education, 3rd Edition, 2008.
2. Ian Sommerville, ***“Software Engineering”***, Pearson Higher Education, 10th Edition, 2016.
3. Pankaj Jalote, ***“An Integrated Approach to Software Engineering”***, Springer New York, 2nd
4. Edition, 2013.

Course Title:	**Graph Theory**	**Semester V**	
Course Code	**BTITOE504A**	**Course Type**	**Elective**
Pre-requisite	**Discrete Structures and Applications**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental Elective**	**Credits**	**3**

Course Content:

UNIT I

Basics – Graphs, degree sequences, distance in graphs, complete, regular and bipartite graphs, basic properties.

UNIT II

Structure and Symmetry – Cut vertices, bridges and blocks, automorphism groups, reconstruction problem.

UNIT III

Trees and connectivity – Properties of trees, Arboricity, vertex and edge connectivity, Mengers theorem

UNIT IV

Eulerian and Hamiltonian graphs – Characterization of Eulerian graphs -Sufficient conditions for Hamiltonian graphs.

UNIT V

Colouring and planar graphs – vertex and edge colouring, perfect graphs, planar graphs, Euler's theorem, Kuratowski's theorem, Colouring of planar graphs, Crossing number and thickness.

UNIT VI

Matching, factors, decomposition and domination. Extremal Graph theory – Turan's theorem, Ramsay's theorem, Szemeredi's 97 regularity lemma, applications.

Text Books:

1. J. A. Bondy, U. S. R. Murthy, ***“Graph Theory”***, Springer Verlag, 2008.
2. D. B. West, ***“Introduction to Graph Theory”***, PHI, 2004.

Reference Books:

1. R. Diestel , ***“Graph Theory”***, Springer Verlag (Free Download available), 2003.

Course Title:	**Human Computer Interaction**	**Semester V**	
Course Code	**BTITOE504B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Content:

UNIT I

Introduction: The human, The computer, The interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories.

UNIT II

Design Process- Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support.

UNIT III

Models and Theories0 Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design, Models of the system, Modeling rich interaction.

UNIT IV

Interaction Styles- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation.

UNIT V

Design Issues- Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization.

UNIT VI

Outside the Box- Group ware, Ubiquitous computing and augmented realities, Hypertext, multimedia, and the World Wide Web

Text Books:

1. Alan Dix, Janet Finlay, ***"Human Computer Interaction"***, Pearson Education, 2004.
2. Ben Shneiderman, ***"Designing the User Interface - Strategies for Effective Human Computer Interaction"***, Pearson Education, 2010.

Reference Books:

1. M. B. Rosson, J. M. Carroll ***"Usability Engineering: Scenario-Based Development of Human-Computer Interaction"***, Elsevier, 2002.
2. Alan Cooper, ***"The Essentials of Interaction Design"***, Wiley Publishing, 2007.
3. Nielsen, J. Morgan Kaufmann, San Francisco, ***"Usability Engineering"***, 1993.
4. Heim, S., ***"The Resonant Interface: HCI Foundations for Interaction Design"***, Addison-Wesley, 2007.

Course Title:	**Probability and Queuing Theory**	**Semester V**	
Course Code	**BTITOE504C**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics-III**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental Elective**	**Credits**	**3**

Course Objectives:

1. Be through with probability concepts.
2. To acquire knowledge on Probability Distributions.
3. Get exposed to the testing of hypothesis using distributions.
4. Gain strong knowledge inn principles of Queuing theory.
5. Get exposed to Discrete time Markov chain.

Course Outcomes:

1. To acquire analytical ability in solving mathematical problems as applied to the respective branches of engineering.

Course Content:

UNIT I

Random Variables: Review of probability concepts, Types of Events, Axioms, Conditional probability, Multiplication theorem, Applications.

Discrete and continuous Random Variables – Discrete case, Probability Mass function, Cumulative distribution function, Applications, Characteristics of random variables – Continuous case, Probability density function, Cumulative distribution function, Applications, Expectation, Variance, Expectation, Variance, Moment Generating Function, Functions of Random Variable (One dimensional only)
Chebychev‟s Inequality – (Statement only). Applications of Chebychev’s Inequality.

UNIT II

THEORETICAL DISTRIBUTIONS:

Discrete Probability distribution: Binomial distribution – MGF, Mean, Variance, Applications of Binomial distribution, Fitting a Binomial distribution, Poisson distribution – MGF, Mean, Variance, Applications of Poisson distribution, Fitting a Poisson distribution, Geometric distribution – MGF, Mean, Variance, Memoryless Property , Applications of Geometric distribution, Continuous Probability Distributions: Uniform distribution – MGF, Mean, Variance & Applications, Exponential Distribution - MGF, Mean, Variance, Memoryless Property Applications of Exponential distribution, Normal distribution – Mean, Variance, Standard Normal distribution and Applications of Normal distribution

UNIT III

Testing of Hypothesis:

Introduction to Sampling Distributions, Population and Sample, Null Hypothesis and Alternative Hypothesis, Single and Two Tailed Test.

Testing of Hypothesis, Level of Significance, Critical Region, Procedure for Testing of Hypothesis
Large Sample Test- Test For Single Proportion, Two Sample Proportions.

Large Sample Test- Test For Single Mean, Two Sample Means.
Small Sample Tests – „t‟ Test For a Single Mean „t‟ Test For The Difference Of Means, Paired „t‟ Test
F Test – Test of Significance of the Difference between Two Population Variances.
Chi Square Test for Goodness of Fit, Independence of Attributes.

UNIT IV

Queuing Theory: Introduction to Markovian queuing models.
Single Server Model with Infinite system capacity, Characteristics of the Model (M/M/1): (∞/FIFO)
Problems on Model (M/M/1): (∞/FIFO), Problems on Model (M/M/1): (∞/FIFO), Single Server Model with Finite System Capacity, Characteristics of the Model (M/M/1): (K/FIFO), Problems on Model (M/M/1): (K/FIFO).

UNIT V

Markov Chains:
Introduction to Stochastic process, Markov process, Markov chain one step & n-step Transition Probability, TPM and Applications, Chapman Kolmogorov theorem (Statement only), Applications on Chapman Kolmogorov theorem.

UNIT VI

MARKOV CHAINS: Transition probability- Applications, Classification of states of a Markov chain, Classification of states of a Markov chain – Applications.

Text Books:

1. Veerarajan T., ***“Probability, Statistics and Random Processes”***, Tata McGraw Hill, 1st Reprint 2004.
2. S.C. Gupta and V.K. Kapoor, ***“Fundamentals of Mathematical Statistics”***, Sultan Chand & Sons, 9th extensively revised Eition,1999

Reference Books:

1. Trivedi K S, ***“ Probability and Statistics with reliability, Queueing and Computer Science Applications***”, Prentice Hall of India, New Delhi, 1984
2. Gross.D, Harris.C.M. , ***“Fundamentals of Queuing Theory”***, John Wiley and Sons, 1985.
3. Allen.A.O., ***“Probability Statistics and Queuing Theory”***, Academic Press, 1981

Course Title:	**Embedded Systems**	**Semester V**	
Course Code	**BTITSE505A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessor & Microcontroller**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application and Development**	**Credits**	**3**

Course Objectives:

1. To understand the fundamental concepts in Embedded Systems.
2. To learn Real Time Operating Systems.
3. To get acquainted with hardware & interfaces.
4. To know Embedded System Design Techniques.

Course Outcomes:

After learning the course the students should be able:

1. To demonstrate & explain embedded systems hardware & software components.
2. To define embedded systems using real time operating system – VxWorks/ µCOS II RTOS.
3. To design & develop embedded applications using C language.
4. To apply design techniques in real-life application.

Course Content:

UNIT I

Introduction: Introduction to embedded systems-hardware and software components, Types, Examples, Characteristics, Challenges in embedded computing system design, Embedded sys-tem design processes, Introduction to IC technology.

UNIT II

Analysis and Design of Embedded System: Software engineering practices in the embedded systems, Software develop process, Interprocess communication and synchronization of process, Task and threads, Programme language, Program concept and embedded programming in C, Software components-Interpreter, Compiler, Assembler, Cross assembler.

UNIT III

OS for Embedded Systems: Introduction to real time theory, Operating system services, Real time operating system concepts, Basic design using a RTOS, Introduction to RTOS programming tools Micro C/OSII and VxWorks.

UNIT IV

Hardware for Embedded Systems: Hardware components, SOC, Processors, CPU, Types of memory, Memory management, I/O devices and interfacing, Parallel I/O interface, Blind counting synchronization and busy waiting, Parallel port interfacing with switches, Keypads and display unit, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above using C language.

UNIT V

Performance Issues of an Embedded System: CPU performance, CPU power consumption, Analysis and optimization of CPU power consumption program execution time, Analysis and optimization of energy and power, Analysis of program size, Hardware accelerators.

UNIT VI

Design Examples and Case Studies: Personal Digital Assistants, Set Top Boxes, Ink Jet Printers, Digital thermometer, Case Studies of digital camera, Smart card, Case study of coding for sending application layer byte stream on TCP/IP network using RTOS VxWorks.

Text Books

1. Raj Kamal, ***"Embedded Systems Architecture, and Programming"***, TMH Publication, 3rd Edition, 2015.
2. Iyer, Gupta, ***"Embedded Real Time Systems Programming"***, TMH Publication, 2003.

Reference Books:

1. Wayne Wolf, ***"Computer as Components – Principles of Embedded Computing System Design"***, Gulf Professional Publishing, 2nd Edition, 2008.
2. David E Simon, ***"An Embedded Software Primer"***, Addison Wesley Publication, 2004.

Course Title:	**IT Service Management**	**Semester V**	
Course Code	**BTITSE505B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To introduce practical implementation of Information Technology Service Management (ITSM).
2. To understand how an integrated ITSM framework can be utilized to achieve IT business integration, cost reductions and increased productivity.
3. To learn the best practices of ITSM methodology.

Course Outcomes:

After learning the course the students should be able:

1. To identify IT services as a means to provide functionality and value to customers.
2. To describe the needs and targets of the different stakeholders (service providers, customers, suppliers/partners) in the services value chain.
3. To demonstrate the value of a service management framework.
4. To explain the service management processes for given customers.
5. To select the appropriate tools to support a given designed service management solution.

Course Content:

UNIT I

IT Infrastructure: Introduction, Challenges in IT Infrastructure Management, Design Issues of IT Organizations and IT Infrastructure, IT System Management Process, IT Service Management Process, Information System Design Process.

UNIT II

Service Delivery Process: Service Level Management, Financial Management, IT Service Continuity Management, Capacity Management & Availability Management.

UNIT III

Service Support Process: Configuration Management, Incident Management, Problem Management, Change Management & Release Management.

UNIT IV

Storage Management: Storage, Backup, Archive and Retrieve, Disaster Recovery, Space Management, Database and Application Protection and Data Retention.

UNIT V

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System and Intrusion Detection.

UNIT VI

Case Studies on how IT Service Management and ITIL processes make IT efficient and save cost for organizations.

Text Books

1. Phalguni Gupta, Surya Prakash & Umarani Jayaraman, ***“IT Infrastructure & Its Management”***, Tata McGraw-Hill Education.

Reference Books:

1. W. Ronald Hudson, Ralph C. G. Haas, Waheed Uddin, ***“Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation”***, McGraw-Hill, 1997.
2. Anita Sengar, ***“IT Infrastructure Management”***, S.K. Kataria and Sons, 2nd Edition, 2009.

Course Title:	**Information Storage Management**	**Semester V**	
Course Code	**BTITSE505C**	**Course Type**	**Elective**
Pre-requisite	**Computer Architecture & Organization**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To evaluate storage architecture; understand logical and physical components of storage Infrastructure including storage subsystems.
2. To describe storage networking technologies such as FC-SAN, NAS, IP-SAN and data archival solution –CAS.
3. To identify different storage virtualization technologies and their benefits.
4. To understand and articulate business continuity solutions including, backup and recovery technologies, and local and remote replication solutions.
5. To define information security, and storage security domains and Identify parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions.

Course Outcomes:

After learning the course the students should be able:

1. To describe and apply storage technologies.
2. To identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers.
3. To describe important storage technologies' features such as availability, replication, scalability and performance.
4. To design, analyze and manage clusters of resources.

Course Content:

UNIT I

Introduction to Information Storage Management - Intelligent Storage System (ISS) and its components Implementation of ISS as high-end and midrange storage-arrays. Direct Attached -Storage - Introduction to SCSI.

UNIT II

Introduction to parallel SCSI, SCSI Command Model – Storage Area Networks - Fiber Channel Connectivity, Login types, Topologies.

UNIT III

Storage networking technologies: Network-Attached Storage- General purpose servers vs. NAS Devices - Benefits of NAS, NAS File I/O – NAS Components, Implementation, File Sharing protocols, I/O operations – IPSAN-ISCSI, Components of ISCSI- Content-Addressed Storage.

UNIT IV

STORAGE VIRTUALIZATION: Fixed Content and Archives, Types, Features, Benefits, CAS Architecture, object storage and Retrieval, examples - Storage Virtualization-forms of virtualization, SNIA Taxonomy – Storage virtualization configurations, challenges, Types of storage virtualization -

Business Continuity- Overview of emerging technologies such as Cloud storage, Virtual provisioning, Unified Storage, FCOE, FAST.

UNIT V

BUSINESS CONTINUITY AND RECOVERY: Information Availability, BC Terminology, Life cycle, Failure analysis - Backup and Recovery- Backup purpose, considerations, Backup Granularity, Recovery considerations- Backup methods, process, backup and restore operations , Overview of emerging technologies - duplication, offsite backup.

UNIT VI

STORAGE SECURITY AND MANAGEMENT: Storage security framework, Securing the Storage infrastructure Risk triad - Managing the storage infrastructure, Monitoring the storage infrastructure, identify key parameters and components to monitor in a storage infrastructure List key management activities and examples Define storage management standards and initiative-Industry trend.

Text Books

1. EMC Corporation, ***“Information Storage and Management”***, Wiley India, 1st Edition, 2009.

Reference Books:

1. IBM, ***“Introduction to Storage Area Networks and System Networking”***, 5th edition, November 2012.
2. Robert Spalding, ***“Storage Networks: The Complete Reference”***, Tata McGraw Hill, Osborne, 6th reprint 2003.
3. Marc Farley, ***“Building Storage Networks”***, Tata McGraw Hill, Osborne, 1st Edition, 2001.
4. Tom Clark, ***“Designing Storage Area Networks -A Practical Reference for Implementing Fiber Channel and IP SANs”,*** Tata McGraw Hill 2003, 2nd edition.

Course Title:	**Network Management**	**Semester V**	
Course Code	**BTITSE505D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Network**	**Credits**	**3**

Course Objectives:

1. To understand the principles of network management, different standards and protocols used in managing complex networks.
2. To understand the automation of network management operations and making use of readily available network management systems.

Course Outcomes:

After learning the course the students should be able:

1. To acquire the knowledge about network management standards (OSI and TCP/IP).
2. To acquire the knowledge about various network management tools and the skill to use them in monitoring a network.
3. To analyze the challenges faced by Network managers.
4. To evaluate various commercial network management systems and open network management systems.
5. To analyze and interpret the data provided by an NMS and take suitable actions.

Course Content:

UNIT I

Data communication and network management overview: Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT II

SNMPV1 network management, Managed network: Organization and Information Models. Managed network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.

UNIT III

SNMPV1 Network Management: Communication and Functional Models, The SNMP Communication Model, Functional model. SNMP MANAGEMENT: SNMPv2 Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

SNMP MANAGEMENT: RMON: What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT IV

Telecommunication management network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.

UNIT V

Network management tools and systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management and Enterprise Management Solutions.

UNIT VI

Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network , Future Directions. Case Studies:

Text Books:

1. Mani Subrahmanian, ***"Network Management Principles and Practice"***, Pearson Education, 2nd Edition, 2010.

Reference Books:

1. Morris, ***"Network management"***, Pearson Education, 1st Edition, 2008.
2. Mark Burges, ***"Principles of Network System Administration"***, Wiley DreamTech, 1st Edition, 2008.

Course Title:	**Data Visualisation**	**Semester V**	
Course Code	**BTITSE505E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. Learn and understand the importance of data visualization.
2. Learn what is user experience in data visualization and its importance.
3. Learn about basic and advance chart types used in data visualization.
4. Learn the psychology of visualization with Gestalt Principles.

Course Outcomes:

After learning the course the student will be able:

1. Get a solid understanding of how people work in data visualization project.

Course Content:

UNIT I

The seven stages of Data Visualization: Why data display requires planning, An example, Iteration and Combination, Principles.

Getting Started with Processing: Sketching with processing, Example and Distributing your work, Examples and references, Functions, Sketching and Scripting

Mapping: Drawing a Map, Locations on map, Data on Map, Using your own data, Next step.

UNIT II

Time series:

Milk, Tea, and Coffee (Acquire and parse), Cleaning the table(Filter and Mine), A simple plot(Represent and refine), Labeling the current data set(Refine and Interact), Drawing Axis labels(Refine), Choosing a proper representation(Represent and refine), Using rollovers to Highlights points(Interact), Ways to connect points(refine), Text labels as tabbed panes(Interact), Interpolation between data sets(Interact).

UNIT III

Connections and Correlations:

Changing data sources, Problem statement, Preprocessing, Using the processed data(Acquire, Parse Filter and Mine), Displaying the results(Represent), Returning to the questions(Refine), Sophisticated sorting: Using salary as a Tiebreaker(Mine), Moving to multiple days(Interact), Smoothing out Interaction(Refine), Deployment Consideration(Acquire, Parse, filter).

UNIT IV

Scatterplot Maps: ++Preprocessing, Loading the data(Acquire and Parse), Drawing a scatterplot of Zip codes(Mine and represent), Highlighting Points while typing(Refine and Interact), Show the currently selected points(refine), Progressively Dimming and Brightening points(Refine), Zooming In (Interact),Changing How Points are Drawn when Zooming (Refine), Development issues(Acquire and Refine)

UNIT V

Trees, Hierarchies, and Recursion: Using recursion to build a Directory Tree, Using a Queue to Load Asynchronously (Interact), An improving the TreeMaps Display (Refine), Flying through files(Interact).

Networks and Graphs: A simple graph Demo, A more complicated Graph, Approaching Network Problem, Advanced graph example, Mining additional example.

UNIT VI

Acquiring Data:Where to find data, Tools for Acquiring data from Internet, Loading files for use with processing, Loading text data, Dealing with files and folders, Listing files in folders, Asynchronous Image download, Using openStream() As a bridge to Java, Dealing with Byte arrays, Advanced web techniques, Using Databases, Dealing with large number of files.

Parsing Data**:** Levels of efforts, Tools for gathering clues, Text is Best, Text Markup language, Regular expressions(regexps), Grammars and BNF Notations, Compressed Data, Vectors and Geometry, Binary data formats, Advanced detective work.

Text Books:

1. Ben Fry, ***“Visualizing Data: Exploring and Explaining data with Processing Environment”***, Shroff/O’Reilly Media, 2016

Reference Books:

1. Scott Murray, ***“Interactive Data Visualization for the web”***, Shroff/O’Reilly Media, 2016.
2. Julia Steele, Noah Lliinsky, ***“Designing Data Visualizations”***, Shroff/O’Reilly Media, 2012.
3. Kyran Dale, ***“Data Visualization with Python and JavaScript: Scrape, Clean, Explore & Transform your data”***, Shroff/O’Reilly Media, 2016.
4. Julia Steele, Noah Lliinsky, ***“Beautiful Visualization”***, Shroff/O’Reilly Media, 2016.

Course Title:	**Seminar**	**Semester V**	
Course Code	**BTITS506**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 2 – 0**
Stream	**Core**	**Credits**	**2**

Seminar topic is included to enable the students to apply their knowledge to understand advanced technologies, designs etc. Literature survey may help to select such topics which are invaluable to an engineer in an Information Technology industry. It will encourage students to develop their presentation skills, good communication skills and skills of collecting the correct information regarding the technical topic.

The students will be able to deliver seminar with useful information. He/she should under-stand the technologies, designs and skills of writing technical report, to do literature survey and to attempt the queries from examiner.

Course Title:	**Programming Lab – Minor(R programming)**	**Semester V**	
Course Code	**BTITL507**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn R programming.

Lab Experiments List:

1. Download R programming language SDK and setup to run programs.
2. Develop and write a program to declare R variables, constants, operators and reserved words and understand the operator precedence.
3. Write a program to declare and understand the functioning of all the decision and loop constructs like If-Else, While, Break-Next and Repeat.
4. Execute all R functions.
5. Execute program to demonstrate Vectors, Matrix, data frame and factor.
6. Execute programs to test R Objects and Class.
7. Write a program to use and display various graphs and charts in R.
8. Execute programs to use plot in R.

Course Title:	**Database Management Systems Lab**	**Semester V**	
Course Code	**BTITL509**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To design a database adopting the principles of relational database model.
2. To practice and master DDL and DML through SQL.
3. To learn building efficient queries to interact with a database.

Lab Experiments List:

1. Creation of databases and use of SQL commands (DDL, DML and DCL).
2. Suitable exercises to practice SQL commands may be given for Insert, Update and Delete.
3. Write SQL procedure for an application which uses exception handling.
4. Write SQL procedure for an application with cursors.
5. Write SQL for implementing Nested Queries.
6. Write SQL for implementing Join Queries.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write SQL block containing triggers.
9. Write SQL block containing stored procedures.
10. Develop a menu driven, GUI-based database application in any one of the domains such as Banking, Billing, Library management, Payroll, Insurance, Inventory, Healthcare etc. integrating all the features specified in the above exercises.

Course Title:	**Design and Analysis of Algorithms Lab**	**Semester V**	
Course Code	**BTITL510**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To design and develop various algorithms and analyze its efficiency to a specific problem.

Lab Experiments List:

1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
2. Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program.
4. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
5. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
6. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm
7. (b) Implement Travelling Sales Person problem using Dynamic programming.
8. Design and implement a program to find a subset of a given set S = Sl, S2,.....,Sn of n positive integers whose SUM is equal to a given positive integer d. For example, if S = 1, 2, 5, 6, 8 and d = 9, there are two solutions 1, 2,6and 1, 8. Display a suitable message, if the given problem instance doesn't have a solution.
9. Design and implement a program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Course Title:	**Operating Systems**	**Semester VI**	
Course Code	**BTITC601**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To study the basic concepts and functions of operating systems.
2. To understand the structure and functions of OS.
3. To learn about Processes, Threads and Scheduling algorithms.
4. To understand the principles of concurrency and Deadlocks.
5. To learn various memory management schemes.
6. To study I/O management and File systems.

Course Outcomes:

After learning the course the students should be able:

1. To design various Scheduling algorithms.
2. To apply the principles of concurrency.
3. To design deadlock, prevention and avoidance algorithms.
4. To compare and contrast various memory management schemes.
5. To design and Implement a prototype file systems.

Course Content:

UNIT I

Operating System Structures: Definition, Types of operating system, Real time operating system, System components, Sys-tem services, Systems calls, System programs, System structure, Virtual machines, System design and implementation.

UNIT II

Processes and CPU scheduling: Process concept, Process scheduling, Operation on a process, Co-operating processes, Threads, Interprocess communication, Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling, Scheduling algorithms and performance evaluation.

UNIT III

Process Synchronization: The critical-section problem, Critical regions, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors.

UNIT IV

Deadlocks: Systems model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, Combined approach to deadlock handling.

UNIT V

Memory Management and Virtual Memory: Logical versus physical address space, Swapping, Contiguous allocation, Paging, Segmentation with paging, Demand paging, Page replacement algorithms, Thrashing.

UNIT VI

File Management: File system and secondary storage devices, Real-time operating systems.

Text Books

1. A. Silberschatz, P. Galvin, ***"Operating System Concepts"***, Wiley Publication, 9th Edition, 2013.
2. A. S. Tanenbaum, H. Bos, ***"Modern Operating Systems"***, Pearson Education, 4th Edition, 2015.

Reference Books:

1. D.M. Dhamdhere, ***"Systems Programming and Operating Systems"***, Tata McGraw Hill Publication, 2nd Edition, 2001.
2. G. Nutt, ***"Operating Systems Concepts"***, Addison Wesley Publication, 3rd Edition.
3. H. M. Deitel, ***"An Introduction to Operating Systems"***, Addison Wesley Publication, 1990.

Course Title:	**Compiler Construction**	**Semester VI**	
Course Code	**BTITC602**	**Course Type**	**Elective**
Pre-requisite	**Data Structures**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To introduce the major concept areas of language translation and compiler design.
2. To develop an awareness of the function and complexity of modern compilers.
3. To provide practical, hands on experience in compiler design.

Course Outcomes:

After learning the course the students should be able:

1. To understand the major concept areas of language translation and compiler design.
2. To develop an awareness of the function and complexity of compilers.
3. To identify the similarities and differences among various parsing techniques and grammar transformation techniques.

Course Content:

UNIT I

Introduction to Compiling and Lexical Analysis: Definition, analysis of the source program, the phases of a compiler, the grouping of phases, Compiler-Construction tools, The role of the Lexical analyzer, Input buffering, Specification of Tokens, A Language for Specifying Lexical Analyzers, Design of a Lexical Analyzer generator.

UNIT II

Syntax Analysis: The role of the Parser, Context-free grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Operator-precedence Parsing, LR-Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III

Syntax-Directed Translation: Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed definitions, Top-Down Translation, Bottom-Up Evaluation of Inherited attributes.

UNIT IV

Intermediate Code Generation: Intermediate Languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Back patching, Procedure Calls.

UNIT V

Code Generation: Issues in the Design of a Code Generator, The target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use Information, Simple Code Generator, Register allocation and Assignment, The DAG Representation of Basic Blocks, Generating Code from DAGs, Dynamic Programming, Code-Generation Algorithm, Code-Generators.

UNIT VI

Code Optimization: Peephole optimization, principal sources of optimization, introduction to Global data flow analysis.

Text Books:

1. Aho, Sethi, Ullman, ***“Compilers-Tools and Techniques”***, Pearson, 2nd Edition, 2011.
2. Tremblay, Sorenson, ***“Theory and Practice of Compiler Writing”***, McGraw Hill Publication.
3. Hopcroft, ***“Introduction to Automata Theory, Languages and Computation”***, Pearson Publication.

Reference Books:

1. Paul G. Sorenson, ***“Compiler Writing”***, Tata McGraw Hill.
2. Robin Hunter, ***“The Essence of Compilers”***, Pearson Publication, 1998.

Course Title:	**Object Oriented Software and Web Engineering**	**Semester VI**	
Course Code	**BTITC603**	**Course Type**	**Mandatory**
Pre-requisite	**Object Oriented Paradigm with C++**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn the concept of Object Oriented Software Development Process.
2. To get acquainted with UML Diagrams.
3. To understand Object Oriented Analysis Processes.
4. Understand the characteristics of web application.
5. Learn to Model web applications.
6. Be aware of Systematic methods.
7. Be familiar with the testing techniques for web applications.

Course Outcomes:

After learning the course the students should be able:

1. To understand Object Oriented Software Development Process.
2. To gain exposure to Object Oriented Methodologies & UML Diagrams.
3. To apply Object Oriented Analysis Processes for projects.
4. Apply the characteristics of web applications.
5. Model web applications.
6. Design web applications.
7. Test web applications.

Course Content:

UNIT I

Object Basics, Object oriented philosophy, objects, classes, attributes, object behavior and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence.. Object oriented systems development life cycle: Software development process, building high quality software, use- case driven approach, reusability.

UNIT II

Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, and the unified approach. Unified modeling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modeling, packages, UML extensibility and UML Meta model.

UNIT III

Object Oriented Analysis Process: Business object analysis, use-case driven object oriented analysis, business process modeling, use-case model, developing effective documentation, case study. Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes.

UNIT IV

Identifying Object Relationships, Attributes and Methods: Association, super-subclass relationships, a-part of relationships, case study, class responsibility, Defining attributes for vianet bank objects, object responsibility, defining methods for vianet bank objects Design process and design axioms: Corollaries, design patterns.

Designing Classes: UML object constraint languages, designing classes, class visibility, refining attributes for the vianet bank objects, designing methods and protocols, designing methods for the vianet bank objects, packages and managing classes. Designing access layer, Designing view layer, macro level process.

UNIT V

Introduction to Web Engineering and requirement engineering: Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering – Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools.

Web Application Architecture and Modelling Web Applications: Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Relation to Content, Hypertext, and Presentation Modeling

UNIT VI

Web Application Design: Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.

Testing Web Applications: Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability

Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation.

Web Project Management: Understanding Scope, Refining Framework Activities, Building a Web Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project, Introduction to node JS – web sockets.

Text Books

1. Ali Bahrami, ***"Object Oriented Systems Development using the Unified Modeling Language"***, McGraw Hill, Reprint, 2009.
2. Craig Larman, ***"Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development"***, Pearson Education, 3rd Edition, 2005.
3. Gerti Kappel, Birgit Proll, ***"Web Engineering"***, John Wiley and Sons Ltd, 2006.
4. Roger S. Pressman, David Lowe, ***"Web Engineering"***, Tata McGraw Hill Publication, 2007.
5. Guy W. Lecky-Thompson, ***"Web Programming"***, Cengage Learning, 2008.

Reference Books:

1. Bernd Oestereich, ***"Developing Software with UML, Object-Oriented Analysis and Design in Practice"***, Addison-Wesley, 2000.
2. James Rumbaugh, Ivar Jacobson, Grady Booch, ***"The Unified Modeling Language Reference Manual"***, Addision Wesley, 2nd Edition, 2005
3. Simon Bennett, Steve Mc Robb and Ray Farmer, ***"Object Oriented Systems Analysis and Design Using UML"***, McGraw Hill Education, 4th Edition, 2010.
4. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, ***"Design Patterns: Elements of Reusable Object-Oriented Software"***, Addison-Wesley, 1995.
5. Chris Bates, **"Web Programming: Building Internet Applications"**, Third Edition, Wiley India Edition, 2007.
6. John Paul Mueller, **"Web Development with Microsoft Visual Studio 2005"**,Wiley Dream tech, 2006.

Course Title:	**Enterprise Resource Planning**	**Semester VI**	
Course Code	**BTITOE604A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To introduce to enterprise systems and show how organizations use enterprise systems to run their operations more efficiently and effectively.
2. To learn about the critical success factors and implementation strategies that lead to enterprise system success.
3. To learn about the informational, knowledge, and decision-making opportunities afforded by enterprise systems.
4. To examine typical Enterprise Systems modules: materials management (MM), supply chain management (SCM), customer relationship management (CRM), financials, projects, human resource management (HRM).

Course Outcomes:

After learning the course the students should be able:

1. To demonstrate a good understanding of basic issues in Enterprise Systems.
2. To explain the scope of common Enterprise Systems (e.g., MM, SCM, CRM, HRM, procurement).
3. To explain the challenges associated with implementing enterprise systems and their impacts on organizations.
4. To describe the selection, acquisition and implementation of enterprise systems.
5. To use one of the popular ERP packages to support business operations and decision-making.
6. To communicate and assess an organization’s readiness for enterprise system implementation with a professional approach in written form.
7. To demonstrate an ability to work independently and in a group.

Course Content:

UNIT I

Enterprise Resource Planning: Introduction, Disadvantages of non-ERP systems, What Is ERP? Need of ERP, Advantage of ERP, Risks of ERP, Growth of ERP.

UNIT II

ERP Modules: Finance, Production Planning, Control and Management, Sales and Distribution, Human Resource Management, Inventory Control System, Quality Management, Plant Maintenance.

UNIT III

ERP Implementation: ERP Implementation (Transition) strategies, ERP Implementation Life Cycle, Implementation Methodologies, Evaluation and selection of ERP package, ERP Project Team: Vendors, Employees, Consultants, Training & Education, Project management & Monitoring, Post Implementation Activities, Operation & maintenance of ERP system, Measuring the Performance of ERP System, Success & failure factors of an ERP, Implementation.

UNIT IV

ERP Market and Vendors: ERP Marketplace and Marketplace Dynamics, Comparison of Current ERP Packages and Vendors, like; SAP, Oracle, PeopleSoft, BAAN etc.

UNIT V

ERP and related technologies: Business Process Re-Engineering (BPR), Information Systems -Management Information, System (MIS), Decision Support System (DSS), Executive Support System (ESS) Data Warehousing, Data Mining, On-Line Analytical Processing (OLAP), Supply Chain Management, Customer Relationship Management

UNIT VI

ERP Case Studies: ERP systems implemented in – for example :TISCO, SKF Automotive Bearings Co. Ltd, Qualcomm CDMA, California, Post Implementation review of ERP packages – in, Manufacturing, Services and Others Organizations, Customization of ERP for different types of Industries.

Text Books

1. Alexis Leon, ***“ERP Demystified”***, TMH New Delhi, 2nd Edition.
2. V. K. Garg & N. K. Venkita Krishnan, ***“ERP Ware: ERP Implementation Framework”***, PHI.

Reference Books:

1. V. K. Garg & N. K. Venkita Krishna, ***“ERP Concepts & Planning”***, PHI, 2nd Edition.

Course Title:	**Decision Support Systems**	**Semester VI**	
Course Code	**BTITOE604B**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To select appropriate modeling techniques for supporting semi-structured business decision making.
2. To identify and select appropriate decision support systems for generating innovative business solutions.
3. To design and implement decision support systems for generating innovative business solutions.

Course Outcomes:

After learning the course the students should be able:

1. To recognize the relationship between business information needs and decision making.
2. To appraise the general nature and range of decision support systems.
3. To appraise issues related to the development of DSS.
4. To select appropriate modeling techniques.
5. To analyze, design and implement a DSS.

Course Content:

UNIT I

Basic Concepts: Decision making systems, Modeling and support, Basics and definition Systems models, Modeling process, Decision making, Intelligence phase, Design phase Choice phase, Evaluation, Implementation phase, Alternative decision making models, Decision support systems, Decision makers, Case applications.

UNIT II

Decision Support System Development: Decision support system development, Basics, Life cycle, Methodologies, Prototype, Technology levels and tools, Development platforms, Tool selection, Developing DSS, Enterprise systems, Concepts and definition, Evolution of information systems, Information needs, Characteristics and capabilities, Comparing and integrating EIS and DSS, EIS data access, Data warehouse, OLAP, Multidimensional analysis, Presentation and the Web, Including soft information enterprise on systems, Organizational DSS, Supply and value chains, Decision support, Supply chain problems and solutions, Computerized systems. MRP, ERP, SCM, Frontline decision support systems.

UNIT III

Knowledge Management: Organizational learning and memory, Knowledge management, Development Methods, Technologies and tools, Success , Knowledge management and artificial intelligence, Electronic Document Management, Knowledge Acquisition and Validation, Knowledge Engineering – Scope, Acquisition Methods, Interviews, Tracking Methods, Observation and other Methods, Grid Analysis, Machine Learning, Rule Induction, Case-Based Reasoning, Neural Computing, Intelligent Agents, Selection of an appropriate Knowledge Acquisition Methods, Multiple Experts, Validation and

Verification of the Knowledge Base-Analysis, Coding, Documenting, and Diagramming, Numeric and Documented.

UNIT IV

Knowledge Acquisition, Knowledge Acquisition and the Internet/Intranets, Knowledge Representation Basics, Representation in Logic and other Schemas, Semantic Networks, Production Rules, Frames, Multiple Knowledge Representation, Experimental Knowledge Representations, Representing Uncertainty. Intelligent System Development: Inference Techniques, Reasoning in Artificial Intelligence, Inference with Rules, Inference Tree, Inference with Frames, Model Based and Case Based Reasoning, Explanation and Meta Knowledge, Inference with Uncertainty, Representing Uncertainty, Probabilities and Related Approaches, Theory of Certainty, Approximate Reasoning using Fuzzy Logic

UNIT V

Intelligent Systems Development, Prototyping, Project Initialization, System Analysis and Design, Software Classification, Building Expert Systems with Tools, Shells and Environments, Software Selection, Hardware, Rapid Prototyping and a Demonstration Prototype, System Development, Implementation, Post Implementation.

UNIT VI

Management Support Systems: Implementing and Integrating Management Support Systems, Implementation, Major Issues, Strategies, System Integration, Generic Models MSS, DSS–ES, Integrating EIS, DSS and ES, Global Integration, Intelligent DSS, Intelligent Modeling and Model Management, Examples of Integrated Systems, Problems and Issues in Integration.

Text Books

1. Efrain Turban and Jay E. Aronson, “***Decision Support Systems and Intelligent Systems”***, Pearson Education, 6th Edition,2001.

Reference Books:

1. Ganesh Natarajan and Sandhya Shekhar, ***“Knowledge Management Enabling Business Growth”***, Tata McGraw Hill, 2002.
2. George M. Marakas, ***“Decision Support System”***, Prentice Hall, India, 2003.
3. Efrem A. Mallach, ***“Decision Support and Data Warehouse Systems”***, Tata McGraw, Hill, 2002.
4. Kimiz Dalkir, ***“Knowledge Management: Theory and Practice”***, Elsevier Science, 2005.
5. Becerra Fernandez and Laidener, ***“Knowledge Management: An Evolutionary View”***, PHI, 2009.

Course Title:	**Software Project Management**	**Semester VI**	
Course Code	**BTITOE604C**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

UNIT I

Project Evaluation and Planning - Activities in Software Project Management, Overview of Project Planning, Stepwise planning, contract management, Software processes and process models.

UNIT II

Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation. Project costing, COCOMO 2, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb, Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Hazard Identification, Hazard Analysis, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

UNIT III

Monitoring And Control- Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control

UNIT IV

Software Configuration Management (SCM), Managing Contracts, Types Of Contracts, Stages In Contract Placement, Typical Terms of A Contract, Contract Management and Acceptance.

UNIT V

Quality Management and People Management- Introduction, Understanding Behavior, Organizational Behaviour, Selecting The Right Person For The Job, Motivation, The Oldman – Hackman Job Characteristics Model , Working in Groups, Organization and team structures, Decision Making, Leadership, Organizational Structures, Stress, Health and Safety. ISO and CMMI models, Testing, and Software reliability, test automation.

UNIT VI

Overview of project management tools.

Text Books:

1. Bob Hughes, Mike Cotterell, ***"Software Project Management"***, Tata McGraw Hill, 2009.

Reference Books:

2. Royce, ***"Software Project Management"***, Pearson Education, 2005.
3. Robert K. Wysocki, ***"Effective Software Project Management"***, Wiley, 2006.

Course Title:	**Software Testing**	**Semester VI**	
Course Code	**BTITSE605A**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application & Development**	**Credits**	**3**

Course Objectives:

1. To study fundamental concepts in software testing, including software testing objectives, processes, criteria, strategies, and methods.
2. To learn planning of a test project, designing test cases and test data, conducting test operations, managing software problems and defects, and generating a test report.
3. To develop an understanding of the meaning and importance of quality in relation to software systems and the software development process.
4. To study issues and techniques for implementing and managing software quality assurance processes and procedures.

Course Outcomes:

After learning the course the students should be able:

1. To apply software testing knowledge and its processes to software applications.
2. To identify various software testing problems.
3. To solve software testing problems by designing and selecting software test models, criteria, strategies and methods.
4. To apply the techniques learned to improve the quality of software development.
5. To prepare a software quality plan for a software project.

Course Content:

UNIT I

Principles of Testing Software development life cycle model: Phases of software project, Quality, Quality assurance and quality control, Testing, Verification and validation, Process models to represent various phases, Life cycle models, Software testing life cycle.

UNIT II

White Box Testing (WBT) and Black Box Testing: Static testing, Structural testing, Challenges in WBT. Black box testing: Black box testing process.

UNIT III

Integration Testing: Definition, As a type of testing: Top-down integration, Bottom-up integration, Bi-directional integration, System integration, Choosing integration method, As a phase of testing, Scenario testing: System scenarios, Use case scenarios, Defect bash.

UNIT IV

System and Acceptance Testing, Functional Vs non Functional, Functional system testing, Non-functional system testing, Acceptance testing.

UNIT V

Performance testing, Regression testing, Internationalization testing, Adhoc testing. Factors governing performance of testing, Methodology, tools and process for performance testing. Regression Testing: Introduction, Types of Regression testing, Regression testing process. Adhoc testing: Introduction, Buddy testing, Pair testing, exploratory testing, Iterative testing, Agile and Extreme testing, XP work flow, Defect seeding.

UNIT VI

Testing Object Oriented Software: Introduction, Comparison of object oriented and procedural software, Sys-tem testing example, Unit testing of classes, Tools for testing object oriented software, Testing web applications.

Text Books

1. Srinivasan Desikan, Gopalaswamy Ramesh, ***“Software Testing: Principles and Practices”***, Pearson publication, 2nd Edition, 2006.

Reference Books:

1. Loise Tamres, ***“Introducing Software Testing”***, Pearson publication, 2002.
2. Boris Beizer, ***“Software Testing Techniques”***, Dreamtech press, 2nd Edition, 2014

Course Title:	**Data Storage Technologies & Networks**	**Semester VI**	
Course Code	**BTITSE605B**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols,, Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To gain knowledge and understand the design of a Data Centre.
2. To understand the best practice of design in the Data Centre.
3. To learn the options in the running of an efficient Data Centre.
4. To understand the value of data to a business, Information Lifecycle.
5. To understand the challenges in data storage and data management.
6. To learn solutions available for data storage.

Course Outcomes:

After learning the course the students should be able:

1. To explain the design of a data center and storage requirements.
2. To discuss the various types of storage and their properties.
3. To explain physical and virtualization of storage.
4. To explain the backup, archiving with regard to recovery and business continuity.

Course Content:

UNIT I

DATA CENTRE: Introduction, Site Selection and Environmental Considerations, Hierarchical or Layered Architecture, Architect Roles, Goals and Skills, Architecture Precursors.

UNIT II

DATA CENTRE DESIGN: Architecture Design and Standards Recommendations, Raised Access Floor and Design Best Practices, connecting the infrastructure with copper and fiber. IT Hardware, Cooling System Options and Environmental Control, Electrical Power Systems, Room Layout, Fire Protection and Security Systems, Building Automation and Energy Management Systems, Commissioning and Handover.

UNIT III

STORAGE MANAGEMENT: Introduction to Storage Technology, Storage Systems Architecture, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their functions, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Integrated and Modular storage systems, high-level architecture and working of an intelligent storage systems.

UNIT IV

NETWORKED STORAGE: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Need for long-term archiving solutions and describe how CAS fulfill the need, Appropriateness of the different networked storage options for different application environments.

UNIT V

Managing Data Center: Reasons for planned/unplanned outages, Impact of downtime, Difference between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity Remote replication technologies and their role in providing disaster recovery and business continuity capabilities, Key areas to monitor in a data center, Industry standards for data center monitoring and Management Key metrics to monitor storage infrastructure.

UNIT VI

Securing Storage and Storage Virtualization: Information Security, Critical security attributes for information systems, Storage security domains, Analyze the common threats in, each domain, Storage Virtualization: Forms, Configurations and Challenges, Types of Storage Virtualization: Block-level and File-Level.

Text Books

1. Mauricio Arregoces, ***“Data Center Fundamentals”***, Cisco Press, 1st edition, 2003.
2. Robert Spalding, ***“Storage Networks: The Complete Reference”***, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, ***“Building Storage Networks”***, Tata McGraw Hill, Osborne. 2001.
4. Meeta Gupta, ***“Storage Area Network Fundamentals”***, Pearson Education Limited, 2002

Reference Books:

1. G. Somasundaram, Alok Shrivastava, ***“Information Storage and Management”***, EMC Education Series, Wiley Publishing Inc., 2011.
2. Gustavo Santana, ***“Data Center Virtualization Fundamentals: Understanding Techniques and Designs for Highly Efficient Data Centers with Cisco Nexus, UCS, MDS, and Beyond”***, Cisco Press, 1st Edition, 2013

Course Title:	**Service Oriented Architecture**	**Semester VI**	
Course Code	**BTITSE605C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To gain understanding of the basic principles of service orientation.
2. To learn service oriented analysis techniques.
4. To learn technology underlying the service design.
5. To learn advanced concepts such as service composition, orchestration and Choreography.
6. To know about various WS specification standards.

Course Outcomes:

After learning the course the students should be able:

1. Build applications based on XML.
2. Develop web services using technology elements.
3. Build SOA-based applications for intra-enterprise and inter-enterprise applications.

Course Content:

UNIT I

Introducing SOA: Fundamental SOA: Common Misperceptions about SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA, The Evolution of SOA:-from XML to Web services to SOA, The continuing evolution of SOA, The roots of SOA. Web Services and Primitive SOA: The Web services framework-Services, Service descriptions, messaging with SOAP.

UNIT II

Web Services and Contemporary SOA: Message exchange patterns- Service activity-coordination-Atomic transactions-Business activities-Orchestration-Choreography- Web Services and Contemporary SOA: Addressing- Reliable messaging-Correlation- Policies- Metadata exchange- Security- Notification and eventing.SOA and Service-Orientation: Principles of Service - Anatomy of a service-oriented architecture- Common principle of service orientation-Service Layers –Service orientation.

UNIT III

Building SOA: SOA Delivery Strategies- SOA delivery lifecycle phases. Service-Oriented Analysis: Introduction to service-oriented analysis-Benefits of a business-centric SOA- Deriving business services-Service-Oriented Analysis: Service modeling, Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches.

UNIT IV

Service-Oriented Design: Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface, design tools. SOA Composition Guidelines: Steps to composing SO Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions.

UNIT V

SOA Service Design: - Overview-Service design of business service, application service, task centric service and guidelines. SOA Business Process Design: WS-BPEL language basics-WS Coordination.

UNIT VI

SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)-Web Services Interoperability Technologies (WSIT)

Text Books

1. Thomas Erl, ***"Service-Oriented Architecture: Concepts, Technology, and Design"***, Pearson Education, 2006.
2. Frank. P. Coyle, ***"XML, Web Services And The Data Revolution"***, Pearson Education, 2002.
3. Sandeep Chatterjee, James Webber, ***"Developing Enterprise Web Services. An Architect's Guide"***, Pearson Education, 2005.
4. Eric Newcomer, Greg Lomow, ***"Understanding SOA with Web Services"***, Pearson Education, 2005.
5. Ron Schmelzer et al. ***"XML and Web Services"***, Pearson Education, 2002

Reference Books:

1. Dan woods and Thomas Mattern, ***"Enterprise SOA designing IT for Business Innovation"***, O'REILLY, 1st Edition, 2006.
2. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, ***"Java Web. Services Architecture"***, Morgan Kaufmann Publishers, 2003.
3. Atul Kahate, ***"XML and Related technologies"***, Pearson Education, 2008.
4. Kennard Scibner and Mark C. Stiver, ***"Understanding SOAP"***, SAMS publishing.
5. B. V. Kumar, S. V. Subrahmanya, ***"Web Services: An Introduction"***, TMH India, 2nd Edition, 2012.

Course Title:	**Network Programming**	**Semester VI**	
Course Code	**BTITSE605D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols, Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Network**	**Credits**	**3**

Course Objectives:

1. To learn the basics of socket programming using TCP Sockets.
2. To learn about Socket Options.
3. To learn to develop Macros for including Objects In MIB Structure.
4. To understand SNMPv1, v2 and v3 protocols & practical issues.

Course Outcomes:

After learning the course the students should be able:

1. To analyze the requirements of a networked programming environment and identify the issues to be solved;
2. To create conceptual solutions to those issues and implement a programming solution;
3. To understand the key protocols that support the Internet;
4. To apply several common programming interfaces to network communication;
5. To understand the use of TCP/UDP Sockets
6. To apply advanced programming techniques such as Broadcasting, Multicasting.

Course Content:

UNIT I

Socket And Application Devlopment: Introduction to Socket Programming - System Calls - Address conversion functions - POSIX Signal Handling - Server with multiple clients - Boundary conditions - Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown - I/O Multiplexing - I/O Models -TCP echo client/server with I/O Multiplexing

UNIT II

Socket Optian: Socket options - getsockopt and setsockopt functions - Generic socket options - IP socket options -ICMP socket options - TCP socket options - Multiplexing TCP and UDP sockets - SCTP Sockets -SCTP Client/server - Streaming Example - Domain name system - gethostbyname, gethostbyaddr, getservbyname and getservbyport functions - Protocol Independent functions in TCP Client/Server Scenario

UNIT III

Advanced Socket: IPv4 and IPv6 interoperability - Threaded servers - Thread creation and termination - TCP echo server using threads - Mutex - Condition variables - Raw sockets - Raw socket creation - Raw socket output - Raw socket input - ping program - traceroute program

UNIT IV

Simple Network Management: SNMP network management concepts - SNMPv1 - Management information - MIB Structure – Object syntax - Standard MIB’s - MIB-II Groups - SNMPv1 protocol and Practical issues.

UNIT V

SNMP V2, V3 and RMO: Introduction to SNMPv2 - SMI for SNMPV2 - Protocol - SNMPv3 - Architecture and applications -Security and access control model - Overview of RMON.

UNIT VI

Protocols, Sessions, State, and Implementing Custom Protocols State vs. Stateless, Methods for Maintaining State, What Is a Protocol? Designing a Custom Protocol, Our Chat Protocol, Protocol Registration

Elementary Name, Address Conversions and design decisions Domain Name System, gethostbyname Function, RES_USE_INET6 Resolver Option, gethostbyname2 Function and IPv6 Support, gethostbyaddr Function, uname Function, gethostname Function, getservbyname and getservbyport Functions

Text Books

1. W. Richard Stevens, ***“UNIX Network Programming Vol-I”***, Addison-Wesley Professional, 3rd Edition, 2003.
2. William Stallings, ***“SNMP, SNMPv2, SNMPv3 and RMON 1 and 2”***, Pearson Edition, 3rd Edition, 2009.

Reference Books:

1. D.E. Comer, ***“Internetworking with TCP/IP Vol- III: Client-Server Programming and Application BSD Sockets Version”***, Pearson Edition, 2nd Edition, 2003.

Course Title:	**Advanced Database Technology**	**Semester VI**	
Course Code	**BTITSE605E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To learn the various types of databases and their advanced applications.
2. To understand how and where databases are used in industry.
3. To examine the requirements on special databases.
4. To learn complex queries and interface them with applications.

Course Outcomes:

After learning the course the students should be able:

1. To explain how databases are used in various fields of industry.
2. To apply query evaluation techniques and query optimization techniques.
3. To develop transaction processing systems with concurrency control.
4. To design and develop a database application system as part of a team.
5. To explore open issues in advanced databases.

Course Content:

UNIT I

PARALLEL AND DISTRIBUTED DATABASES: Database System Architectures: Centralized and Client-Server Architectures – Server System, Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

UNIT II

OBJECT AND OBJECT RELATIONAL DATABASES: Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL /Oracle – Case Studies.

UNIT III

XML DATABASES: XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC– Information Retrieval – Data Warehousing – Data Mining.

UNIT IV

MOBILE DATABASES: Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes.

UNIT V

INTELLIGENT DATABASES: Active databases – Deductive Databases – Knowledge bases – Multimedia Databases-Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

UNIT VI

COMPLEX QUERIES AND REASONING: Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Datalog – Fix-point semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues.

Text Books

1. Carlo Zaniolo, Stefano Ceri, ***“Advanced Database Systems”***, Morgan Kauffmann Publishers.
2. Subramaniam, ***“Multimedia Databases”***, Morgan Kauffman Publishers, 2008.
3. Rajesh Narang, ***“Object Oriented Interfaces and Databases”***, Prentice-Hall of India, Pvt. Ltd., 2004.
4. Thomas Cannolly and Carolyn Begg, ***“Database Systems, A Practical Approach to Design, Implementation and Management”***, Pearson Education, 3rd Edition, 2007.
5. Jeffrey A. Hoffer, Mary B. Prescottand Fred R. McFadden, ***“Modern Database Management”***, Prentice Hall, 2007.

Reference Books:

1. Henry F Korth, Abraham Silberschatz and S. Sudharshan, ***“Database System Concepts”***, McGraw Hill, 6th Edition, 2011.
2. C. J. Date, A. Kannan and S. Swamynathan, ***“An Introduction to Database Systems”***, Pearson Education, 8th Edition,2006.
3. R. Elmasri, S. B. Navathe, ***“Fundamentals of Database Systems”***, Pearson Education/Addison Wesley, 5th Edition, 2007.
4. Ramakrishnan, Gehrke, ***“Database Management System”***, Tata McGraw Hill Publications, 4th Edition.
5. Ramez Elmasri, Sham Navathe, ***“Fundamentals of Database Systems”***, Addison-Wesley, 2000.

Course Title:	**Operating Systems Lab**	**Semester VI**	
Course Code	**BTITL607**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn shell programming and the use of filters in the UNIX environment.
2. To learn to programming in C using system calls.
3. To learn to use the file system related system calls.
4. To process creation and inter process communication.
5. To familiarize with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance.

Lab Experiments List:

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms:
    Round Robin
    SJF
    FCFS
    Priority
4. Implement all file allocation strategies:
    Sequential
    Indexed
    Linked
5. Implement Semaphores.
6. Implement all File Organization Techniques:
    Single level directory
    Two level
    Hierarchical
    DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance.
8. Implement an Algorithm for Dead Lock Detection.
9. Implement e all page replacement algorithms:
    FIFO
    LRU
    LFU
10. Implement Shared memory and IPC.
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications.

Course Title:	**Object Oriented Software and Web Engineering Lab**	**Semester VI**	
Course Code	**BTITL608**	**Course Type**	**Mandatory**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn the concept of Object Oriented Software Development Process.
2. To get acquainted with UML Diagrams.
3. To understand Object Oriented Analysis Processes.

Lab Experiments List:

1. Program to implement classes and objects.
2. Program to implement constructors and destructors with array of objects.
3. Program to demonstrate function overloading.
4. Program to implement different types of inheritances like multiple, Multilevel and hybrid.
5. I/O Program to demonstrate the use of abstract classes.
6. Program to demonstrate I/O streams and functions.
7. Program to perform all possible type conversions.
8. Program to demonstrate exception handling technique.
9. Program to implement networking concepts.
10. Program to implement RMI concepts.
11. Program to implement AWT concepts.
12. Program to implement swing concepts.
13. Program to design and implement applet.
14. Program to design and implement JDBC.
15. Program to design an event handling event for simulating a simple calculator.

Course Title:	**Software Testing Lab**	**Semester VI**	
Course Code	**BTITSEL609A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Software Application & Development**	**Credits**	**1**

Lab Experiments Objective:

1. To implement different testing techniques to practical teat and understand their merits and demerits.

Lab Experiments List:

1. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of data flow testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
2. Design, develop, code and run the program in any suitable language to solve the NextDate problem. Analyze it from the perspective of decision table-based testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
3. Design, develop, code and run the program in any suitable object-oriented language to solve the calendar problem. Analyze it from the perspective of OO testing, derive test cases to test the method that increment the date and the method that increments the month., execute these test cases and discuss the test results.
4. Design, develop, code and run the program in any suitable object-oriented language to solve the currency converter problem. Analyze it from the perspective of use case-based system testing, derive appropriate system test cases, execute these test cases and discuss the test results.
5. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
6. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

Course Title:	**Data Storage Technologies & Networks Lab**	**Semester VI**	
Course Code	**BTITSEL609B**	**Course Type**	**Elective**
Pre-requisite	**Computer Networks, Operating Systems**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credits**	**1**

Lab Experiments Objective:

1. Understand the functionalities of storage network administration.
2. Set up a NAS server to support file level data access via the NSF and the CIFS protocols.
3. Set up a SAN server to support the iSCSI protocol for block level data access.
4. Demonstrate ability to design and build a small-scale data center and a small-scale cloud computing environment.
5. Be hand-on with data and network management software.

Lab Experiments List:

1. Install a hard disk on a Linux machine covering all the below activities:
a. Connecting the disk to an HBA (Host Bus Adapter) and BIOS setup for the disk;
b. Partitioning the disk;
c. Creating file systems within disk partitions;
d. Mounting the files systems;
e. Setting up automatic mounting;
f. Labeling disk partitions;
g. Setting up swapping on swap partitions.
2. Use “smartmontools” to monitor the disk performance monitoring and testing:
a. Use “smartctl” to enable S.M.A.R.T. support and offline data collection on the disk;
b. Check the overall health of the disk;
c. Run a self-test on the disk;
d. Set up “smartd” to do tests automatically.
3. Use “hdparm”, “iostat”, and “iometer” tools to measure the performance of different storage devices, such as SATA drive, SCSI drive, and USB drives.
a. Plot graphs to compare read/write and sequential/random access rates among different storage devices.
4. Use Navisphere Manager Simulator to perform management on SAN disk array systems:
a. Configure storage pools and LUNs (Logical Unit Number) for storage groups;
b. Configure snapshots and clones;
c. Create SANCopy full and incremental sessions;
d. Create MirrorView synchronous and asynchronous images;
e. Expand a LUN to create metaLUNs;
f. Migrate a LUN to another LUN.
5. Use Openfiler for network storage configuration management:
a. Configure the Openfiler to support locally attached USB drives;
b. Set up a NAS server to support NSF and CIFS protocols;
c. Set up a SAN server to support an iSCSI protocol.
6. Configure Openfiler as a NAS Server:
a. Configure access control rules and NFS/CIFS shares for the NAS server;
b. Configure the Linux client machine to access the NFS shares on the NAS server;

c. Configure a Windows VM on the Linux client machine to access the CIFS shares on the NAS server;
d. Use Openfiler to set up a SAN server, to supports iSCSI protocol for the block level data access;
e. Configure access control rules for the SAN server and configure iSCSI targets on the server.
7. Use VMware to create virtual disks, Virtual Machine File Systems and provisioning.
a. Use thin and thick provisioning concepts.

Course Title:	**Service Oriented Architecture Lab**	**Semester VI**	
Course Code	**BTITSEL609C**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credits**	**1**

Lab Experiments Objective:

1. To learn to create web services and web service clients.
2. To learn SOAP, UDDI and WSDL platforms.

Lab Experiments List:

1. Write a simple web application program in Java to create web services incorporating:
    a. Development of web service.
    b. Testing the web service.
    c. Developing the client.
    d. Deploying the application.
2. Write a factorial application program in Java to create web services.
3. Implement a Calculator program and calculate Simple and Compound Interest using .Net.
4. Develop an invoice order processing system.
5. Invoke EJB components as Web Service.

Course Title:	**Network Programming Lab**	**Semester VI**	
Course Code	**BTITSEL609D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C**	**L – T – P**	**0 – 0 – 2**
Stream	**Network**	**Credits**	**1**

Lab Experiments Objective:

1. To develop TCP Socket Programming, UDP applications and to implement File Transfer Protocols.
2. To utilize RMI and Routing Algorithms.

Lab Experiments List:

1. Write a socket Program for Echo/Ping/Talk commands.
2. Create a socket (TCP) between two computers and enable file transfer between them.
3. Create a socket (UDP) between two computers and enable file transfer between them.
4. Write a program to implement Remote Command Execution. (Two M/Cs may be used)
5. Write a code simulating ARP /RARP protocols.
6. Create a socket for HTTP for web page upload and download.
7. Write a program for TCP module implementation.(TCP services)
8. Write a program for File Transfer in client-server architecture using following methods.
   a. (a) RS232C (b) TCP/IP
9. Write a program to implement RMI (Remote Method Invocation)
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
   a. Shortest path routing
   b. Flooding
   c. Distance vector
11. Implement client in C and server in Java and initiate communication between them.
12. Using OPNET
   a. Create a scenario with the following specifications.
      i. No of subnets – 2
      ii. No. of nodes – 40
      iii. Traffic
         1. FTP - 11 to 21
         2. FTP - 30 to 40
         3. UDP - 5 to 7
      iv. Routing Protocol – AODV
      v. 802.16, Show the throughput using different bandwidths i.e., 10 Mbps and 100 Mbps respectively.
   b. Create a scenario as described below.

No of students – 2
SN -1 Nodes – 15
SN -2 Nodes - 10
Generate FTP Traffic & HTTP traffic between Nodes 1 to 11 (FTP)
14 to 7 (HTTP / Gen FTP)

- · Trace the packet within the Simulation time and display the Trace file.

Course Title:	**Advanced Database Technology Lab**	**Semester VI**	
Course Code	**BTITSEL609E**	**Course Type**	**Elective**
Pre-requisite	**SQL**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credits**	**1**

Lab Experiments Objective:

1. To learn the various types of databases and their advanced applications.
2. To understand how and where databases are used in industry.
3. To examine the requirements on special databases.
4. To learn complex queries and interface them with applications.

Lab Experiments List:

1. A University wants to track persons associated with them. A person can be an Employee or Student. Employees are Faculty, Technicians and Project associates. Students are Full time students, Part time students and Teaching Assistants.

a. Design an Enhanced Entity Relationship (EER) Model for university database. Write OQL for the following

1. Insert details in each object.
2. Display the Employee details.
3. Display Student Details.
4. Modify person details.
5. Delete person details.

b. Extend the design by incorporating the following information.

Students are registering for courses which are handled by instructor researchers (graduate students). Faculties are advisors to graduate students. Instructor researchers' class is a category with super class of faculty and graduate students. Faculty is having sponsored research projects with a grant supporting instruction researchers. Grants are sanctioned by different agencies. Faculty belongs to different departments. Department is chaired by a faculty. Implement for the Insertion and Display of details in each class.

2. Consider the application for University Counseling for Engineering Colleges. The college, department and vacancy details are maintained in 3 sites. Students are allocated colleges in these 3 sites simultaneously. Implement this application using parallel database [State any assumptions you have made].
3. There are 5 processors working in a parallel environment and producing output. The output record contains college details and students mark information. Implement parallel join and parallel sort algorithms to get the marks from different colleges of the university and publish 10 ranks for each discipline.
4. Create triggers and assertions for Bank database handling deposits and loan and admission database handling seat allocation and vacancy position. Design the above relational database schema and implement the following triggers and assertions.

a. When a deposit is made by a customer, create a trigger for updating customers account and bank account

b. When a loan is issued to the customer, create a trigger for updating customer's loan account and bank account.

c. Create assertion for bank database so that the total loan amount does not exceed the total balance in the bank.

d. When an admission is made, create a trigger for updating the seat allocation details and vacancy position.

5. Construct a knowledge database for kinship domain (family relations) with facts. Extract the following relations using rules.

    Parent, Sibling, Brother, Sister, Child, Daughter, Son, Spouse, Wife, husband, Grandparent, Grandchild, Cousin, Aunt and Uncle.

6. Work with Weka tool classification and clustering algorithms using the given training data and test with the unknown sample. Also experiment with different scenarios and large data set

7. Design XML Schema for the given company database, Department (deptName, deptNo, deptManagerSSN, deptManagerStartDate, deptLocation), Employee (empName, empSSN, empSex, empSalary, empBirthDate, empDeptNo, empSupervisorSSN, empAddress, empWorksOn), Project (projName, projNo, projLocation, projDeptNo, projWorker)

a. Implement the following queries using XQuery and XPath

    i. Retrieve the department name, manager name, and manager salary for every department'
    ii. Retrieve the employee name, supervisor name and employee salary for each employee who works in the Research Department.
    iii. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project.
    iv. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project with more than one employee working on it.

b. Implement a storage structure for storing XML database and test with the above schema.

Teaching and Evaluation Scheme Final year B. Tech. (Information Technology)

Sr. No	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
Semester VII										
1	BTIT701	Cloud Computing and Storage Management	2	-	-	20	20	60	2	2
2	BTITDE702	Open / Departmental Elective - Group 3	3	-	-	20	20	60	3	3
3	BTIT DE703	Open / Departmental Elective - Group 4	3	-	-	20	20	60	3	3
4	BTIT SE704	Stream Elective - Group 3	3	-	-	20	20	60	3	3
5	BTITL705	Cloud Computing and Storage Management Lab	-	-	2		25	25	1	2
6	BTITDEL706	Open / Departmental Elective - Group 3 Lab	-	-	2	-	25	25	1	2
7	BTITSEL707	Stream Elective - Group 3 Lab	-	-	2	-	25	25	1	2
8	BTITP708	Project Phase I	-	-	8	-	50	50	4	8
9	BTIT709	Industrial Training Assessment	-	-	-	-	-	50	2	-
Summary of Semester Assessment Marks, Credit & Hours			**11**	**-**	**14**	**80**	**205**	**415**	**20**	**25**
Semester VIII										
1	BTIT DE801	Open/Departmental Elective - Group 5	3	-	-	20	20	60	3	3
2	BTITSE802	Stream Elective - Group4	3	-	-	20	20	60	3	3
3	BTIT SE803	Stream Elective - Group 5	3	-	-	20	20	60	3	3
4	BTITSE804	Stream Elective - Group 6	3	-	-	20	20	60	3	3
5	BTITDEL805	Open/Departmental Elective - Group 5 Lab	-	-	2		25	25	1	2
7	BTITSEL806	Stream Elective - Group 4 Lab	-	-	2	-	25	25	1	2
8	BTITSEL807	Stream Elective - Group 6 Lab	-	-	2	-	25	25	1	2
9	BTITP808	Project Phase II	-	-	12		50	50	5	12
Summary of Semester Assessment Marks, Credit & Hours			**12**	**-**	**18**	**80**	**205**	**365**	**20**	**30**

List of Open/Departmental Electives – Group 3

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE702A	Pattern Recognition	Nil
2	BTITDE702B	Soft Computing	Nil

List of Open/Departmental Electives – Group 4

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE703A	Natural Language Processing	Nil
2	BTITDE703B	Artificial Intelligence	Nil

List of Stream Electives – Group 3

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE704A	Real Time Systems	Operating Systems, Design and Analysis of Algorithms
2	BTITSE704B	Information Security	Internetworking Protocols
3	BTITSE704C	Management Information Systems	Decision Support Systems
4	BTITSE704D	Distributed Computing	Operating Systems
5	BTITSE704E	Data Warehousing and Data Mining	Database Management Systems

List of Open/Departmental Electives – Group 5

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE801A	Internet of Things	Microprocessor & Microcontrollers
2	BTITDE801B	E-commerce Systems	Nil

List of Stream Electives – Group 4

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE802A	Mobile Computing	Internetworking Protocols, Operating Systems
2	BTITSE802B	Cryptography	Computer Architecture and Organization
3	BTITSE802C	Information Retrieval	Design and Analysis of Algorithms
4	BTITSE802D	Network Security	Internetworking Protocols, Network Programming
5	BTITSE802E	Big Data Analytics	Database Management Systems

List of Stream Electives – Group 5

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE803A	User Experience Design	Software Engineering
2	BTITSE803B	Infrastructure Auditing & Implementation	IT Service Management
3	BTITSE803C	Cyber Law and IPR	Nil
4	BTITSE803D	Optical Networks	Internetworking Protocols
5	BTITSE803E	Web & Text Mining	Data Mining

List of Stream Electives – Group 6

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE804A	Multimedia Applications	Nil
2	BTITSE804B	Ethical Hacking	Operating Systems
3	BTITSE804C	CRM & SCM	Enterprise Resource Planning
4	BTITSE804D	Wireless Networking	Internetworking Protocols
5	BTITSE804E	Machine Learning	Engineering Mathematics

Course Title:	**Cloud Computing and Storage Management**	**Semester VII**	
Course Code	**BTIT701**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Core**	**Credits**	**2**

Course Objectives:

1. To learn the concept of cloud computing.
2. To understand the trade-off between deploying applications in the cloud over local infrastructure.
3. To identify different storage virtualization technologies and their benefits.
4. To understand and articulate business continuity solutions including backup and recovery technologies, local and remote replication solutions.

Course Outcomes:

After learning the course the student will be able:

1. To understand the key dimensions of the challenge of Cloud Computing.
2. To assess the economics, financial and technological implications for selecting cloud computing for organization.
3. To describe and apply storage technologies.
4. To identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers.
5. To describe important storage technology features such as availability, replication, scalability and performance.

Course Content:

UNIT I

Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, Deployment models and service models.

UNIT II

Virtualization: Issues with virtualization, Virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, Virtualization of data centers and Issues with Multi-tenancy.

UNIT III

Implementation: Study of Cloud computing Systems like Amazon EC2 and S3, Google App Engine and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from inside and outside a Cloud Architecture, MapReduce and its extensions to Cloud Computing, HDFS and GFS.

UNIT IV

Storage virtualization: Fixed Content and Archives, Types, Features, Benefits, CAS Architecture, Object storage and retrieval, Examples: Storage Virtualization-forms of virtualization, SNIA Taxonomy – Storage virtualization configurations, Challenges, Types of storage virtualization - Business

Continuity- Overview of emerging technologies such as Cloud storage, Virtual provisioning, Unified Storage, FCOE, FAST.

UNIT V

Business Continuity and Recovery: Information Availability, BC Terminology, Life cycle, Failure analysis: Backup and Recovery- Backup purpose, considerations, Backup Granularity, Recovery considerations- Backup methods, Process, backup and restore operations, Overview of emerging technologies: Duplication, Off site backup.

UNIT VI

Storage security and Management: Storage security framework, Securing the Storage infrastructure, Risk triad: Managing the storage infrastructure, Monitoring the storage infrastructure, identify key parameters and components to monitor in a storage infrastructure, List key management activities and examples, Define storage management standards and initiative-Industry trend.

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, ***“Cloud Computing Principles and Paradigms”***, Wiley Publishers, 2011.
2. Barrie Sosinsky, ***“Cloud Computing Bible”***, Wiley Publishers 2010.
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, ***“Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance”***, O’Reilly 2010.
4. EMC Corporation, ***“Information Storage and Management”***, 1st Edition, Wiley India 2009..

Reference Books:

1. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, ***“Mastering Cloud Computing”***, McGraw Hill, 2013
2. Michael Miller, ***“Cloud Computing : Web-based Applications that change the way you work and collaborate online”***, Pearson Education, 2008
3. IBM, ***“Introduction to Storage Area Networks and System Networking”***, 5th Edition, November 2012.
4. Robert Spalding, ***“Storage Networks: The Complete Reference”***, Tata McGraw Hill, Osborne, 6th reprint 2003.
5. Marc Farley, ***“Building Storage Networks”***, Tata McGraw Hill, Osborne, 1st Edition, 2001.

Course Title:	**Pattern Recognition**	**Semester VII**	
Course Code	**BTITDE702A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To study pattern recognition topics and be exposed to recent developments in pattern recognition research.
2. To provide in-depth design concepts and implementation techniques of pattern recognitions.

Course Outcomes:

1. Identify and explain detailed aspects of internal structures of pattern recognitions.
2. Compare and contrast design issues for statistical pattern recognition.
3. Develop implementation skills for building pattern recognition.

Course Content:

UNIT I

Introduction: Machine Perception, Definition of Pattern Recognition (PR), Pattern Recognition system: Sensing, Segmentation & grouping, Feature extraction, Classification and Post processing, Design cycle: Data collection, Feature choice, Model choice, Training, Evaluation and computational complexity. Learning and adaptation: Supervised learning, Unsupervised learning and Reinforcement learning. Examples of PR Applications, Pattern Recognition Extensions. Machine learning : Components of learning, Learning models, Geometric models, Probabilistic models, Logic models, Grouping and grading, Learning versus design, Theory of learning, Feasibility of learning, Error and noise, Training versus testing, Theory of generalization, Generalization bound, Approximation-generalization tradeoff, Bias and variance, Learning curve.

UNIT II

Statistical Pattern Recognition (StatPR): Introduction to StatPR, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal costs of error, Estimation of error rates, Characteristic curves, Estimating the composition of populations, Introduction to supervised parametric approaches and unsupervised approaches. Cluster analysis: Clustering techniques, Cluster analysis, Cluster validity. Feature selection & extraction: Feature selection criteria, Feature set search algorithm, Feature selection.

UNIT III

Tree Classifiers: (a) Decision Trees: CART, C4.5, ID3, (b) Random Forests, Linear Discriminants, Discriminative Classifiers: the Decision Boundary, (a) Separability, (b) Perceptrons, (c) Support Vector Machines.

UNIT IV

Parametric Techniques: Generative methods grounded in Bayesian Decision Theory (a) Maximum Likelihood Estimation (b) Bayesian Parameter Estimation (c) Sufficient Statistics. Non-Parametric Techniques :(a) Kernel Density Estimators (b) Parzen Window (c) Nearest Neighbor Methods.

UNIT V

Syntactic (Structural) Pattern Recognition (Syntpr): Introduction to SyntPR, Syntactic PR: primitive selection & pattern grammars, Higher dimensional grammars, Syntactic recognition, Automata, Error – correcting parsing, Shape & texture analysis, Image database management. Structural analysis using constraint satisfaction and structural matching, The Formal Language-based approach to SyntPR, Learning/Training in the Language-based Approach (Grammatical Inference). Problem solving methods for PR: Problem solving models, Problem solving algorithms.

UNIT VI

Unsupervised Methods : Exploring the Data for Latent Structure :(a) Component Analysis and Dimension Reduction: i. The Curse of Dimensionality, ii. Principal Component Analysis, iii. Fisher Linear Discriminant, iv. Locally Linear Embedding, (b) Clustering: i. K-Means, ii. Expectation Maximization, iii. Mean Shift. Classifier Ensembles : (a) Bagging, (b) Boosting / AdaBoost, Algorithm Independent, Topics Theoretical Treatments in the Context of Learned Tools: (a) No Free Lunch Theorem, (b) Ugly Duckling Theorem, (c) Bias-Variance Dilemma, (d) Jacknife and Bootstrap Methods.

Text Books:

1. Duda, R.O., Hart, P.E., Stork, D.G. ***"Pattern Classification",*** Wiley, 2nd Edition, 2001.
2. Eart Gose, Richard Johnsonburg and Steve Joust, ***"Pattern Recognition and Image Analysis"***, Prentice-Hall of India-2003.

Reference Books:

1. Bishop, C. M. ***"Pattern Recognition and Machine Learning"*** Springer, 2nd Edition, 2007.
2. Marsland, S., ***"Machine Learning: An Algorithmic Perspective"***, CRC Press. 2009.
3. Theodoridis, S. and Koutroumbas, K., ***"Pattern Recognition"***, 4th Edition, Academic Press, 2008.
4. Russell, S. and Norvig, N., ***"Artificial Intelligence: A Modern Approach",*** Prentice Hall, Series in Artificial Intelligence, 2003.

Course Title:	**Soft Computing**	**Semester VII**	
Course Code	**BTITDE702B**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
2. To gain insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems
3. To create awareness of the application areas of soft computing technique
4. To learn alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system

Course Outcomes:

After learning the course the student will be able:

1. To use a new tool /tools to solve a wide variety of real world problems
2. To find an alternate solution, more adaptable, resilient and optimum
3. To apply knowledge of soft computing domain to real world problems

Course Content:

UNIT I

Artificial Neural Network: Biological neuron, Artificial neuron model, Concept of bias and threshold, McCulloch Pits Neuron Model, Implementation of logical AND, OR, XOR functions. Soft Topologies of neural networks, Learning paradigms: Supervised, Unsupervised, Reinforcement, Linear neuron model: Concept of error energy, Gradient descent algorithm and application of linear neuron for linear regression, Activation functions: Binary, Bipolar (linear, signup, log sigmoid, tan sigmoid) Learning mechanisms: Hebbian, Delta Rule of Perceptron and its limitations.

UNIT II

Artificial Neural Network: Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression of self organizing Feature Maps, Clustering of Learning vector quantization. Radial Basis Function networks: Cover's theorem,Mapping functions (Gaussian, Multi-quadrics, Inverse multiquadrics, Application of RBFN for classification and regression of Hopfield network, Associative memories.

UNIT III

Fuzzy Logic: Concept of Fuzzy number, Fuzzy set theory (continuous, discrete) of operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), Primary and composite linguistic terms, Concept of fuzzy relation, Composition operation (T-norm, T-conorm) of Fuzzy if-then rules.

UNIT IV

Fuzzy Logic: Fuzzification, Membership value assignment techniques, De-fuzzification (Maxmembership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules: Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems: Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

UNIT V

Fuzzy Control Systems: Control system design, Control (Decision) Surface, Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, Advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem.

UNIT VI

Adaptive Neuro-Fuzzy Inference Systems (ANFIS): ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression.

Text Books:

1. Laurene Fausett, ***“Fundamentals of Neural Networks: Architectures, Algorithms And Applications”***, Pearson Education, 2008.
2. Timothy Ross, “***Fuzzy Logic With Engineering Applications”***, 3rd Edition, John Wiley & Sons, 2010.
3. J.S. Jang, C.T. Sun, E. Mizutani, ***“Neuro- Fuzzy and Soft Computing”***, PHI Learning Private Limited.
4. S. N. Sivanandam, S. N. Deepa, ***“Principles of Soft Computing”***, John Wiley & Sons, 2007.

Reference Books:

1. John Hertz, Anders Krogh, Richard Palmer, ***“Introduction to the theory of neural computation”***, Addison –Wesley Publishing Company, 1991.
2. Simon Haykin, ***“Neural Networks A comprehensive foundation”***, Prentice Hall International Inc-1999.
3. José C. Principe Neil R. Euliano , W. Curt Lefebvre, ***“Neural and Adaptive Systems: Fundamentals through Simulations”***, John-Wiley & Sons, 2000.
4. Peter E. Hart, David G. Stork Richard O. Duda, ***“Pattern Classification”***, 2nd Edition, 2000.
5. Sergios Theodoridis , Konstantinos Koutroumbas, ***“Pattern Recognition”***, 4th Edition, Academic Press, 2008.
6. Hung T. Nguyen, Elbert A. Walker, ***“A First Course in Fuzzy Logic”***, 3rd Edition, Taylor & Francis Group, LLC, 2008.
7. S. N. Sivanandam , S. Sumathi, S. N. Deepa, ***“Introduction to Fuzzy Logic using MATLAB”***, Springer Verlag, 2007.

Course Title:	**Natural Language Processing**	**Semester VII**	
Course Code	**BTITDE703A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Open/Departmental**	**Credits**	**3**

Course Objectives:

1. To learn the leading trends and systems in natural language processing.
2. To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
3. To recognize the significance of pragmatics for natural language understanding.
4. To describe simple system based on logic and demonstrate the difference between the semantic presentation and interpretation of that presentation.
5. To describe application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

After learning the course the student will be able:

1. To understand the models, methods and algorithms of statistical Natural Language Processing.
2. To implement probabilistic models in code, estimate parameters for such models and run meaningful experiments to validate such models.
3. To apply core computer science concepts and algorithms, such as dynamic programming.
4. To understand linguistic phenomena and explore the linguistic features relevant to each NLP task.
5. To identify opportunities and conduct research in NLP.
6. To analyze experimental results and write reports.

Course Content:

UNIT I

Introduction to NLP: Definition, Issues and strategies, Application domain, Tools for NLP, Linguistic organization of NLP, NLP vs. PLP.

UNIT II

Word Classes: Review of Regular Expressions, CFG and different parsing techniques. Morphology: Inflectional, derivational, Parsing and parsing with FST, Combinational Rules.

UNIT III

Phonology: Speech sounds, Phonetic transcription,Phoneme and phonological rules, Optimality theory, Machine learning of phonological rules, Phonological aspects of prosody and speech synthesis. Pronunciation, Spelling and N-grams: Spelling errors, Detection and elimination using probabilistic models, Pronunciation variation (lexical, allophonic, dialect), Decision tree model, Counting words in Corpora, Simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation.

UNIT IV

Syntax: POS Tagging: Tagsets, Concept of HMM tagger, Rule based and stochastic POST, Algorithm for HMM tagging, Transformation based tagging. Sentence level construction & unification: Noun phrase, Co-ordination, Sub-categorization, Concept of feature structure and unification.

UNIT V

Semantics: Representing Meaning: Unambiguous representation, Canonical form, Expressiveness, Meaning structure of language, Basics of FOPC. Semantic Analysis: Syntax driven, Attachment & integration, Robustness. Lexical Semantics: Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, Internal structure of words, Metaphor and metonymy and their computational approaches. Word Sense Disambiguation: Selectional restriction based, Machine learning based and dictionary based approaches.

UNIT VI

Pragmatics: Discourse: Reference resolution and phenomena, Syntactic and semantic constraints on coreference, Pronoun resolution algorithm, Text coherence, Discourse structure. Dialogues: Turns and utterances, Grounding, Dialogue acts and structures. Natural Language Generation: Introduction to language generation, Architecture, Discourse planning (text schemata, rhetorical relations).

Text Books:

1. D. Jurafsky & J. H. Martin, ***"Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition"***, Pearson Education.
2. Allen, James, ***"Natural Language Understanding"***, 2nd Edition, Benjamin/Cummings, 1996.

Reference Books:

1. Bharathi, A., Vineet Chaitanya and Rajeev Sangal, ***"Natural Language Processing-A Pananian Perspective",*** Prentice Hall India, 1995.
2. Eugene Cherniak, ***"Statistical Language Learning"***, MIT Press, 1993.
3. Manning, Christopher and Heinrich Schütze, ***"Foundations of Statistical Natural Language Processing",*** MIT Press, 1999.

Course Title:	**Artificial Intelligence**	**Semester VII**	
Course Code	**BTITDE703B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To acquaint the students with the theoretical and computational techniques in Artificial Intelligence.
2. To use various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
3. To use different logical systems for inference over formal domain representations and trace how a particular inference algorithm works on a given problem specification.
4. To understand the conceptual and computational trade-offs between the expressiveness of different formal representations.

Course Outcomes:

After learning the course the students should be able:

1. To find appropriate idealizations for converting real world problems into AI search problems formulated using the appropriate search algorithm.
2. To analyze, formalize and write algorithmic methods for search problem.
3. To explain important search concepts, the definitions of admissible and consistent heuristics and completeness and optimality.
4. To implement and execute by hand alpha-beta search.
5. To design good evaluation functions and strategies for game playing.
6. To carry out proofs in first order and propositional logic using techniques such as resolution, unification, backward and forward chaining.
7. To choose and implement learning algorithms such as decision trees, support vector machines, and boosting.

Course Content:

UNIT I

Introduction: Overview of Artificial intelligence- Problems of AI, AI techniques, Tic - Tac - Toe problem. Intelligent Agents: Agents & environment, Nature of environment, Structure of agents, Goal based agents, Utility based agents, Learning agents.

UNIT II

Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, Production system, Problem characteristics and issues in the design of search programs. Search techniques: Solving problems by searching: problem solving agents, Searching for solutions; uniform search strategies: Breadth first search, Depth first search, Depth limited search, Bidirectional search, Comparing uniform search strategies.

UNIT III

Heuristic search strategies: Greedy best-first search, A* search, Memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, Simulated annealing search, Local beam search, Genetic algorithms; Constraint satisfaction problems, Local search for constraint satisfaction problems. Adversarial search: Games, optimal decisions & strategies in games, The minimax search procedure, Alpha-beta pruning, Additional refinements, Iterative deepening.

UNIT IV

Knowledge & reasoning: Knowledge representation issues, Representation & mapping, Approaches to knowledge representation, Issues in knowledge representation. Using predicate logic: Representing simple fact in logic, Representing instant & ISA relationship, Computable functions & predicates, Resolution, Natural deduction. Representing knowledge using rules: Procedural verses declarative knowledge, Logic programming, Forward verses backward reasoning, Matching, Control knowledge.

UNIT V

Probabilistic reasoning: Representing knowledge in an uncertain domain, The semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics, Planning: Overview, Components of a planning system, Goal stack planning, Hierarchical planning and other planning techniques.

UNIT VI

Natural Language processing: Introduction, Syntactic processing, Semantic analysis, Discourse & pragmatic processing. Learning: Forms of learning, Inductive learning, Learning decision trees, explanation based learning, Learning using relevance information, Neural net learning & genetic learning. Expert Systems: Representing and using domain knowledge, Expert system shells and knowledge acquisition.

Text Books:

1. Rich, E. and Knight K., ***“Artificial Intelligence”***, Tata McGraw- Hill.
2. Russell, S. and Norvig P., ***“Artificial Intelligence: A Modern Approach”***, Pearson Education.
3. Patterson, Dan W. , ***“Introduction to Artificial Intelligence & Expert Systems”***, PHI, 2005.

Reference Book:

1. Nilsson, N. J., Morgan Kaufmann, ***“Artificial Intelligence: A New Synthesis”***,Tata McGraw-Hill.

Course Title:	**Real Time Systems**	**Semester VII**	
Course Code	**BTITSE704A**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems, Design and Analysis of Algorithms**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application and Development**	**Credits**	**3**

Course Objectives:

1. To introduce students to the fundamental problems, concepts and approaches in the design and analysis of real-time systems.
2. To study issues related to the design and analysis of systems with real-time constraints.
3. To learn real-time scheduling and schedulability analysis.
4. To understand formal specification and verification of timing constraints and properties.
5. To design methods for real-time systems.
6. To learn new techniques of state-of-the-art real-time systems research.

Course Outcomes:

After learning the course the student will be able:

1. To characterize real-time systems and describe their functions.
2. To analyze, design and implement a real-time system.
3. To apply formal methods to the analysis and design of real-time systems.
4. To apply formal methods for scheduling real-time systems.
5. To characterize and debug a real-time system.

Course Content:

UNIT I

Introduction: Hard vs. Soft real time systems, A reference model of real time system. Real-time scheduling: Clock driven approach, Weighted Round-robin approach, Priority driven approach, Dynamic vs. static system, Effective Release Times and Deadlines, EDF and LST algorithm, Optimality and Non-Optimality of the EDF and LST algorithms, Off line vs. online Scheduling.

UNIT II

Clock-Driven Scheduling: Static, Time-Driven scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of a-periodic Jobs, Scheduling Sporadic Jobs.

UNIT III

Priority Driven Scheduling of Periodic Tasks: Fixed priority vs. Dynamic priority algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM algorithms, A Schedulability test for fixed-priority tasks with short response times, Sufficient Schedulability conditions for the RM and DM algorithms.

UNIT IV

Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumptions and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth and Weighted Fair-Queuing Servers.

UNIT V

Resources and Resource Access control: Resource contention, Resource access control, Nonpreemptive critical section, Basic Priority-Inheritance protocol, Basic Priority Ceiling Protocol, Stack based, Priority-ceiling protocol, preemption ceiling protocol.

UNIT VI

Multiprocessor scheduling, Resource Access Control, and Synchronization: Model of multiprocessor & distributed systems, task assignment, multiprocessor Priority-ceiling protocol, Elements of Scheduling Algorithms for End-to-End Periodic Tasks- IPS protocols, PM protocols, MPM protocol.

Text Books:

1. Jane W. S. Liu, ***"Real-Time System"***, Pearson Education.
2. C. M. Krishna and K. G. Shin, ***"Real-Time Systems"***, McGraw Hill.

Reference Books:

1. Laplante, ***"Real Time System Design and Analysis: An Engineer Handbook"***, PHI.
2. Dr. K. V. K. Prasad, ***"Embedded Real Time System Concept Design and Programming"***, Wiley India.

Course Title:	**Information Security**	**Semester VII**	
Course Code	**BTITSE704B**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure and Security Management**	**Credits**	**3**

Course Objectives:

1. To understand information security's importance in the increasingly computer-driven world.
2. To master the key concepts of information security and its working.
3. To develop a security mindset.
4. To learn to critically analyze situations of computer and network security usage.
5. To identify the salient issues, viewpoints and trade-offs of information security.

Course Outcomes:

After learning the course the student will be able:

1. To explain the challenges and scope of information security.
2. To explain security concepts as confidentiality, integrity and availability.
3. To explain the importance of cryptographic algorithms used in information security .
4. To identify and explain symmetric algorithms for encryption-based security of information.
5. To describe the access control mechanism used for user authentication and authorization.
6. To describe Secure Sockets Layer (SSL), Internet Protocol (IP) communications by using Internet Protocol Security (IPSec).
7. To explain the use of security tools as firewalls and intrusion prevention systems.
8. To explain malicious software issues introduced by software-based viruses and worms.
9. To describe the process of risk assessment in the context of IT security management.

Course Content:

UNIT I

Introduction to Information Systems: Security concepts, Computer security concepts, Threats, Attacks and Assets, Security functional requirements, A security architecture for Open Systems, Computer security trends, Computer security strategy.

UNIT II

Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Practical Application: Encryption of Stored Data.

UNIT III

Models, Frameworks, Standards & Legal Framework: A structure and framework of compressive security policy, policy infrastructure, policy design life cycle and design processes, PDCA model, Security policy standards and practices - ISO 27001, SSE-CMM, IA-CMM, ITIL & BS 15000, BS7799, Understanding Laws for Information Security: Legislative Solutions, Contractual Solutions, Evidential Issues, International Activity, Indian IT Act, Laws of IPR, Indian Copyright Act.

UNIT IV

Controls: Access control principles, Subjects, Objects and access rights, Discretionary access control, Role-based access control, Case study.

UNIT V

Virus and Malware: Introduction & types of Malicious Software (Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail, Trojans, Payload–System Corruption, Payload–Attack, Agent–Zombie, Bots, Payload–Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealthing–Backdoors, Rootkits, Countermeasures.

UNIT VI

Security issues: Database security challenge in the modern world, Federated Databases, securing Mobile databases, Network Security, Trusted and untrusted networks, Network attacks, Network security dimensions, Network attack – the stages; using firewalls effectively; Privacy – Privacy invasion due to direct marketing, Outsourcing using data masking ; privacy issues in smart card applications, Ethical Hacking ;Role of Cryptography in information security, digital signatures.

Text Books:

1. Nina Gobole, ***"Information Systems Security: Security Management, Metrics, Frameworks And Best Practices"***, Wiley, 2008.
2. Mark Rhodes –Ousley, ***"Information Security: The Complete Reference"***, McGraw-Hill Education, 2nd Edition, 2013.
3. Dhiren R Patel, ***"Information Security Theory and Practices"***, PHI Learning, 2008.
4. Mark Stamp, ***"Information Security: Principles and Practice"***, 2nd Edition, , Wiley, 2011.

Reference Books:

1. Gary R. McGraw, ***"Software Security: Building Security In"*** Addison Wesley, 2006.
2. Ankit Fadia, ***"Network Security: A Hacker's Perspective"***, 2006.

Course Title:	**Management Information Systems**	**Semester VII**	
Course Code	**BTITSE704C**	**Course Type**	**Elective**
Pre-requisite	**Decision Support Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To create interest and awareness about the proliferation of the Information Systems in today's organizations.
2. To understand categories of MIS: Operations Support System, Management Support System and Office automation system, Functional management system.
3. To learn Information Systems for strategic management and strategic role of information systems.
4. To plan for information systems: Identification of Applications, Business Application Planning, Systems and Critical Success Factors, Method of Identifying Applications.
5. To understand System Development Process and Approaches, System Implementation, System maintenance, Introduction to MIS Risks, System Evaluation, IT Procurement Options. Change management in IT Projects.

Course Outcomes:

After learning the course the student will be able:

1. To understand the usage and constituents of MIS in organizations.
2. To understand the classifications, understanding and the different functionalities of these MIS.
3. To explain the functions and issues at each stage of system development.
4. To identify emerging trends in MIS technologies.
5. To identify and assess MIS in real-life organization.

Course Content:

UNIT I

Management & organizational support systems for digital firm: Definition of MIS; Systems Approach to MIS: Report writing s/w, MIS and Human factor considerations, concept of organizational information sub-system, MIS & problem solving.

UNIT II

Information systems & business strategy: Information Management, Who are the users? Manager & Systems, Evolution of Computer based information system (CBIS), Model of CBIS. Information services organization: Trend to End-User computing, Justifying the CBIS, Achieving the CBIS, Managing the CBIS, Benefits & Challenges of CBIS implementation. Strategic Information System, Business level and Firm level Strategy.

UNIT III

Information systems in the enterprise: Systems from Management and functional perspective and their relationship: Executive Information System, Decision support system sales and Marketing Information System, Manufacturing Information System, Human-Resource Information System. Finance and Account Information System.

UNIT IV

Information technology for competitive advantage: Firm in its environment, What are the information resources? Who manages the information resources? Strategic planning for information resources. End-User Computing as a strategic issue, Information resource management concept.

UNIT V

E-commerce and international information system: Introduction to E-Commerce, Business Intelligence. E-Commerce strategy, Electronic Data Interchange, E-commerce methodology, E-commerce technology, Business application of the Internet. Electronic Business success strategies.

UNIT VI

Managing International Information Systems: IIS architecture, Global business Drivers, Challenges, Strategy: divide, conquer and appease, Cooptation, Business organization, Problems in implementing global information systems, Computer crime, ethics and social issues.

Text Book:

1. Kelkar, S.A., ***"Management Information Systems"***, Prentice Hall of India, 2003.

Reference Books:

1. Mark G. Simkin, ***"Introduction to computer Information System for Business"***, 1996.
2. James A. Senn, ***"Analysis & Design of Information Systems"***, McGraw-Hill.

Course Title:	**Distributed Computing**	**Semester VII**	
Course Code	**BTITSE704D**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To understand the major tools and techniques that allow programmers to effectively program the parts of the code that require substantial communication and synchronization.
2. To study the core ideas behind modern coordination and communication paradigms and distributed data structures
3. To introduce a variety of methodologies and approaches for reasoning about concurrent and distributed programs.
4. To realize basic principles and best practice engineering techniques of concurrent and distributed computing.
5. To study the safety and progress properties of concurrent and distributed algorithms.
6. To understand the performance of current multi-core and future many-core systems.

Course Outcomes:

After learning the course the student will be able:

1. To identify the core concepts of distributed systems.
2. To learn orchestration of multiple machines to correctly solve problems in an efficient, reliable and scalable way.
3. To examine concepts of distributed systems in designing large systems.
4. To apply distributed computing concepts to develop sample systems.

Course Content:

UNIT I

Introduction: Historical background, Key characteristics, Design goals and challenges, Review of networking and internetworking, Internet protocols.

UNIT II

Processes and Inter process Communication: Processes and threads, Virtualization, Code migration, The API for the Internet protocols, External data representation, Client-server communication, Multicast communication, Message oriented communication, Network virtualization, Overlay networks, RPC and MPI.

UNIT III

Naming: Name services and Domain Name System, Directory services, Case study: X.500 directory service.

UNIT IV

Time, Global States and Synchronization: Physical and logical clocks, Global states, Mutual exclusion, Election algorithms, Consistency and Replication: Consistency models, Replica management, Consistency protocols, Case studies of highly available services: the gossip architecture and Coda.

UNIT V

Fault Tolerance and Security: Distributed Commit, Recovery, Security Issues, Cryptography. Distributed File Systems: File service architecture, Case study: Sun Network File System, The Andrew File System.

UNIT VI

Peer to peer Systems: Introduction, Napster, Peer-to-peer middleware, Routing overlays, Case studies: Pastry, Tapestry. Distributed Object Based Systems: Distributed objects, Java beans, CORBA.

Text Books:

1. Tanenbaum A.S, ***“Distributed Systems: Principles and Paradigms”***, 2nd Edition, Pearson Education, 2006.
2. Coulouris G., Dollimore J., Kindberg T. and Blair G., ***“Distributed Systems: Concepts and Design”***, 5th Edition, Addison Wesley, 2011.
3. Mahajan S., Shah S., ***"Distributed Computing"***, 1st Edition, Oxford University Press, 2010.

Reference Books:

1. Hwang K., Dongarra J., Geoffrey C. Fox, ***“Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”***, Morgan Kaufmann, 2011.
2. Comer D.E. and Droms, R.E., ***“Computer Networks and Internets”***, 4th Edition, Prentice-Hall, 2004.

Course Title:	**Data Warehousing and Data Mining**	**Semester VII**	
Course Code	**BTITSE704E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. Introduce the concepts, techniques, design and applications of data warehousing and data mining.
2. Enable students to understand and implement classical algorithms in data mining and data warehousing.
3. Enable students to learn how to analyze the data, identify the problems and choose the relevant algorithms to apply.

Course Outcomes:

After learning the course the student will be able:

1. Understand the functionality of the various data mining and data warehousing components.
2. Appreciate the strengths and limitations of various data mining and data warehousing models.
3. Compare the various approaches to data warehousing and data mining implementations.
4. Describe and utilize a range of techniques for designing data warehousing and data mining systems for real-world applications.

Course Content:

UNIT I

Introduction to data warehousing, Evolution of decision support systems, Modeling a data warehouse, granularity in the data warehouse, Data warehouse life cycle, building a data warehouse, Data Warehousing Components, Data Warehousing Architecture.

UNIT II

On Line Analytical Processing, Categorization of OLAP Tools, Introduction to Data mining and knowledge discovery, Relation to Statistics, Databases, Data Mining Functionalities, Steps In Data Mining Process, Architecture of a Typical Data Mining Systems, Classification of Data Mining Systems.

UNIT III

Overview of Data Mining Techniques, Data Preprocessing, Data Cleaning, Data Integration, Data Transformation and Data Reduction, Data Generalization and Summarization Based Characterization, Mining Association Rules In Large Databases.

UNIT IV

Classification and Prediction, Issues Regarding Classification and Prediction, Classification By Decision Tree Induction, Bayesian Classification, Other Classification Methods.

UNIT V

Prediction, Clusters Analysis, Types of Data In Cluster Analysis, Categorization of Major Clustering Methods, Partitioning methods, Hierarchical Methods.

UNIT VI

Applications of Data Mining, Social Impacts of Data Mining, Case Studies, Mining WWW, Mining Text Database, Mining Spatial Databases.

Text Books:

1. Adriaans, **“ *Data mining*”**, Addison- Wesley, 1996.
2. Margaret Dunham, ***“Data Mining: Introductory and Advanced Topics”***, Published by Prentice Hall.
3. Weiss, Sholom M.,***”Predictive data mining : a practical guide”,*** Kaufmann Publishers, 1998.

Reference Books:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, ***“Introduction to Data Mining”***, Pearson Education, 2008.
2. M.Humphires, M.Hawkins, ***“Data Warehousing: Architecture and Implementation”***, Pearson Education, 2009.
3. Anahory, Murray, ***“Data Warehousing in the Real World”***, Pearson Education, 2008.
4. Kargupta, Joshi, etc., ***“Data Mining: Next Generation Challenges and Future Directions”***, Prentice Hall of India Pvt. Ltd, 2007.

Course Title:	**Cloud Computing and Storage Management Lab**	**Semester VII**	
Course Code	**BTITL705**	**Course Type**	**Compulsory**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credit**	**1**

Lab Experiments Objectives:

Learner will be able to...

1 Appreciate cloud architecture.
2 Create and run virtual machines on open source OS.
3 Implement Infrastructure, storage as a Service.
4 Install and appreciate security features for cloud.

Lab Experiments List:

1 Study of Cloud Computing & Architecture.
2 Study and implementation of Infrastructure as a Service.
3 Implementation of Private cloud using Eucalyptus or Open stake.
- Working with KVM to create VM.
- Installation and configuration of Private cloud.
- Bundling and uploading images on a cloud.
- Creating web based UI to launch VM.
- Working with Volumes – Attached to the VM.

Course Title:	**Pattern Recognition Lab**	**Semester VII**	
Course Code	**BTITDEL706A**	**Course Type**	**Elective**
Pre-requisite	**NIL**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objectives:

1. To study pattern recognition topics and be exposed to recent developments in pattern recognitions research.
2. To provide in-depth design concepts and implementation techniques of pattern recognitions.

Lab Experiments List:

1. Feature Representation.
2. Mean and Covariance.
3. Linear Perceptron Learning.
4. Generation of Random Variables.
5. Bayesian Classification.
6. MLE: Learning the classifier from data.
7. Data Clustering: K-Means, MST-based.

Course Title:	**Soft Computing – Lab**	**Semester VII**	
Course Code	**BTITDEL706B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objectives:

1. To utilize Soft computing algorithms to solve engineering problems.
2. To compare results and provide a analysis of algorithms efficiency.
3. To apply soft computing thought process for solving issues.

Lab Experiments List:

1. Implement simple logic network using MP neuron model.
2. Implement a simple linear regression with a single neuron model.
3. Implement and test MLP trained with back-propagation algorithm.
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian)
7. Implement defuzzyfication (Max-membership principle, Centroid method, Weighted average method).
8. Implement FIS with Mamdani Inferencing mechanism.
9. A small project: may include classification or regression problem, using any soft computing technique studied earlier.

Course Title:	**Real Time Systems Lab**	**Semester VII**	
Course Code	**BTITSEL707A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Software Application and Development**	**Credit**	**1**

Lab Experiments Objectives:

1. To design and write programs to demonstrate various real time system concepts of scheduling processes.
2. To demonstrate how real time principles can be applied to business problems by simulating business processes.

Lab Experiments List:

1. Execute a program to demonstrate real time scheduling EDF vs. LST to show a comparative result.
2. Demonstrate clock driven scheduler system.
3. Develop a random generator to set priority and demonstrate a priority driven scheduler system.
4. Simulate a manufacturing process to demonstrate resource and resource control scheduling system in real time.
5. Simulate a logistics service provider scheduling of product delivery system using the principles of real-time system learned in the course.

Course Title:	**Information Security – Lab**	**Semester VII**	
Course Code	**BTITSEL707B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure and Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. To be familiar with the algorithms of data mining,
2. To be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
3. To be exposed to web mining and text mining.

Lab Experiments List:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
    a. Caesar Cipher
    b. Playfair Cipher
    c. Hill Cipher
    d. Vigenere Cipher
    e. Rail fence – row & Column Transformation.
2. Implement the following algorithms
    a. DES
    b. RSA Algorithm
    c. Diffiee-Hellman
    d. MD5
    e. SHA-1
3. Implement the SIGNATURE SCHEME - Digital Signature Standard.
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor).
6. Installation of rootkits and study about the variety of options.
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler).
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).

Course Title:	**Management Information Systems - Lab**	**Semester VII**	
Course Code	**BTITSEL707C**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To prepare organizational data for MIS reports and dashboards.
2. To learn what data should be used to prepare MIS reports.
3. To write programs to produce MIS reports.
4. To depict data in a MIS report to support decision making.

Lab Experiments List:

1. Prepare a MIS report for HR system to depict the various grades of employee in an organization by years of service.
2. Prepare a EIS report of Sales of an organization.
3. Prepare a graphical EIS dashboard of the Sales over a period of 1 year.
4. Prepare a manufacturing MIS report of all orders fulfilled, in progress and pending for management.
5. Prepare a monthly MIS profit and loss dashboard from financial data.
6. Prepare an EIS for reporting population demographic.

Course Title:	**Distributed Computing-Lab**	**Semester VII**	
Course Code	**BTITSEL707D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Networking**	**Credit**	**1**

Lab Experiments Objective:

1. To implement distributed systems paradigms practically to understand impact on resources and processes.

Lab Experiments List:

1. Load Balancing Algorithm.
2. Scalability in Distributed Environment.
3. Client/server using RPC/RMI.
4. Inter-process communication.
5. Election Algorithm.
6. Distributed Deadlock.
7. Name Resolution protocol.
8. Clock Synchronization algorithms.
9. Mutual Exclusion Algorithm.
10. Group Communication.
11. CORBA architecture.
12. Parallel Algorithms.
13. Message Passing Interface.

Course Title:	**Data Warehousing and Data Mining-Lab**	**Semester VII**	
Course Code	**BTITSEL707E**	**Course Type**	**Elective**
Pre-requisite	**SQL**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objectives:

1. To be familiar with the algorithms of data mining.
2. To be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
3. To be exposed to web mining and text mining.

Lab Experiments List:

1. Creation of a Data Warehouse.
2. Apriori Algorithm.
3. FP-Growth Algorithm.
4. K-means clustering.
5. One Hierarchical clustering algorithm.
6. Bayesian Classification.
7. Decision Tree.
8. Support Vector Machines.
9. Applications of classification for web mining.
10. Case Study on Text Mining or any commercial application.

Course Title:	**Project Phase – I**	**Semester VII**	
Course Code	**BTITP708**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0–0 – 8**
Stream	**Core**	**Credits**	**4**

The project should enable the students to combine the theoretical and practical concepts studied in his/her academics. The project work should enable the students to exhibit their ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

Project work

The project work is an implementation of learned technology. The knowledge gained by studying various subjects separately supposed to utilize as a single task. A group of 03/04 students will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipments, data, tools etc. should be arranged.

Project Activity

The project groups should interact with guide, who in turn advises the group to carry various activities regarding project work on individual and group basis. The group should discuss the progress every week in the project hours and follow further advice of the guide to continue progress. Guide should closely monitor the work and help the students from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

Phase I

1. Submission of project/problem abstract containing problem in brief, requirements, broad area, applications, approximate expenditure if required etc.
2. Problem definition in detail.
3. Literature survey.
4. Requirement analysis.
5. System analysis (Draw DFD up to level 2, at least).
6. System design, Coding/Implementation (20 to 30%).

Course Title:	**Industrial Training Assessment**	**Semester VII**	
Course Code	**BTIT709**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 0**
Stream	**Core**	**Credits**	**2**

The students receive theoretical knowledge of the basic engineering and applied engineering in first six semesters. They have to do in plant training of four weeks at least during vacation after sixth semester. The training enables the students to expose to industry during their training, provides orientation and improves their prospects for employment. The students should prefer industrial training in the domain of Information Technology.

Training report and Assessment

During the industrial training he/she will observe layout, working environment, various equipments, tools, instruments etc. under the supervision of supervisor and engineer of the company. Students are required to submit a printed report of industrial training in the seventh semester. The report should contain information about the major field of company, particularly about the section/department where he/she have undergone the training giving the details of equipments, product, tools their detailed specification, use etc. The training report and field work done by students will be assessed by internal examiner(s) and appropriate grade will be awarded.

Course Title:	**Internet of Things**	**Semester**	**VIII**
Course Code	**BTITDE801A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessor & Micro-controllers**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To understand the vision of IoT.
2. To understand IoT market perspective.
3. To study the data and knowledge management and use of devices in IoT technology.
4. To understand state of the art – IoT Architecture.
5. To study the real world IoT design constraints, industrial automation and commercial building automation in IoT.

Course Outcomes:

After learning the course the students should be able:

1. To interpret the vision of IoT from a global context.
2. To determine the market perspective of IoT.
3. To compare and contrast the use of devices, gateways and data management in IoT.
4. To implement state of the art architecture in IoT.
5. To illustrate the application of IoT in industrial automation and identify real world design constraints.

Course Content:

UNIT I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing characteristics.

UNIT II

M2M to IoT: A Market Perspective– Introduction, Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies, M2M to IoT. An architectural overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations.

UNIT III

M2M and IoT Technology Fundamentals - Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT IV

IoT Architecture: State of the Art, Introduction, State of the art, Architecture Reference Model - Introduction, Reference model and architecture, IoT reference model.

UNIT V

IoT Reference Architecture: Introduction, Functional view, Information view, Deployment and operational View, Other relevant architectural views. Real-World Design Constraints - Introduction, Technical design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT VI

Industrial Automation: Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation: Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Text Book:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,***"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence"***, Academic Press, 1st Edition, 2014.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga, ***"Internet of Things (A Hands-on-Approach)"***, VPT, 1st Edition, 2014.
2. Francis da Costa, ***"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything"***, 1st Edition, Apress Publications, 2013.

Course Title:	**E-commerce Systems**	**Semester**	**VIII**
Course Code	**BTITDE801B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To learn the importance of E-commerce and its impact on business.
2. To understand the various E-commerce business models and its uses.
3. To learn the various E-commerce technologies and IT requirements for a successful E-commerce business.
4. To discover factors required for good E-commerce systems.

Course Outcomes:

After learning the course the students should be able:

1. To explain E-commerce systems construct limitations and benefits.
2. To design E-commerce applications.
3. To discuss security and IT requirements to deploy E-commerce systems.
4. To explain the critical success factors of good E-commerce applications.

Course Content:

UNIT I

Introduction to E-commerce: Meaning, Nature and scope; channels of E-commerce, Business applications of E-commerce, Traditional commerce vs. E-commerce and Business model of E-commerce: B2B, B2C, C2C, B2G and other models of E-commerce.

UNIT II

Mobile commerce: Introduction to M-Commerce, History and key benefits & limitations, Critical success factors, Wireless Application Protocol (WAP), Mobile banking. Electronic payment system: Type of payment systems: E-cash and currency servers, E-cheques, Credit card, Smart card, Electronic purses and debit cards, Operational, Credit and legal risks of e-payments, Risk management options for e-payment system, Order fulfillment for E-commerce.

UNIT III

E-commerce strategy: Overview, Strategic methods for developing E- commerce.

UNIT IV

The Four C's of E-commerce: (Convergence, Collaborative Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence: Types, Convergence and its implications, Convergence and Electronic Commerce, Collaborative Computing: Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security. Content Management: Definition of content, Authoring Tools and Content Management, Content: partnership, repositories, convergence, providers, Web Traffic and Traffic Management; Content Marketing. Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).

UNIT V

E-commerce Technologies: Relationship Between E-Commerce and Networking, Different Types of Networking for E-Commerce, Internet, Intranet and Extranet, EDI Systems.

UNIT VI

Security issues in e-commerce: Security risk of e-commerce, Type and sources of threats, Protecting the electronic commerce assets and intellectual property, Firewalls, Client server network security, Data and message security, Digital identification and electronic signature, Encryption approach to e-commerce security.

Text Books:

1. C.S.V. Murthy, ***"E-Commerce Concept-model-strategies"***, Himalaya Publication House.
2. Nidhi Dhawan, ***"E-Commerce Concepts and Applications"***, International book house Pvt. Ltd.
3. Kalkota and Whinston, ***"Frontiers of Electronic Commerce"***, Pearson publication.

Reference Books:

1. Elias M. Awad., ***"Electronic Commerce"***, PHI.
2. Joseph, ***"E-commerce"***, PHI, 2nd Edition.
3. Bhaskar Bharat, ***"Electronic Commerce - Technologies & Applications"***, TMH
4. Chris Bates, ***"Web Programming"***, Wiley publication, 3rd Edition, 2009.
5. B.V. Kumar, S.V. Subrahmanya, ***"Web Services: An Introduction"***, Tata McGraw Hill, 2008.

Course Title:	**Mobile Computing**	**Semester**	**VIII**
Course Code	**BTITSE802A**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols , Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To describe the basic concepts and principles in mobile computing.
2. To understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks.
3. To explain the structure and components for Mobile IP and Mobility Management.
4. To understand positioning techniques and location-based services and applications.
5. To describe the important issues and concerns on security and privacy.
6. To design and implement mobile applications to realize location-aware computing.
7. To design algorithms for location estimations based on different positioning techniques and platforms.
8. To acquire the knowledge to administrate and to maintain a Wireless LAN.

Course Outcomes:

After learning the course the students should be able:

1. To describe wireless and mobile communications systems.
2. To choose an appropriate mobile system from a set of requirements.
3. To work around the weaknesses of mobile computing.
4. To interface a mobile computing system to hardware and networks.
5. To program applications on a mobile computing system and interact with servers and database systems.

Course Content:

UNIT I

Fundamental of Wireless and basics of wireless network: Digital communication, Wireless communication system and limitations, Wireless media, Frequency spectrum, Technologies in digital wireless communication, Wireless communication channel specification, Wireless network, Wireless switching technology, Wireless communication.

UNIT II

Mobile Communications and Computing: An Overview Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security, Mobile Devices and Systems, Mobile Phones, Digital Music Players, Hand-held Pocket Computers, Hand-held Devices: Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems.

UNIT III

GSM and other architectures: GSM-Services and System Architectures, Radio Interfaces, Protocols Localization, Calling, Handover, Security, New Data Services, modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks.

UNIT IV

Mobile Network and Transport Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer, Conventional TCP/IP Transport Layer Protocol, Indirect TCP, Snooping TCP, Mobile TCP, Mobile Ad-hoc Networks (MANET), Routing and Routing Algorithms in MANET, Security in ad-hoc networks.

UNIT V

Data Dissemination and Data Synchronization in Mobile Computing: Communication Asymmetry, classification of data delivery mechanism, data dissemination broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.

UNIT VI

Mobile Devices and Mobile Operating System: Mobile agent, Applications framework, Application server, Gateways, Service discovery, Device management, Mobile file system, Mobile Operating Systems, Characteristics, Basic functionality of Operating Systems: Window 8, iOS, Android OS.

Text Books:

1. Raj Kamal, “Mobile Computing”, Oxford University Press-New Delhi, 2nd Edition.
2. Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, ***“Wireless and Mobile Networks, Concepts and Protocols”***, Wiley, India.

Reference Books:

1. Mark Ciampa, ***“Guide to Designing and Implementing wireless LANs”***, Thomson learning, Vikas Publishing House, 2001.
2. Ray Rischpater, ***“Wireless Web Development”***, Springer Publishing,
3. Sandeep Singhal, ***“The Wireless Application Protocol”***, Pearson Publication.
4. P.Stavronlakis, ***“Third Generation Mobile Telecommunication Systems”***, Springer Publishers.

Course Title:	**Cryptography**	**Semester**	**VIII**
Course Code	**BTITSE802B**	**Course Type**	**Elective**
Pre-requisite	**Computer Architecture & Organization**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To learn cryptography in information security implementation.
2. To know the methods of conventional encryption.
3. To understand the concepts of public key encryption and number theory.
4. To understand authentication and Hash functions.
5. To know the network security tools and applications.
6. To understand the system level security used.

Course Outcomes:

After learning the course the students should be able:

1. To compare and contrast a range of different cryptosystems.
2. To list and elaborate the differences between secret key and public key cryptosystems.
3. To identify the different approaches to quantifying secrecy.
4. To recognize the different modes of operation for block ciphers and their applications.
5. To explain the role of hash functions in Information Security.
6. To discuss the place of ethics in the Information Security Area.

Course Content:

UNIT I

Introduction: What is cryptology: (cryptography + cryptanalysis), Overview of cryptology: How cryptography works, how to break a cryptographic system, Classical conventional encryption, Modern conventional encryption, Public key encryption, Hashing algorithm, OSI security architecture, Cryptanalysis of classical cryptosystems, Shannon’s theory.

UNIT II

Symmetric Cipher: Classical Encryption Techniques, Symmetric Cipher Model, Block Cipher principles, DES, Triple DES, Cryptanalysis of symmetric key ciphers: Differential and Linear Cryptanalysis, Block cipher design principle, The Euclidean algorithm, Finite field of form GP(p), Advance Encryption Standard (AES), AES cipher, Multiple encryption and triple DES, Stream Cipher and RC4, Placement of encryption function, Traffic confidentiality, Key distribution, Random number generation. System security: Intrusion detection, Password management, Virus countermeasure, Denial of service attack, Firewall design principles, Trusted System.

UNIT III

Public Key Cryptography: Key Management - The Discrete Logarithm Problem (DLP) and the Diffie Hellman Key Exchange algorithm, Cryptanalysis of DLP, Elliptic Curve Architecture and Cryptography : Confidentiality using Symmetric Encryption, Public Key Cryptography, RSA, Primality Testing, Factoring algorithms, Other attacks on RSA and semantic security of RSA ElGamal cryptosystems.

UNIT IV

Authentication and Hash Function: Authentication requirements, Authentication functions, Message Authentication codes, Hash functions, Security of hash functions, Hash functions: The Merkle Damgard Construction and MACs, MD5 message Digest algorithm - Secure Hash Algorithm, RIPEMD, HMAC, CMAC, Whirlpool and Comparative analysis. Digital Signatures, Authentication Protocols, Digital Signature Standard.

UNIT V

Network Security: Authentication Applications: Kerberos - X.509 Authentication Service, Electronic Mail Security - PGP - S/MIME - IP Security - Web security.

UNIT VI

System Level Security: Intrusion detection, Password management, Viruses and related Threats, Virus Counter measures, Firewall Design Principles, Trusted Systems. Cryptanalysis: Differential Cryptanalysis, Linear Cryptanalysis, Truncated differential cryptanalysis, etc. Assignments (not limited to this): including Cryptographic standards, application of cryptosystems, network security (IPSEC, VPN, Web Security), privilege management infrastructure (PMI) and Access Control, e-Commerce and Smart IC cards).

Text Book:

1. William Stallings, ***"Cryptography and Network Security - Principles and Practices"***, Prentice Hall of India, 3rd Edition, 2003.

Reference Books:

1. Atul Kahate, ***"Cryptography and Network Security"***, Tata McGraw-Hill, 2003.
2. Bruce Schneier, ***"Applied Cryptography"***, John Wiley & Sons Inc, 2001.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, ***"Security in Computing"***, Pearson Education, 3rd Edition, 2003.

Course Title:	**Information Retrieval**	**Semester**	**VIII**
Course Code	**BTITSE802C**	**Course Type**	**Elective**
Pre-requisite	**Design and Analysis of Algorithms**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To learn the techniques used to retrieve useful information from repositories such as the Web.
2. To understand the concepts in information retrieval such as documents, queries, collections and relevance.
3. To learn approaches for efficient indexing for quick identification of candidate answer documents
4. To learn modern techniques for crawling data from the web.

Course Outcomes:

After learning the course the students should be able:

1. To apply information retrieval principles to locate relevant information in large collections of data.
2. To understand and deploy efficient techniques for the indexing of document objects that are to be retrieved.
3. To implement features of retrieval systems for web-based and other search tasks.
4. To analyze the performance of retrieval systems using test collections.
5. To make practical recommendations about deploying information retrieval systems in different search domains, including considerations for document management and querying.

Course Content

UNIT I

Introduction to the Course: Information retrieval problem, First take at building an inverted index, Processing of Boolean queries, Extended Boolean model vs. ranked retrieval. Term vocabulary and postings lists: document delineation and character sequence decoding, Determining vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings and phrase queries.

UNIT II

Dictionaries, Tolerant Retrieval and Indexing: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction; Index construction, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing and other types; Index compression: Heaps' and Zipf's law, Dictionary compression and postings file compression.

UNIT III

Scoring and IR System Evaluation: Parametric and zone indexes, Term frequency and weighing, Vector space model for scoring, Variant tf-idf functions, Efficient scoring and ranking, Components of an IR system, Vector space scoring and query operator interaction, IR system evaluation, Standard test collections, Evaluation of unranked and ranked retrieval results, Assessing relevance, System quality and user utility; Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

UNIT IV

XML and Probabilistic Information Retrieval: Basic concepts of XML retrieval and challenges, vector space model for XML retrieval, Text-centric vs. data centric XML retrieval, Probability ranking principal, Binary independence model, Appraisal and some extensions, Language models for information retrieval, Query likelihood model, Language modeling vs. other approaches in IR.

UNIT V

Document Classification: Text classification problem, Naïve Bayes text classification, Bernoulli model, Feature selection, Evaluation of text classification; Vector space classification: Document representations and measure of relatedness in vector spaces, Rocchio classification, k nearest neighbor, Linear vs. Non-linear classifiers, Bias-variance tradeoff; Support vector machines, Extensions to SVM models, Issues in the classification of text documents, Machine learning methods in ad hoc information retrieval.

UNIT VI

Document Clustering and Matrix Decomposition: Flat clustering, Cardinality, Evaluation of clustering, K-means, Model based clustering, Hierarchical Agglomerative clustering, Singlelink and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Optimality of HAC, Divisive clustering, Cluster labeling; Matrix decompositions, Term document matrices and singular value decomposition, Low-rank approximations, Latent semantic indexing.

Web Search: Basics concepts, Web graph, Spam, Search user experience, Index size and estimation, Near-duplicates and shingling, Web crawling and indexes: Overview, Crawler architecture, DNS resolution, URL frontier, Distributing indexes and connectivity servers; Link analysis: Anchor text and web graph, Page Rank, Hubs and Authorities.

Text Books:

1. Manning, C. D., Raghavan, P., Schütze, H. ***"Introduction to Information Retrieval",*** Cambridge University Press, 2008.
2. Witten, I. H., Moffat, A., Bell, T. C. ***"Managing Gigabytes: Compressing and Indexing Documents and Images.",*** Morgan Kaufmann, 1999.
3. Grossman, D. A., ***"Information Retrieval: Algorithms and Heuristics"***, Springer, 2004.

Reference Books:

1. Baeza-Yates, R., Ribeiro-Neto, B. ***"Modern information Retrieval"***, ACM press, 1999
2. Belew, R. K. ***"Finding Out About: A Cognitive Perspective on Search Engine Technology and the WWW"***, Cambridge University Press, 2000.
3. Chakrabarti S. ***"Mining the Web: Discovering Knowledge from Hypertext Data"***, Morgan Kaufmann, 2003.
4. Manning, C. D. ***"Foundations of Statistical Natural Language Processing"***, H. Schütze (Ed.). MIT press, 1999.

Course Title:	**Network Security**	**Semester VIII**	
Course Code	**BTITSE802D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols, Network Programming**	**L – T – P**	**3 – 0 – 0**
Stream	**Networks**	**Credits**	**3**

Course Objectives:

1. To understand the number theory used for network security.
2. To understand the design concept of cryptography and authentication.
3. To understand the design concepts of internet security.
4. To develop experiments on algorithm used for security.

Course Outcomes:

After learning the course the students should be able:

1. To describe network security awareness and a clear understanding of its importance.
2. To explain how threats to an organization are discovered, analyzed and dealt with.
3. To explain protocols for security services.
4. To describe network security threats and countermeasures
5. To explain network security designs using available secure solutions (such as PGP, SSL, IPSec, etc).
6. To demonstrate advanced security issues and technologies (such as DoS attack detection and containment, and anonymous communications).

Course Content

UNIT I

Model of network security, Security attacks, services and attacks, OSI security architecture, Classical encryption techniques, SDES, Block cipher Principles, DES, Strength of DES, Block cipher design principles, Block cipher mode of operation, Evaluation criteria for AES, RC4 - Differential and linear cryptanalysis, Placement of encryption function, traffic confidentiality.

UNIT II

Number Theory, Prime number, Modular arithmetic, Euclid's algorithm, Fermat's and Euler's theorem, Primality, Chinese remainder theorem, Discrete logarithm, Public key cryptography and RSA Key distribution, Key management, Diffie Hellman key exchange, Elliptic curve cryptography.

UNIT III

Authentication requirement, Authentication function, MAC, Hash function, Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.

UNIT IV

Security Services for E-mail-establishing keys-privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME.

UNIT V

SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL-Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

UNIT VI

Firewall Design Principles- Packet Filters- Application level Gateways-Tunnels-DoS attacks-Intrusion Detection-Password Management-Malicious Software.

Text Book:

1. William Stallings, ***"Cryptography & Network Security"***, Pearson Education, 4th Edition, 2010.

Reference Books:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, ***"Network Security, Private Communication in Public World"***, PHI, 2nd Edition, 2002.
2. Bruce Schneier, Neils Ferguson, ***"Practical Cryptography"***, Wiley Dreamtech India Pvt. Ltd, 1st Edition, 2003.
3. Douglas R Simson ***"Cryptography – Theory and Practice"***, CRC Press, 1st Edition, 1995.

Course Title:	**Big Data Analytics**	**Semester**	**VIII**
Course Code	**BTITSE802E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To understand the concept of Big Data.
2. To learn Big Data file systems and their storage methods.
3. To learn to process Big Data information for analytics.
4. To discuss and understand Big Data implementations within large corporations like Google and Facebook.

Course Outcomes:

After learning the course the students should be able:

1. To model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. To analyze methods and algorithms to compare and evaluate them with respect to time and space requirements and make appropriate design choices when solving real-world problems.
3. To explain trade-offs in big data processing techniques.
4. To explain the Big Data Fundamentals including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.
5. To apply non-relational databases techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.
6. To apply the novel architectures and platforms introduced for Big data in particular Hadoop and MapReduce.

Course Content

UNIT I

Introduction to Big Data: Introduction to Big Data, The four dimensions of Big Data: Volume, Velocity, Variety, Veracity, Drivers for Big Data, Introducing the Storage, Query Stack, Revisit useful technologies and concepts, Real-time Big Data Analytics.

UNIT II

Distributed File Systems: Hadoop Distributed File System, Google File System, Data Consistency.

UNIT III

Big Data Storage Models: Distributed Hash-table, Key-Value Storage Model (Amazon's Dynamo), Document Storage Model (Facebook's Cassandra), Graph storage models.

UNIT IV

Scalable Algorithms: Mining large graphs with focus on social networks and web graphs. Centrality, Similarity, All-distances sketches, Community detection, Link analysis, Spectral techniques. Map-reduce, Pig Latin, and NoSQL, Algorithms for detecting similar items, Recommendation systems, Data stream analysis algorithms, Clustering algorithms, Detecting frequent items.

UNIT V

Big Data Applications: Advertising on the Web, Web Page Quality Ranking, Mining Social-Networking Group, Human Interaction with Big-Data. Recommendation systems with case studies of Amazon's Item-to-Item recommendation and Netfix Prize, Link Analysis with case studies of the PageRank algorithm and the Spam farm analysis, Crowd Sourcing.

UNIT VI

Big Data Issues: Privacy, Visualization, Compliance and Security, Structured vs. Unstructured Data.

Text Book:

1. Anand Rajaraman and Jeffrey Ullman, ***“Mining of Massive Datasets”***, Cambridge University Press, 2012.

Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, ***“An Introduction to Information Retrieval”***, Cambridge University Press, 2008.
2. Jimmy Lin and Chris Dyer, ***“Data-Intensive Text Processing with MapReduce”***, Morgan and ClayPool Publishers, 2010.

Course Title:	**User Experience Design**	**Semester**	**VIII**
Course Code	**BTITSE803A**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To understand user experience design principles
2. To understand the various elements and how the elements of user experience work together.
3. To understand strategy, structure, skeleton and scope as an element of user experience.
4. To identify business goals, user needs, content requirements.
5. To create a functional specification and an effective information design.
6. To learn to prioritize specs and requirements.
7. To architect information effectively and navigation.
8. To learn resources available to assist with User Experience Design Process.

Course Outcomes:

After learning the course the students should be able:

1. To design applications and web pages with effective and easy to use user experience.
2. To utilize tools and techniques for research and build user screens based on best practices.
3. To collect and document business, user and information specification.
4. To implement user screens and package information with ease of navigations.

Course Content:

UNIT I
UX Introduction: User Interaction with the products, Applications and services, Cognitive Model/Mental Model; Necessity of User Experience Design; Definition of User Experience (UX) Design.

UNIT II
Elements of UX Design: Core elements of User Experience, Working of elements, UX Design Process: Defining the UX Design Process and Methodology.

UNIT III
UX Design Process: Research and define: importance of research, Research methods and tools, Understanding the User needs and goals, Understanding the business goals, Deliverables of the research and define phase-Insight on User goals and business goals, Hands-on assignments and Quiz.

UNIT IV
UX Design Process: IDEATE/DESIGN - Visual design principles, Information design and data, Visualization: Interaction design, Information architecture, Wire-framing and story-boarding, UI elements and widgets, Screen design and layouts, Hands-on assignments and quiz.

UNIT V

UX Design Process: PROTOTYPE and TEST: Necessity of testing your design, Usability testing, Types of usability testing, Usability testing process, Plan for the usability tests, Prototype your design to test, Introduction of prototyping tools, Conduction and preparation of usability test results.

UNIT VI

UX Design Process: iterate/improve: Understanding the Usability test findings, Applying the Usability test feedback in improving the design. UX Design Process: Communication with implementation team UX Deliverables to be given to implementation team.

Text Books:

1. Jesse James Garrett, ***"The Elements of User Experience: User-Centered Design for the Web and Beyond"***, New Riders Publishing, 2nd Edition, 2002.
2. Steve Krug, ***"Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability"***, 3rd Edition, 2014.
3. Thomas Tullis, Willaim Albert, ***"Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics"***, Morgan Kaufman, 1st Edition, 2008.

Reference Books:

1. Jeff Gothelf, Josh Seiden, ***"Lean UX: Applying Lean Principles to Improve User Experience"***, O'Reilly, 1st Edition, 2013.
2. Kevin Mullet, Darrell Sano, ***"Designing Visual Interfaces: Communication Oriented Techniques"***, Soft Press, 1995.
3. Wilbert O. Galitz, ***"The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques"***, Wiley, 2002.

Course Title:	**Infrastructure Auditing & Implementation**	**Semester**	**VIII**
Course Code	**BTITSE803B**	**Course Type**	**Elective**
Pre-requisite	**IT Service Management**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To know the goals and objectives of IT audit and its role in internal control system.
2. To learn the techniques of audit planning and audit performance, gathering of audit related information and audit evidence.
3. To understand how to audit and evaluate effectiveness of the IT internal controls system.
4. To learn the fundamentals of information risk management and audit of information security.

Course Outcomes:

After learning the course the students should be able:

1. To describe the need for information security audit.
2. To define the requirements of IT risks, security and policies required for organizations.
3. To explain the mandatory items that need to be checked.

UNIT I

Fundamentals of infrastructure audit: meaning and definition, Overview, Choice of correct methods, Need, Scope and objectives.

UNIT II

Introduction to risk assessment: Entity area, strategies and policies in operation, support, External Drivers, User Interaction, Consequences-Importance of demonstrating control over network and security staffs, Risk of operator access controls over device and server settings.

UNIT III

Checklist for IT audit: Alignment with business strategy, Long term IT strategy, Short range IT plans, Information system security policy, Implementation of security policy, Information system audit guidelines, Acquisition and implementation of packaged software.

UNIT IV

Requirement identification and analysis Configuration audits: Need for an audit trail, A real-time live-network change review, Automatically verify compliance with both external best practices and internal standards.

UNIT V

Vendor selection criteria and process: Tracking the vendor selection criteria, Contracting- The issues of site licenses, Usage of open sources software, Annual maintenance contracts.

UNIT VI

Implementation: Importance of regulations and standards such as Sarbanes-Oxley, ISO 17799 and Visa's Cardholder Information Security Program (CISP), On-demand historical reports, Governance and

Cobit as a model for IT compliance. Benefits of infrastructure audit, Strong change management process.

Text Books:

1. Richard E. Cascarino, ***"Auditor's Guide to Information Systems Auditing"***, Wiley, 2007.
2. Chris Jackson, ***"Network Security Auditing"***, Cisco Press, 2010.

References:

1. www.netwrix.com
2. www.rbi.org

Course Title:	**Cyber Law and IPR**	**Semester**	**VIII**
Course Code	**BTITSE803C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To understand cyber laws and its applicability in India.
2. To learn the basic concepts of technology and law, digital contracts, rights of netizens and E-governance. To study cyber space and the cyber laws and regulating them through relevant Acts.
3. To learn the comparative study of national and international laws keeping in view international scenario in a no-barrier world.
4. To be aware about IPR in scientific and technical community for protecting their inventions.
5. To understand IPR from a non-lawyers perspective like senior managers, administrators etc.
6. To experience practices and procedures in various government offices administering IPR Laws.

Course Outcomes:

After learning the course the students should be able:

1. To describe the cyber world and cyber law in general.
2. To explain about the various facets of cyber crimes.
3. To explain the problems arising out of online transactions and provoke them to find solutions.
4. To clarify the Intellectual Property issues in the cyber space and the growth and development of the law in this regard.
5. To educate about the regulation of cyber space at national and international level.

Course Content

UNIT I

Introduction to Cyber crimes: Definition, Cybercrime and information security, Classes of cybercrime and categories, Cyber offences, Cybercrimes with mobile and wireless devices.

UNIT II

Jurisdiction in the cyber world across the world: Cybercrime law in Asia, Cybercrime and federal laws, Legal principles on jurisdiction and jurisdictional disputes w.r.t. the internet in United States of America, Cybercrime legislation in African region, Foreign judgments in India.

UNIT III

Indian IT act: Information Technology Act, 2000(Complete including digital signature, certifying authorities and E-governance), Positive aspects, Weak areas, Amendments to the Information Technology Act, 2008. Challenges to Indian law and cyber crime scenario in India. Protection of cyber consumers in India.

UNIT IV

Emerging Electronic System: E – commerce; E – governance; Concept of Electronic Signature; Credit Cards; Secure Electronic Transactions.

UNIT V

Intellectual property Rights: Intellectual Property law basics, Types of Intellectual Property, Agencies responsible for Intellectual Property registration. International organizations, Agencies and Treaties. Increasing importance of Intellectual Property Law.

UNIT VI

Copyright issues in Cyberspace: Relevant provisions under Copyright Act, 1957, regulating copyright issues in Cyberspace; Online Software Piracy – legal issues involved; Analysis of sufficiency of provisions of Copyright Act to deals with Online Software.

Piracy: Trademark issues in Cyberspace – Domain Name; Cyber squatting as a form of Domain Name dispute; Case law.

Case studies: Highlight the cybercrimes, cyber laws and Intellectual property Rights with the help of minimum 5 cases with reference to Indian IT act for better understanding.

Text Books:

1. Herman T. Tavani, ***“Ethics & Technology, Ethical Issues in an Age of Information and Communication Technology”***, John Wiley & Sons, 3rd Edition, 2011.
2. Syed Shakil Ahmed, Reheja Rajiv, ***“A Guide to Information Technology (Cyber Laws & E-commerce)”***, Capital Law House, 2001.
3. Kamath Nandan, ***“Law Relating to Computers Internet & E-commerce (A guide to Cyber Laws & the Information Technology Act, 2000 with Rules & Notification)”***, Universal Book Traders, 2nd Edition, Reprint: 2002.

Reference Books:

1. Ahmad Tabrez, “***Cyber law , E-commerce & M-Commerce”***, A. P. H. Publishing Corporation, 2003.
2. Bakshi P.M and Suri R.K, ***“Cyber and E-commerce Laws”***, Bharat Publishing House, 1st Edition, 2002.
3. Vishwanathan Suresh T, ***“The Indian Cyber Law”***, Bharat Law House, 2nd Edition, 2001.
4. Prasad T.V.R. Satya, ***“Law Relating to Information Technology (Cyber Laws)”***, Asia Law House , 1st Edition, 2001.
5. Reed Chris, ***“Computer Law”***, 3rd Edition, Universal Law Publishing Co. Pvt. Ltd., 1996 (First Indian Reprint 2000).
6. P. Narayanan, ***“Intellectual Property (Trade Marks & the Emerging concepts of Cyber property rights (HB)"***, 3rd Edition. (HB), 2002.

Course Title:	**Optical Networks**	**Semester**	**VIII**
Course Code	**BTITSE803D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM to acquire knowledge about fault and congestion management.

Course Outcomes:

The student will be able to:

1. Design a system, component or process as per needs and specification.
2. Gain knowledge on optical network architectures ranging from optical access networks to backbone optical transport networks.
3. Gain the knowledge on methodologies of optical network design optimization.
4. Explore techniques of optical network survivability.
5. Solve the Problems in the discipline of optical networks.

Course Content

UNIT I

Optical Layer: SONET/SDH: Multiplexing, CAT and LCAS, Sonnet/SDH Layers, SONET Frame Structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure, Optical Transport Network: Hierarchy, Frame Structure, Multiplexing, Generic framing procedure Ethernet: Frame structure, Switches, Ethernet Physical layer, Carrier transport IP: Routing and forwarding, Quality of service. Multiprotocol label switching: Labels and forwarding, Quality of service, Signaling and routing, Carrier transport, Resilient packet ring: Quality of service, Node structure, Fairness storage area networks: Fiber channel.

UNIT II

WDM Network Elements: Optical line terminals, Optical line amplifiers, Optical Add/Drop Multiplexers: OADM Architectures, Reconfigurable OADMs, Optical cross connects: All-Optical OXC configurations.

UNIT III

Control and Management: Network management functions: Management framework, Information model, Management protocols. Optical layer services and interfacing, Layers within the Optical layer, Multi vendor Interoperability.

UNIT IV

Performance and Fault Management: The Impact of transparency, BER measurement, Optical trace, Alarm management, Data Communication Network (DCN) and Signaling, Policing, Optical layer overhead, Client layers. Configuration management: Equipment management, Connection management, Adaptation management. Optical Safety: Open Fiber Control protocol.

UNIT V

Protection in SONET/SDH: Point-to-Point links, Self-healing rings, Unidirectional line-switched rings, Bidirectional line-switched rings, Ring Interconnection and dual homing. Protection in the client layer: Protection in Resilient Packet Rings, Protection in Ethernet, Protection in IP, Protection in MPLS, Why Optical Layer protection: Service classes based on protection. Optical Layer protection schemes: 1+1 OMS Protection, 1:1 OMS Protection, OMS-DPRing, OMS-SPRing, 1:N Transponder Protection, 1+1 OCh Dedicated Protection, OCh-SPRing, OCH-Mesh Protection, GMPLS Protection, Interworking between layers.

UNIT VI

WDM Network Design: Cost Trade-OFFS: A detailed ring network example LTD and RWA problems, Light path topology design, Routing and wavelength assignment, Wavelength conversion. Dimensioning, Wavelength- routing networks, Statistical dimensioning models: First-passage model, Blocking model, Maximum load dimensioning models: Offline light path requests, Online RWA in rings.

Text Book:

1. Rajeev Ramaswamy, Kumar N Sivarajan, "***Optical Networks***" , Elsevier Publication, 3rd Edition, 2009.

Reference Book:

1. Uyless Black," ***Optical Networks-Third generation transport system***" Pearson Publication, 2013.

Course Title:	**Web & Text Mining**	**Semester**	**VIII**
Course Code	**BTITSE803E**	**Course Type**	**Elective**
Pre-requisite	**Data Warehouse and Data Mining**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.
2. To learn the essential techniques of data and text mining.
3. To understand data mining standard predictive methods to unstructured text.
4. To discuss the standard techniques of preparation and handling methods to transform that can be mined.

Course Outcomes:

After learning the course the students should be able:

1. To examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. To explore DWH and OLAP and devise efficient and cost effective methods for maintaining DWHs.
3. To discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes.
4. To comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.
5. To evaluate systematically supervised and unsupervised models and algorithms w.r.t. their accuracy.

Course Content

UNIT I

Introduction to Information Retrieval: Inverted indices and Boolean queries, Query optimization, The nature of unstructured and semi-structured text.

UNIT II

Text encoding: Tokenization, Stemming, Lmmatization, Stop words, Phrases, Further optimizing indices for query processing, Proximity and phrase queries, Positional indices.

UNIT III

Index compression: Lexicon compression and postings lists compression, Gap encoding, Amma codes, Zipf's Law. Blocking. Extreme compression, Query expansion: spelling correction and synonyms. Wild-card queries, Permuterm indices, N-gram indices. Edit distance, Soundex, Language detection. Index construction. Postings size estimation, Merge sort, Dynamic indexing, Positional indexes, N-gram indexes, Real-world issues.

UNIT IV

Parametric or fielded search: Document zones, The vector space retrieval model, Scoring documents, Vector space scoring, The cosine measure, Efficiency considerations, Nearest neighbor techniques, Reduced dimensionality approximations, Random projection. Results summaries: Static and dynamic, Evaluating search engines.

User happiness, Precision, Recall, F-measure, Creating test collections: kappa measure, interjudge agreement. Relevance, approximate vector retrieval.

UNIT V

Feedback: Relevance feedback, Pseudo relevance feedback, Query expansion, Automatic thesaurus generation, Sense-based retrieval, Experimental results of performance effectiveness.

Probabilistic models for text problems, Classical probabilistic IR, Language models, Introduction to text classification, Naive Bayes models, Spam filtering, Probabilistic language models for IR, Bayesian nets for IR.

UNIT VI

Introduction to the problem: Partitioning methods, K-means clustering, Mixture of Gaussians model, Clustering versus classification, Hierarchical agglomerative clustering, Clustering terms using documents, Labelling clusters, Evaluating clustering, Text-specific issues, Reduced dimensionality/spectral methods, Latent semantic indexing (LSI), Applications to clustering and to information retrieval.

Vector space classification using hyperplanes, centroids, k Nearest Neighbors, Support Vector machine classifiers, Kernel functions, Text classification, Exploiting text-specific features, Feature selection, Evaluation of classification, Micro- and macro averaging, Comparative results.

Text Books:

1. Michael Geatz and Richard Roiger, ***“Data Mining: A Tutorial Based Primer”***, Pearson Education.
2. Thomas W. Miller, ***“Data and Text Mining: A Business Applications Approach”***, Pearson Education.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, ***“Introduction to Data Mining”***, Pearson Education.

Reference Books:

1. R. Baeza-Yates and B. Ribeiro-Neto, ***“Modern Information Retrieval”***, Pearson Education, 1999.
2. D.A. Grossman, O. Frieder, ***“Information Retrieval: Algorithms and Heuristics”***, Springer, 2004.
3. W. Frakes and R. Baeza-Yates, ***“Information Retrieval: Data Structures and Algorithms”***, 1st Edition, Pearson Education.

Course Title:	**Multimedia Applications**	**Semester**	**VIII**
Course Code	**BTITSE804A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To understand the overview of basic topics in multimedia.
2. To learn the software technologies of non-traditional interfaces.
3. To learn the development of interactive multimedia applications.

Course Outcomes:

After learning the course the students should be able:

1. To understand basic concepts related to MM including data standards, algorithms and softwares.
2. To experience development of multimedia software by utilizing existing libraries and descriptions of algorithms.
3. To demonstrate cutting-edge multimedia topics through independent study and presentations in class.

Course Content:

UNIT I

Introduction: Components of Multimedia, Multimedia and Hypermedia multimedia building blocks, Communication and information transfer model, Multimedia information systems, Application purposes of multimedia, Electronics performance support systems. Interaction Technologies and devices: Human Computer Interface, Input/output technologies, Combined I/O device, Storage technologies, Processing technologies.

UNIT II

Multimedia Authoring and data representation: Multimedia Authoring: Production, Presentation and auto authoring, Image data types, Image representation, Image acquisition, Picture display, Working with image.

UNIT III

Compression Technologies for multimedia: Need for data compression, Compression basics, Llossless and lossy compression, Image compression standards, Video compression standards, Basic audio compression standards.

UNIT IV

Text, Hypertext and Hypermedia, and Digital audio: Visual representation of text, Digital representation of characters, Formatting aspect text, Hypertext and hypermedia, Producing digital audio, Psychoacoustics, Processing sound, Representation of audio files, Digitization of sound, MIDI, Quantization and transmission of audio.

UNIT V

Designing multimedia: Development phases and teams, Analysis phase, Design phase, Development phase, Implementation phase, Evaluation and testing.

UNIT VI

Multimedia networks and communication: Multimedia in the Internet, Streaming stored audio/video, Streaming live audio/video, real-time interactive audio/video, Real-time interactive protocols: RTP, RTCP, Session Initialization protocol (SIP), H.323, SCTP. QoS: Data flow, Flow classes, Flow control, Integrated services, Differentiated services. Multimedia content management systems, Multimedia indexing, Multimedia retrieval.

Text Books:

1. Li. Z., Drew M., ***“Fundamentals of Multimedia”***, Pearson Education publishers, 2004.
2. Chow V. W. S., ***“Multimedia Technology and Applications”***, Springer.

Reference Books:

1. Banerji A., and Ghosh A.M., ***“Multimedia Technologies”***, McGraw Hill International, 2009.
2. Stamou G., and Kollias S., ***“Multimedia Contents and the Semantic Web”***, John Wiley & Sons., 2005.

Course Title:	**Ethical Hacking**	**Semester**	**VIII**
Course Code	**BTITSE804B**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To understand how intruders escalate privileges.
2. To understand Intrusion Detection, Policy Creation, Social Engineering, Buffer Overflows and different types of attacks and their protection mechanisms.
3. To learn about ethical laws and tests.

Course Outcomes:

After successful completion of the course, the student will be able:

1. To understand the core concepts related to malware, hardware and software vulnerabilities and their causes.
2. To understand ethics behind hacking and vulnerability disclosure.
3. To appreciate the Cyber Laws and impact of hacking.
4. To exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies.

Course Content:

UNIT I

Types of data stolen from the organizations, Elements of Information Security, Authenticity and non-repudiation, Security challenges, Effects of hacking, Types of hacker, Ethical hacker.

UNIT II

Hacktivism - role of security and penetration tester, Penetration testing methodology, Networking and computer attacks – Malicious software (Malware), Protection against malware, Intruder attacks on networks and computers, Addressing physical security, Key loggers and Back doors.

UNIT III

Web tools for foot printing, Conducting competitive intelligence, Google hacking, Scanning, Enumeration, Trojans and backdoors, Virus and worms, Proxy and packet filtering, Denial of service, Sniffer, Social Engineering: Shoulder surfing, Dumpster Diving, Piggybacking.

UNIT IV

Physical Security: Attacks and protection, Steganography: Methods, Attacks and measures, Cryptography : Methods and types of attacks, Wireless hacking, Windows hacking, Linux hacking.

UNIT V

Routers, Firewall and Honeypots, IDS and IPS, Web filtering, Vulnerability, Penetration testing, Session hijacking, Web server, SQL Injection, Cross site scripting, Exploit writing, Buffer overflow, Reverse engineering, Email hacking, Incident handling and response, Bluetooth hacking, Mobiles phone hacking.

UNIT VI

An introduction to the particular legal, Professional and ethical issues likely to face the domain of ethical hacking, Ethical responsibilities, Professional integrity and making appropriate use of the tools and techniques associated with ethical hacking, Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

Text Books:

1. Michael T. Simpson, Kent Backman, James E., ***"Corley, Hands-On Ethical Hacking and Network Defense"***, CENGAGE Learning, 2nd Edition, 2010.
2. Patrick Engebretson, ***"The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy"***, Syngress Basics Series – Elsevier, August 4, 2011.

Reference Books:

1. Steven DeFino, Barry Kaufman, Nick Valenteen, ***"Official Certified Ethical Hacker Review Guide"***, CENGAGE Learning, 2009-11-01.
2. Whitaker, Newman, ***"Penetration Testing and Network Defense"***, Cisco Press, Indianapolis, IN, 2006.

Course Title:	**CRM & SCM**	**Semester**	**VIII**
Course Code	**BTITSE804C**	**Course Type**	**Elective**
Pre-requisite	**Enterprise Resource Planning**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management and Quality Control**	**Credits**	**3**

Course Objectives:

1. To make students understand the how IT is an enabler for SCM and CRM.
2. To understand supply chain strategy framework and supply chain strategies.
3. To comprehend the functionalities of CRM in service sector.

Course Outcomes:

After learning the course the students should be able:

1. To understand the concept of logistics and supply chain management.
2. To appreciate the importance of logistics function in overall success of any business/industrial sector.
3. To understand the interrelationship between logistics and supply chain management.
4. To understand the importance and dynamics of supply chain management in any business/industrial sector.
5. To know the world class best practices being carried out in supply chain management.
6. To understand the procurement and outsourcing strategies.
7. To understand the impact of customer relationship management in effective supply chain management.
8. To know how to measure the performance of supply chain operations.

Course Content:

UNIT I

Introduction to CRM: What is CRM? Why we need CRM? Definition of CRM, Architecture of CRM, Technology considerations of CRM, Technology components of CRM, Customer life cycle, Customer lifetime value computation, Implications of globalization on customer relationship management.

UNIT II

Introduction to e-CRM: Definition of e-CRM, Its need, Features, Framework of e-CRM, Six e’s of e-CRM, CRM Vs e-CRM, Architecture of e-CRM, Implementing a technology based CRM solution.

UNIT III

Introduction to Supply Chain: What is SCM?, Why SCM? Generic types of supply chain, Major drivers of Supply chain, Supply Chain strategies, Value in Supply Chain- quality, Delivery, Flexibility, Core competencies in Supply Chain.

UNIT IV

Source management in Supply Chain: Insourcing, outsourcing, Partner selection, Sourcing strategies, Procurement strategies, Managing Inventory in Supply chain, Definition of inventories, Selective inventory control, Vendor managed inventory systems, Inventory performance measures- financial, operational & inventory turnover ratio (ITR), Transportation decisions in a Supply Chain – Transportation Strategy, Transportation selection, Mode of transportation, Transportation management system (TMS).

UNIT V

e- SCM: Information technology in Supply Chain: Typical IT solutions- EDI, Intranet, Extranet, Data Warehousing, E- commerce, E-procurement, Bar coding technology, GPS, RFID.

UNIT VI

Information Systems in Supply Chain Case Study – A live case of use of IT, Case Studies for SCM & CRM, For SCM: Mumbai Tiffinwala, For CRM: Sales Force.

Text Books:

1. Bowersox, Closs & Cooper , ***"Supply Chain & Logistic Management"***, Tata McGraw Hill 2nd Edition.
2. Paul Greenberg, ***"CRM at the speed of light"***, YMH 2nd Edition.

Reference Book:

1. Kristin Anderson and Carol Kerr, ***"Customer Relationship Management"***, Tata McGraw Hill.

Course Title:	**Wireless Networking**	**Semester**	**VIII**
Course Code	**BTITSE804D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To study the evolving wireless technologies and standards.
2. To understand the architectures of various access technologies such as 3G, 4G, WiFi etc.
3. To understand various protocols and services provided by next generation netwoks.

Course Outcomes:

After learning the course the students should be able:

1. To keep himself updated on latest wireless technologies and trends in the communication field.
2. To understand the transmission of voice and data through various networks..

Course Content:

UNIT I

Introduction, Technology and service trends of emerging Wireless technologies, The amazing growth of Mobile Communications, A little history, Mobile Communications fundamentals, Mobile data, WiFi, Bluetooth, Cable systems, Wireless migration options, Harmonization process.

UNIT II

WiFi (802.11), 802.11 Standards, WiFi protocols, Frequency allocation, Modulation and coding schemes, Network architecture, Typical WiFi configurations, Security, 802.11 Services, Hot spots, Virtual Private Networks (VPNs), Mobile VPN, VPN types, WiFi Integration with 3G/4G, Benefits of convergence of WiFi and Wireless Mobile.

UNIT III

Introduction, Universal mobile telecommunications service (UMTS), UMTS services, The UMTS air interface, Overview of the 3GPP release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5, All-IP Network Architecture, Overview CDMA2000, TD-CDMA, TD-SCDMA, Commonality among WCDMA, CDMA2000, TD-CDMA, and TD-SCDMA.

UNIT IV

LTE Ecosystem, Standards, Radio spectrum, LTE architecture, User Equipment (UE), Enhanced Node B (eNodeB), Core network (EPC), Radio channel components, TD-LTE, Multiple Input Multiple Output, LTE scheduler, Carrier aggregation, Cell search, Cell reselection, Attach and default bearer activation, Handover (X2, S1, Inter-MME), Self-Organizing Networks (SONs), Relay cells, Heterogeneous Network (HetNET), Remote radio heads (RRH), VoLTE, LTE advanced.

UNIT V

Introduction, Standards, Generic WiMAX Architecture, Core network, Radio network, WiMAX Spectrum, Modulation, Channel structure, Mixed mode, Interference Mitigation techniques, Frequency planning, Features and applications, Security, QoS, Profiles, Origination, Handover, Femto and SON.

UNIT VI

Why VoIP?, The Basics of IP transport, VoIP challenges, H.323, The Session Initiation Protocol (SIP), Distributed architecture and media gateway control, VoIP and SS7, VoIP Quality of Service.

Text Books:

1. Clint Smith, P.E., Daniel Collins, ***"Wireless Networks: Design and Integration for LTE, EVDO, HSPA, and WiMAX"***, McGraw Hill 3rd Edition,
2. Eldad Perahia, Robert Stacey, ***"Next Generation Wireless LANs"***, Cambridge University Press, 2nd Edition.

Reference Books:

1. Yi-Bang Lin, Imrich Chlamtac, ***"Wireless and Mobile Network Architecture"***, Wiley India Edition.
2. Dipankar Ray chaudhary, Maria Gerla, ***"Emerging Wireless Technologies and the Future Mobile Internet"***, Cambridge University Press.

Course Title:	**Machine Learning**	**Semester VIII**	
Course Code	**BTITSE804E**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics III**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To understand the basic concepts and methods of machine learning.
2. To make use of some elementary machine learning techniques in the design of computer systems.
3. To develop a broad perspective about the applicability of ML algorithms in different fields.
4. To understand the major machine learning algorithms, the problem settings and assumptions that underlies them.
5. To possess insights, concerning the relative strengths and weaknesses of various common machine learning methods.

Course Outcomes:

After learning the course the student will be able:

1. To demonstrate knowledge of the machine learning literature.
2. To describe how and why machine learning methods work.
3. To demonstrate results of parameter selection.
4. To explain relative strengths and weaknesses of different machine learning methods.
5. To select and apply appropriate machine learning methods to a selected problem.
6. To implement machine learning algorithms on real datasets.
7. To suggest ways to improve results.

Course Content:

UNIT-I

Introduction: Well-posed learning problems, Designing a Learning System, Perspectives and Issues in Machine learning, Concept Learning and General-to-specific Ordering: A concept learning task, Concept learning as Search, Finding a maximally specific hypothesis, Version Spaces and Candidate elimination algorithm, Inductive Bias.

UNIT-II

Decision Tree Learning: Decision tree learning algorithm, Hypothesis space search in decision tree Evaluating Hypothesis: Estimating Hypothesis accuracy, Basics of sampling theory, Deriving confidence intervals, Hypothesis testing, comparing learning algorithms.

UNIT-III

Bayesian Learning: Bayes theorem and concept learning, Maximum likelihood and least square error hypotheses, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Computational Learning Theory: Probably learning an approximately correct hypothesis, PAC learnability, The VC dimension, the mistake bound model for learning.

UNIT-IV

Linear Models for Regression: Linear basis function models, The Bias-Variance decomposition, Bayesian Linear Regression, Bayesian Model comparison

Kernel Methods: Constructing kernels, Radial basis function networks, Gaussian Processes

UNIT-V

Approximate Inferencing: Variational inference, Variational mixture of Gaussians, Variational linear regression, Variational logistic regression, Hidden Markov Models: Learning algorithms for HMM, the Viterbi algorithm, Linear Dynamical Systems.

UNIT-VI

Reinforcement Learning: The learning task, Q learning, Non-deterministic rewards and action, Temporal difference learning, Generalizing from examples.

Text Books:

1. Mitchell, Tom. M., *"Machine Learning"*, McGraw-Hill Education, 1st Edition, May 2013.
2. Segaran, Toby. ***"Programming Collective Intelligence- Building Smart Web 2.0 Applications"***, O'Reilly Media, August 2007.

Reference Books:

1. Miroslav, Kubat. ***"An Introduction to Machine Learning"***, Springer Publishing.
2. Bishop, C. M., ***"Pattern Recognition and Machine Learning"***, Springer Publishing.
3. Conway, Drew and White, John Myles, ***"Machine Learning for Hackers"***, O'Reilly Media, February 2012.

Course Title:	**Internet of Things Lab**	**Semester VIII**	
Course Code	**BTITDEL805A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessors and Microcontrollers Lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objective:

1. To implement M2M programs using ARM/Raspberry Pi boards.
2. To interface real-world devices with Internet and display data and information collected.

Lab Experiments List:

1. Write program for creating different LED patterns and use ARM/Raspberry Pi boards, on-board LEDs for checking output.
2. Write program for interfacing LEDs and push to on switch with ARM/Raspberry Pi board at different GPIO pins.
3. Write program for interfacing 16x2 LCD with ARM/Raspberry Pi board at different GPIO pins.
4. Write program to read the onboard temperature and display on cloud.

Course Title:	**E-commerce Systems Lab**	**Semester VIII**	
Course Code	**BTITDEL805B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Web Technologies**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objective:

1. To design an E-commerce website.
2. To develop the various modules for a B2C E-commerce business.
3. To program and implement various web pages and workflows to deploy a B2C ecommerce business.
4. To develop the various web forms and page panels for an ecommerce.

List of Lab Experiments:

1. Students can choose any online retail business on the B2C model of e-commerce business.
2. Creating the Website Layout for E-Commerce.
3. Inserting & Displaying the Products & Categories.
4. Creating the Shopping Cart.
5. Creating the User Registration & Login Systems.
6. Creating the Checkout System.
7. Creating the Payment Integration System.
8. Creating the Admin Panel for E-commerce.
9. Uploading the E-Commerce to Online Server.

Course Title:	**Mobile Computing - Lab**	**Semester VIII**	
Course Code	**BTITSEL806A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Software and Application Development**	**Credit**	**1**

Lab Experiments Objectives:

1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.

List of Lab Experiments:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

Course Title:	**Cryptography Lab**	**Semester VIII**	
Course Code	**BTITSEL806B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.

List of Lab Experiments:

1. Encryption using binary/byte addition.
2. Encryption using binary Exclusive-OR (XOR).
3. Triple DES with CBC mode and Weak DES keys.
4. RSA Encryption and Factorization Attacks.
5. Attack on RSA encryption with short RSA modulus
6. Hash generation and sensitivity of hash functions to plaintext modifications.
7. Digital Signature Visualization.
8. RSA Signature.
9. Study of Attack on Digital Signature/Hash Collision.

Course Title:	**Information Retrieval- Lab**	**Semester VIII**	
Course Code	**BTITSEL806C**	**Course Type**	**Elective**
Pre-requisite	**Design and Analysis of Algorithms lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To implement various information retrieval (IR) algorithms across data and web successfully.
2. To compare results and discuss the merits and demerits of various algorithms.

Lab Experiments List:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming.
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio's, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank.
8. Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of PageRank on Scholarly Citation Network.

Course Title:	**Network Security - Lab**	**Semester VIII**	
Course Code	**BTITSEL806D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Networks**	**Credit**	**1**

Lab Experiments Objectives:

1. To highlight the issues with computer and network security by giving the hands on knowledge of various things like monitoring and analyzing network traffic.
2. To install and configure different tools like Wireshark, SNORT, NMAP and Port Scanners etc.

Lab Experiments List:

1. Perform An Experiment To Grab A Banner With Telnet And Perform The Task Using Netcat Utility.
2. Perform An Experiment For Port Scanning With Nmap, Superscan Or Any Other Software.
3. Using Nmap.
4. Find Open Ports On A System.
5. Find The Machines Which Are Active.
6. Find The Version Of Remote Os On Other Systems.
7. Find The Version Of S/W Installed On Other System.
8. Perform An Experiment On Active And Passive Finger
9. Printing Using Xprobe2 and Nmap.
10. Perform an experiment to demonstrate how to sniff for Router Traffic by Using the Tool Wireshark.
11. Perform an experiment How To Use Dumpsec.
12. Perform a Wireless Audit Of An Access Point / Router And Decrypt WEP And WPA.
13. Perform an Experiment To Sniff Traffic Using Arp Poisoning.
14. Install Jcrypt Tool (Or Any Other Equivalent) And Demonstrate Asymmetric, Symmetric Cryptography Algorithm, Hash And Digital/PKI Signatures.
15. Demonstrate Intrusion Detection System (Ids) Using Any Tool e.g. Snort Or Any Other S/W.
16. Install Rootkits And Study Variety Of Options.
17. Generating Password Hashes With Openssl.
18. Setup A Honey Pot And Monitor The Honeypot On Network.

Course Title:	**Big Data Analytics - Lab**	**Semester VIII**	
Course Code	**BTITSEL806E**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / C++ / Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objective:

1. To learn the concepts of Big data processing techniques by writing programs in Hadoop and MapReduce algorithms.

Lab Experiments List:

1. Study of Hadoop ecosystem.
2. Two programming exercises on Hadoop.
3. Two programming exercises in No SQL.
4. Implementing simple algorithms in MapReduce: Matrix multiplication, Aggregates, joins, sorting, searching.
5. Implementing any one frequent item set algorithm using MapReduce.
6. Implementing any one clustering algorithm using MapReduce.
7. Implementing any one data streaming algorithm using MapReduce.
8. Mini Project: one real life large data application to be implemented (use standard datasets available on the web).

Course Title:	**Multimedia Applications-Lab**	**Semester VIII**	
Course Code	**BTITSEL807A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Software and Application Development**	**Credit**	**1**

Lab Experiments Objectives:

1. To write programs to edit and modify multimedia files into different formats.
2. To write programs to service multimedia information on demand through streaming.
3. To transfer multimedia data from one system to other.

Lab Experiments List:

1. Assignment on: Image editing using Photoshop (or other image editing software).
2. Audio editing using Sound Forge or Audacity (or other sound editing software).
3. Animation using Flash Video editing using Premier or Adobe.
4. Write a program to convert audio files from one format to other.
5. Write a program to convert video files from one format to other.
6. Write a program to embed multimedia files on a webpage and stream them.
7. Write programs to transfer multimedia files from one device to another.

Course Title:	**Ethical Hacking- Lab**	**Semester VIII**	
Course Code	**BTITSEL807B**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. To understand the different kinds of hacker attacks to information and computer systems.
2. To simulate hacker attacks.
3. To change system parameters to prevent hacker attacks.
4. To write programs to prevent attacks and make system more resilient.

Lab Experiments List:

1. Use any 2 of the following hacking tools to expose system vulnerability (Nmap, Nessus, John the Ripper, Cain & Abel, Netstumbler, SQLMap).
2. Conduct and experiment to crack a password of an Application using the Cain & Abel tool.
3. Simulate a Denial of Service attack.
4. Execute a network sniffing exercise using Wireshark.
5. Discover vulnerabilities in a web server.
6. Create a simple website and write programs protect it from hacks such as (SQL injection, DoS, Cross Site Scripting XSS, Cookie/Session Poisoning, Form Tampering, Code injection and Defacement).

Course Title:	**CRM & SCM – Lab**	**Semester VIII**	
Course Code	**BTITSEL807C**	**Course Type**	**Elective**
Pre-requisite	**Enterprise Resource Planning**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To understand CRM and SCM as candidates to understand ERP applications deployed in organization.
2. To demonstrate the workings of various sub functions of CRM and SCM as learned in theory.

Lab Experiments List:

Students can download any open source CRM and SCM systems available to conduct the lab assignments

1. Set up an organizations customers, sales, product/services, departments and markets in the CRM/SCM system
2. Enter data for orders, customers, products, orders, quotes, invoices, payments in the CRM/SCM
3. Generate various CRM reports and alert with all the data entered

Course Title:	**Wireless Networking – Lab**	**Semester VIII**	
Course Code	**BTITSEL807D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**0 – 0 – 2**
Stream	**Networking**	**Credit**	**1**

Lab Experiments Objectives:

1. To give the practical exposure on wireless networks.
2. To configure and understand real issues in maintaining wireless networks.
3. To understand administrator functions.

Lab Experiments List:

1. Wireless Component and Media Identification.
2. Install a WLAN Adapter Card.
3. Wireless Mathematics.
4. Topology Design with Cisco Network Designer (CND).
5. Configuring Basic AP Settings.
6. Resetting the Bridge.
7. Antenna Setup.
8. Wireless Attacks and Countermeasures.
9. WLAN Design.
10. Site Survey Active Mode.

Course Title:	**Machine Learning – Lab**	**Semester VIII**	
Course Code	**BTITSEL807E**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objective:

1. To implement various machine learning techniques to solve problems.

Lab Experiments List:

1. Learn the data preprocessing steps to start a machine learning method for a practical.
2. Solve a stated problem using the simple linear regression method.
3. Use the multiple linear regression method for a stated issue.
4. Implement a polynomial regression solution.
5. Use the support vector regression to implement a ML solution.
6. Solve a stated problem using the decision tree regression method.
7. Implement a random forest regression solution.
8. Implement a reinforcement learning program to demonstrate ML concepts.

Course Title:	**Project Phase - II**	**Semester VIII**	
Course Code	**BTITP808**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 12**
Stream	**Core**	**Credits**	**5**

This is continuous work to the project phase I. Every students will have to submit a completed report (3 copies)* of the project work. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II

1. Coding/Implementation.
2. Use cases.
3. Testing/Trouble shooting.
4. Data dictionary/ Documentation.
5. Finalization of project in all respect.

*(For guide, Personal copy, Departmental library.)

In a presentation, the students should focus to clarify problem definition and analysis of the problem.

PROPOSED SYLLABUS OF INFORMATION TECHNOLOGY

FIFTH AND SIXTH SEMESTER

RTM NAGPUR UNIVERSITY, NAGPUR

ACADEMIC SESSION: 2014-2015

Annexure J

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: FIFTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/ Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT501T	System Programming	3	-	1	4	3	-	1	4	20	80	-	-	100
2	BEIT502T	Design and Analysis of Algorithms	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BEIT503T	Software Engineering	3	-	1	4	3	-	1	4	20	80	-	-	100
4	BEIT503P	Software Engineering	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT504T	Computer Graphics	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT504P	Computer Graphics	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BEIT505T	Java Programming	3	-	1	4	3	-	1	4	20	80	-	-	100
8	BEIT505P	Java Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
9	BEIT506T	Industrial Economics and Entrepreneurship Development	4	-	-	4	4	-	-	4	20	80	-	-	100
		Total	21	6	5	32	21	3	5	29	120	480	75	75	750

Annexure J

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: SIXTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/ Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT601T	Computer Networks	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT602T	Operating Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
3	BEIT603T	Database Management Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT603P	Database Management Systems	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT604T	Internet Programming	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT604P	Internet Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
7	BEIT605T	Functional English	2	-	1	3	2	-	1	3	10	40	-	-	50
8	BEIT606P	Mini Project and Industrial Visit	-	2	-	2	-	2	-	2	-	-	25	25	50
		Total	18	6	5	29	18	4	5	27	90	360	75	75	600

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Scheme of Absorbtion of New course(C.B.S.) to Old course of Fifth Semester

B. E. (Information Technology)

As per Old course scheme of RTM, Nagpur University				As per New course(C.B.S.) scheme of RTM, Nagpur University		
Sr. No	Sem	Subjects	Th / Pr	Subject Code	Subjects	Th / Pr
1	V	System Software	Th	BEIT501T	System Programming	Th
2	V	Computer Graphics	Th	BEIT504T	Computer Graphics	Th
3	V	Computer Graphics	Pr	BEIT504P	Computer Graphics	Pr
4	V	Principles of Management	Th	BEIT506T	Industrial Economics and Entrepreneurship Development	Th
5	V	Information Theory and Data Communication	Th			
6	V	Information Theory and Data Communication	Pr			
7	V	Discrete and Integrated Circuits	Th			
8	V	Discrete and Integrated Circuits	Pr			
9	V	Object Oriented Methodologies	Th			
10	V	Object Oriented Methodologies	Pr			
				BEIT502T	Design and Analysis of Algorithms	Th
				BEIT503T	Software Engineering	Th
				BEIT503P	Software Engineering	Pr
				BEIT505T	Java Programming	Th
				BEIT505P	Java Programming	Pr

Note: If any student has cleared any subject as mentioned in absorption scheme of relevent semester in previous semester of old course will be exempted for appearing in the examination for that subject

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Proposed Scheme of Absorbtion of New course(C. B. S.) to Old course of Sixth Semester

B. E. (Information Technology)

As per Old course scheme of RTM, Nagpur University

Sr. No	Sem	Subjects	Th / Pr
1	VI	Software Engineering	Th
2	VI	Software Engineering	Pr
3	VI	JAVA Programming	Th
4	VI	JAVA Programming	Pr
5	VI	Database Management Systems	Th
6	VI	Database Management Systems	Pr
7	VI	Operating Systems	Th
8	VI	Microprocessors	Th
9	VI	Microprocessors	Pr
10	VI	Visual Techniques	Th
11	VI	Visual Techniques	Pr

As per New course (C. B. S.)scheme of RTM, Nagpur University

Subject Code	Subjects	Th / Pr
BEIT603T	Database Management Systems	Th
BEIT603P	Database Management Systems	Pr
BEIT602T	Operating Systems	Th
BEIT601T	Computer Networks	Th
BEIT604T	Internet Programming	Th
BEIT604P	Internet Programming	Pr
BEIT605T	Functional English	Th
BEIT606P	Mini Project and Industrial Visit	Pr

Note: If any student has cleared any subject as mentioned in absorption scheme of relevent semester in previous semester of old course will be exempted for appearing in the examination for that subject

BEIT501T SYSTEM PROGRAMMING

(Theory Credit: 04)

Teaching Scheme:	Examination Scheme:
Lecture: 3 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction to System Software and IBM 360 Machine:

Evolution of components of programming system, Operating System, Overview, Functions and Facilities o, Goals of System software, Views of System Software, Virtual machine. General machine structure IBM 360/370, Machine Language Assembly language.

UNIT II:

Assembler:

Design of Pass-I and Pass-II Assemblers, Table Processing, Searching and Sorting, Problems based on symbol table, Base table and Literal table generation, Machine code generation and Searching and sorting.

UNIT III:

Macro Language and Macro Processor:

Macro instruction, Features of Macro facility, Implementation of 1-Pass, 2-Pass Macro processor, Macro calls within macro, macro definition within macros.

UNIT IV:

Loaders and Linkers:

Different Loading Schemes, Binders, Overlays, Linking loaders, Design of absolute loaders, Design of Direct Linking loaders.

UNIT V:

Compiler:

Phases of Compiler, Cross Compiler, Bootstrapping, Erros in each phases, ,Compiler writing tools, Lex and YACC, Databases used in Compilation process.

UNIT VI:

UNIX Device Drivers:

Introduction to Device drivers, Types of Device Drivers, Design issues in Device Drivers, Driver installation with example, character driver-A/D Converter, Block Driver-RAM Disk driver, Terminal Driver-The COM1 port driver

Text Books:

1. J. J. Donovan; System Programming; TMH, 2012
2. D.M. Dhamdhere; System Programming; THM; 2011
3. George Pajari; Eritting Unix Device Drivers; Pearson Education; 2011
4. O.G. Kakade; Principles of Compiler Design; Laxmi Pub. 2008

Reference Books:

1. Leland Beck, D. Manjula; System Software; An Introduction to System Programming; Pearson Education; 2013
2. Alfred Aho, J. Ullman; Principles of Compiler Design; Narosa Pub. 2010

*****

BEIT502T DESIGN AND ANALYSIS OF ALGORITHMS

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

===

UNIT I:

Mathematical foundation, summation of arithmetic and geometric series, Σn, Σn^2, bounding summation using integrations, recurrence relations, solutions of recurrence relations using technique of characteristic equation, recursion tree method and master theorem, generating functions, Complexity calculation of various standard functions, principles of designing algorithms

UNIT II:

Asymptotic notations of analysis of algorithms, analyzing control structures, worst case, average case and best case analysis of insertion sort, selection sort and bubble sort, ,lower bound proof, amortized analysis, application of amortized analysis, Sorting networks, comparison networks, biotonic sorting network.

UNIT III:

Divide and conquer strategies: Binary search, quick sort, merge sort, heap sort, Stressen's matrix multiplication algorithm, min-max algorithm. Greedy Approach: Basic strategy, activity selection problem, application to job sequencing with deadlines problem, knapsack problem, optimal merge pattern, Huffman code, minimum cost spanning tree using Prim's and Kruskal's algorithm,

UNIT IV:

Dynamic Programming: Basic Strategy, Multistage graph (forward and backward approach), Longest Common Subsequence, matrix chain multiplication, Optimal Binary Search Tree, 0/1 Knapsack problems, Travelling Salesman problem, single source shortest path using Bellman-Ford algorithm, all pair shortest path using Floyd- Warshall algorithm.

UNIT V:

Basic Traversal and Search Techniques, breadth first search and depth first search, connected components. Backtracking: basic strategy, 4-Queen's problem, 8-Queen's problem, graph coloring, Hamiltonian cycles etc, Approximation algorithm and concepts based on approximation algorithms

UNIT VI:

NP-hard and NP-complete problems, basic concepts, non-deterministic algorithms, NP-hard and NP-complete, Cook's theorem, decision and optimization problems, polynomial reductions, graph based problems on NP Principle, Computational Geometry, Approximation algorithm.

Text Books:

1. "Introduction to Algorithms", Thirs Edition, Prentice Hall of India by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein.
2. "The Design and Analysis of Computer Algorithms", Pearson education by Alfred V. Aho, John E. Hopcraft, Jeffrey D. Ullman.

3. "Fundamentals of Computer Algorithms", Second Edition, University Press By Horowitz, Sahani, Rajsekharam.
4. "Fundamentals of Algorithms", Prentice Hall by Brassard, Bratley
5. "Design and Analysis of Algorithms",Pearson Education, IInd Edition, Parag Dave, Himanshu Dave

Reference Books:

1. Computer Algorithms: Introduction to Design and analysis, 3rd Edition, By Sara Baase and A. V. Gelder Pearson Education.

BEIT503T SOFTWARE ENGINEERING

(Theory Credit: 04)

Teaching Scheme:	Examination Scheme:
Lecture: 3 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

Basics: Introduction to Software Engineering, Software Myths, Software Engineering- A Layered Technology, Software Process Framework, Software Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Agile Process Models

UNIT II:

Measures Metrics and Indicator, Metrics for process & projects: Software measurement, metrics for software quality, metrics for small organization, Estimation: Software scope and Feasibility, Resources, Software project estimation, Decomposition Techniques, Empirical Estimation Models, Make-buy Decision, Project scheduling

UNIT III:

System Engineering: Hierarchy, Business Process Engineering, Product Engineering, System Modeling, Requirements Engineering: Requirements Analysis, Analysis Modeling Approaches, Data Modeling, Object-Oriented Analysis, Scenario-Based Modeling, Flow-Oriented Modeling, Class-based Modeling, Behavioral Model, Metrics for Analysis Models

UNIT IV:

Design Engineering Concepts, Design Model, Pattern-Based Software Design, Architectural Design, Mapping data flow into software architecture, Cohesion, Coupling, User interface analysis and Design,
Metrics for Design Models

UNIT V:

Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging, Software Testing Fundamentals, Black-Box Testing, White-Box Testing, Metrics for Source Code, Metrics for Testing & Maintenance

UNIT VI:

Risk Management: Risk strategies, Software risks, Risk identification, Risk refinement, RMMM Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Review, Software Reliability, Change Management: Software Configuration Management, SCM Repository, SCM Process, Reengineering: Software reengineering, Reverse Engineering, Restructuring, Forward Engineering

Text Books:

1. Software Engineering-A Practitioner's Approach (Sixth Edition) by Roger Pressman (TMH)
2. Software Engineering (Ninth Edition)-Ian Summerville (Pearson)
3. Software Engineering for students (4th Edition)- Douglas Bell(Pearson)

Reference Books:

1. Schaum's Outline of Theory and Problems of Software Engineering by David Gustafson (TMH)
2. Software Engineering (Third Edition) by K. K. Aggarwal and Yogesh Singh (New age International Publishers)
3. Software Engineering, Theory and Practice(4th Edition)- Pfleeger, Atlee(Pearson)

*****

BEIT503P SOFTWARE ENGINEERING

(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

===

Note:

1. Practicals are based on SOFTWARE ENGINEERING syllabus (subject code: BEIT503T)
2. Practicals are based on:
    a) DFD
    b) UML diagrams for software
    c) Testing Tools
    d) CASE Tools
3. Minimum ten practicals have to be performed
4. Do not include study experiments

*****

BEIT504T COMPUTER GRAPHICS

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

Geometry and line generation: points, lines, planes, pixels and frames buffers, types of display devices and its architecture DDA and Bresenham's algorithms for line generation, Bresenham's algorithm for circle generation, aliasing , anti-aliasing and its techniques.

UNIT II:

Graphics primitives: Display files, algorithms for polygon generation, polygon filling algorithms, NDC (normalized device co-ordinates), 2D transformations: scaling, rotation, translation, rotation about arbitrary point, reflections, shearing.

UNIT III:

Segment tables: operations on segments, data structures for segments and display files, Windowing and clipping: window, viewport, viewing transformations, clipping, line and Polygon clipping.

UNIT IV:

3D Graphics: 3D Transformation, parallel, perspective and isometric projections, 3D Transformations. Hidden surfaces and line removal: Painter's, Z-buffer, Warnock's, Back-face Removal algorithm

UNIT V:

Curves and surfaces: Methods of interpolation, Bezier and B-splines, surface rendering methods: Gouraurd Shading, Phong Shading, Constant Intensity Shading, Fast Shading.

UNIT VI:

Color Models and Color Application: Properties of light, standard primaries, chromaticity Diagram, Intuitive colour concept RGB, YIQ CMY, HSK, colour models and their conversion, colour selection and applications. Animation: Design of Animation sequences, animation Function, Raster animation, animation Language, Key-Frame System, motion Specification.

Text Books:

1. Procedural elements for computer graphics by David F. Rogers, Mc-Graw Hill.
2. Computer Graphics 'C' Version, Second Edition By Donald Hearn and M.Pauline Baker, Pearson publication
3. Mathematical elements for computer graphics by David Rogers and J. Alan Adams, Tata Mcgraw Hill Education Private Limited
4. Computer graphics principles and practice in C by Foley, Vandam, Feiner and Huges (Pearson)
5. Computer Graphics, Vikas publications, Neeta Jain
6. Principles of interactive computer graphics by Newman and Sproul.

*****

BEIT504P

COMPUTER GRAPHICS

(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

===

Note:

1. Practicals are based on COMPUTER GRAPHICS syllabus (subject code: BEIT504T)
2. There should be at the most two practicals per unit
3. Minimum ten practicals have to be performed
4. Do not include study experiments

*****

BEIT505T JAVA PROGRAMMING

(Theory Credit: 04)

Teaching Scheme:	Examination Scheme:
Lecture: 3 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction to Java, Data types, Literals: Types of Literals, Operators, Control Statements: If, switch, do-while, while, for, enhanced for loop, Nested Loop, break, continue, return statements, Classes: Fundamentals of classes, Declaring objects, Assigning objects, Reference variables, Overloading methods, Constructors, this keyword, Wrapper classes, Using object as parameter, Argument passing, Command line arguments, returning object, static modifier, final modifier, Nested classes: inner classes, Garbage collection.

UNIT II:

Arrays, Vectors and Generics, String Handling: String and StringBuffer class, String constructors, Data conversion using valueOf(), toString() methods, Methods for String Comparison, Searching string and modifying string.

UNIT III:

Object class, Inheritance, Abstract classes and methods, Interfaces, Method Overriding, Packages: Package Fundamental, Access protection, Importing packages, Exception Handling: Fundamental Exception type: Checked, Unchecked and Uncaught Exceptions, throw and throws keywords, Creating user defined exceptions, Built-in Exceptions.

UNIT IV:

Multithreading:Fundamentals, Thread Life Cycle, Ways of creating threads, Creating multiple threads, isAlive (), join (), Thread Synchronization, Thread priorities, Interthread communication, Methods for suspending, resuming and stopping threads.

UNIT V:

I/O stream, Byte stream, Character stream, Pre-defined streams, Reading console input, Writing console output, PrintWriter class, Reading and Writing files, transient and volatile modifiers, instanceof, strictfp and native methods.

UNIT VI:

Introduction to Swings, AWT as a origin of Swing, Key swing features, Components and container, Swing packages, Event handling, Creating swing applets, Controls: label and image icons, JTextField, Swing Buttons, Tabbed Panes, JScrollPanes, JList, JComboBox, JTable.

Text Books:

1. The Complete Reference (Seventh Edition) by Herbelt Schildt, TATA McGRAW-HILL Publications

Reference Books:

1. Sun Certified Java Programmer for Java 6 by Kathy Sierra.
2. The Java^{TM} Programming Langauge(3rd Edition) by Arnold, Holmes, Gosling, Goteti
3. Core Java for Beginners by Rashmi Kanta Das(III Edition) Vikas Publication
4. Programming in Java(Second Edition) by Sachin Malhotra and Saurabh Choudhary, Oxford University Press

BEIT505P JAVA PROGRAMMING

(Practical Credit: 01)

Teaching Scheme:	Examination Scheme:
Practical: 2 Hours/week	Practical: P (U): 25 Marks P (I): 25 Marks
	Duration of University Exam. : 02 Hours

==

Note:

1. Practicals are based on JAVA PROGRAMMING syllabus (subject code: BEIT505T)
2. There should be at the most two practicals per unit
3. Minimum ten practicals have to be performed
4. Do not include study experiments

*****

BEIT506T INDUSTRIAL ECONOMICS AND ENTREPRENEURSHIP DEVELOPMENT

(Theory Credit: 03)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: Nil	Duration of University Exam. : 03 Hours

==

Objective:

Study of this subject provides an understanding of the scope of an industrial economics and entrepreneurship development, key areas of business development, sources of finance, project preparation, methods of taxation and tax benefits, significance of entrepreneurship and economic growth, application of engineering skills in entrepreneurial activities etc.

UNIT I:

Industrial economics, Types of Business structures, top and bottom line of the organization, economic analysis of business, economics of operations, economic prudence in business.

UNIT II:

Market structures- Monopoly, Oligopoly, and Monopolistic competition. Pricing strategies, business integration- forward backward integration, economies of scale, diseconomies of scale, liberalization, privatization and globalization. Business cycles, optimum size of firm.

UNIT III:

The functions of central bank and commercial banks, Foreign Direct Investment, Free trade vs. Protectionism, Capital formation, Inflation, Recession and stagnation, Inclusive growth, Public-Private partnership for development, Multiplier effect, Accelerator effect.

UNIT IV:

Entrepreneurship meaning, Major Motives Influencing an Entrepreneur, Factors Affecting Entrepreneurial Growth. Project Formulation, Product development, Market Survey and Research, Demand forecasting techniques,Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT V:

Need – Sources of Finance, Term Loans, Capital Structure, venture capital. Angel funding, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Direct, Indirect Taxes.

UNIT VI:

Sickness in small Business, Major problems faced by SSIs, Foreign Direct Investments and threat to SSI, Technical consultancy organizations, safeguard measures against variation in currency value, Government Policy for Small Scale Enterprises, tax holidays, and incentives to SSIs.

TEXT BOOKS

Industrial Economics. By, Ranjana Seth, Ane Book Pvt Ltd.
Modern Economic Theory By, K.K. Dewett. S.Chand.
Industrial Economics. By, Jagdish Sheth, Pearson Publication.
"Entrepreneurial Development" By, S.S.Khanka S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
Management of Entrepreneurship. By, N.V.R. Naidu, I.K. International Pvt Ltd.
Entrepreneurial Development. By, S.Anil Kumar. New Age International.
Small- Scale Industries and Entrepreneurship, By, Dr. Vasant Desai, Himalaya Publication.

REFERENCE BOOKS:

Business Economics. By, K.Rajgopalchar. Atalantic Publishers.
Microeconomics. By, Robert Pindyk
Business Economics. By, H.L. Ahuja,H. L. Ahuja,Louis Prof. De Broglie. S.Chand.

Rabindra N. Kanungo "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.

Financing Small Scale Industries in India, By, K.C.Reddy.Himalaya Publication.

*****

BEIT601T COMPUTER NETWORKS

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I: Introduction

Introduction to computer networks & Internet, Network architecture, layered approach, OSI reference model, TCP/IP protocol suite, performance issues in networks, throughput, delay, latency, jitter, packet delivery ratio, packet loss rate, reliability, Introduction to Wireless Networks, IEEE 802.11, Bluetooth and WiMAX, wireless transmission, infrared transmission

UNIT II: Data Link Layer

Design issues, framing, error control, flow control, error-correcting and detecting codes, Data link protocols, unrestricted simplex protocol, simplex stop-and-wait protocol, one-bit sliding window protocol, Go Back N ARQ protocol, selective repeat ARQ protocol, static and dynamic channel allocation, ALOHA, CSMA/CD, CSMA/CA

UNIT III: Network Layer

Design issues, classful and classless addressing, IPv4 addressing mechanism, Subnetting and Supernetting, Next generation IP, IPv6 addressing, transition from IPv4 to IPv6, ICMPv6, routing algorithms, shortest path routing, flooding, flow-based routing, distance vector routing, link state routing, hierarchical routing, congestion control algorithms, OSPF, BGP, Multicasting, firewalls

UNIT IV: Transport layer and Application Layer

Quality of service, transport service primitives, elements of transport protocol, addressing, establishing a connection, releasing a connection, flow control and buffering, multiplexing, crash recovery, client server model, concurrency, processes, sockets, socket system calls

UNIT V:

BOOTP and DHCP, packet formats, operation, error control, transition states, DNS (Domain Name System), DNS in the Internet, Resolution, FTP and TFTP, connection, communication, command processing, file transfer, messages

UNIT VI:

Mobile IP, addressing, agents, three phases, agent discovery, registration, data transfer, Internet Security, privacy, digital signature, application layer security, transport layer security, security at the IP layer IPSec, Real Time traffic over the Internet

Text Books:

1. Computer Networks, Fifth Edition, Andrew Tanenbaum(Pearson Education)
2. TCP/IP Protocol Suite, Behrouz A Forouzan, McGraw Hill Fourth Edition

*****

BEIT602T OPERATING SYSTEMS

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction: What is Operating System(OS), structure of OS, history of OS, Types of OS: Time sharing, real-time, multiprocess (Asynchronous & Synchronous), multiprogramming (loosely coupled, tightly coupled), Distributed, web-based, client-server, peer-to-peer, services of OS, user view & machine view of OS, System calls, Spooling and buffering. Case Studies: Android, Linux, Windows 8.

UNIT II:

File Management: File Concept, file attributes, file operations, file system structure, file system implementation, file access methods, Disk Scheduling Algorithms, File protection, free space management on disk.

UNIT III:

Process Management: Process concept, process scheduling, operations on process, interprocess communication, communication between client-server, multithreaded model, process scheduling criteria, scheduling algorithm.

UNIT IV:

Memory Management: Preliminaries, Bare machine, resident monitor, swapping, multiple partitions, paging, segmentations, combined systems. Virtual Memory: Overlays, demand-paging performance, of demand paging, page replacement, virtual memory concepts, page replacement algorithms. Allocation algorithm, thrashing.

UNIT V

Process Synchronization: Critical Section problem, semaphores, classic problems: Dining Philosopher problem, producer-consumer, reader-writers problem, bounded buffer problem, monitors, Atomic transaction, synchronization examples.

UNIT VI:

Deadlock and Protection: System model, deadlock characterization, methods for handling deadlocks, prevention, detection, recovery, avoidance, Banker's Algorithm. Goal of protection, mechanism & policies, domain protection, access matrix, implementation of access matrix, dynamic protection structures, revocation, existing systems & language based protection, protection problem security.

Text Books:

1. Modern Operating Systems – A. S. Tanenbaum, Pearson Education
2. Operating System- A. S. Godbole, Tata McGraw Hill, third edition
3. Operating System Concepts- Silberchatz and Galvin, Addison Wesley
4. Android application Development for Java Programmers by James c. Sheusi, CENGAGE Learning.

Reference Books:

1. Operating Systems concepts and Design – Milan Milenkovic, Tata McGraw Hill

* * * * *

BEIT603T DATABASE MANAGEMENT SYSTEMS

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I: Introduction to Database Systems

Database Systems: Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, DBMS Architecture, Functions of DBMS, Formal relational query languages: Relational Algebra, Tuple Relational calculus, Domain Relational Calculus.

UNIT II: File Organization, Indexing and Hashing

File organization, Organization of records in files, Data dictionary storage, Basic concepts of indexing, Ordered indices, B+ Tree index files, B+ Tree indexing, B+ Tree Extensions, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL.

UNIT III: Data Models and Relational Database Design

Evolution of Data Models, Entity Relationship Model, Development of ER Diagrams, Extended Entity Relationship Model. Relational model: Logical View of Data, Keys, Integrity Rules, Relational set operators, Data Dictionary and System Catalog, Indexes, Codd's Relational Database Rules. Normalization of Database Tables: Need and Significance, the normal forms - 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, normalization & database design, denormalization.

UNIT IV: Query Processing and Query Optimization

Overview of Query Processing, Measures of Query cost, Selection Operation, Sorting, Join Operation, Other Operations, and Evaluation of Expressions. Overview of Query Optimization, Transformation of Relational Expressions, Estimating Statistics of Expression results, Choice of Evaluation Plans, Materialized Views

Unit V: Transaction Management

Transactions: Concept, Transaction Model, Transaction atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation Levels and Implementations. Concurrency Controls: Lock Based Protocol, Deadlock Handling, Time-stamp Based Protocols, and Validation Based Protocols. Recovery System: Failure Classification, Log Based Recovery, Advanced Recovery Techniques.

UNIT VI: SQL and Advanced SQL

Introduction to SQL: SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Null values, Aggregate functions, Nested Sub-queries, Modifications of the Databases Intermediate SQL: Join Expressions, Views, Integrity Constraints, SQL Data types and Schemas, Authorization. Advanced SQL: Dynamic SQL and Embedded SQL, Functions and Procedures, Triggers.

Text Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill (SIE), 2013.
2. Carlos Coronel, Steven Morris and Peter Rob, Database Principles – Fundamentals of Design, Implementation and Management, 9th Edition, Cengage Learning, 2013.
3. Hector-Garcia Molina, Jeffrey Ullman and Jeniffer Widom, Database Systems – the Complete Book, 2nd Edition, Pearson Education, 2014.
4. Database Systems Concepts, Designs and Application(2e Pearson) by Shio Kumar Singh
5. The database book, Principles and Practice using MySQL by Narain Gehani, University Press.
6. An Introduction to Database Systems(8e Pearson) by Date, Kannan, Swamynathan

Reference Books:

1. Alexis Leon and Mathews Leon, Database Management Systems, Vikas Publishing, 2008.
2. Ramez Elmasri and Shamkant Navathe, Database Systems - Models, Languages, Design and Application Programming, 6th Edition, Pearson Education, 2009.

*****

BEIT603P DATABASE MANAGEMENT SYSTEMS

(Practical Credit: 01)

Teaching Scheme:	Examination Scheme:
Practical: 2 Hours/ week	Practical: P (U): 25 Marks P (I): 25 Marks
	Duration of University Exam. : 02 Hours

===

Note:

1. Practicals are based on DATABASE MANAGEMENT SYSTEMS syllabus (subject code: BEIT603T)
2. Practicals are to be performed using SQL
3. Minimum ten practicals have to be performed
4. Do not include study experiments

BEIT604T INTERNET PROGRAMMING

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

==

UNIT I:

HTML and common tags: Introduction, www, Internet, URL, Common tags: Text formatting tags Line and Paragraph tags, Lists: ordered list Unordered List, definition List, anchor tag , Absolute and relative path, Tables and its attributes, Image tag- alt attribute, image mapping frames, forms , cascading style sheet, External style sheet, internal Style sheet.

UNIT II:

Java Scripts: Introduction Benefits of java script, Editing java scripts Displaying information, Alerls(), Promots(), confirm box, Operators, conditional statements, conditional loops, functions, arrays, *Objects*-math, string, date, Boolean, number, document, windows. DHTML with java script, Object model collection, events in java script, filters and transitions-Flip filter, Image mask, shadow filter, alpha filter, Blur filter. Difference between HTML and DHTML

UNIT III:

XML: Introduction, Advantages, Difference between HTML and XML, XML Namespace, Well formed and valid XML, XML Document type definition, XML schemas, Data types Attribute Types, XML Transformation- xsl, Document object model (DOM) using XML processors: DOM and SAX.

UNIT IV:

The Server Side: Client side Vs. Server side, Transformation from static to dynamic sites, Java Servlets, reading environment parameters, accessing parameter data, state management, event driven tracking.

UNIT V:

Java Server Pages: Need of JSP, JSP Life Cycle, Elements in JSP Page, Implicit JSP Objects, JSP Objects scope, JSP tags, JSP exceptions ,Expression Language, JSP standard tag Library custom tag Library, JSP and Equivalent Technologies.

UNIT VI:

Android applications Project: android applications components, application design, the screen layout and main.xml file, component Ids, few simple controls, getting and configuring android emulator, Key Classes like Button, TextView, EditText, View. OnClickListner

Text Books:

1. Web Technology Theory and Practices by M. Shrinivasan, PEARSON publication.
2. Android application Development for Java Programmers by James c. Sheusi, CENGAGE Learning.

3. The Modern approach to Web Technologies by Dr. Vaka Murali Mohan and Mr. S. Pratap Singh SCITECH Publications.
4. Web Technologies TCP/IP architecture, and Java Programming by Achyut S. Godbole & Atul Kahate , Tata McGraw-Hill publication Second edition.

Reference Books:

1. HTML: The Complete Reference, by Thomas A. Powell, McGraw Hill
2. XML: The Complete Reference, by Williamson, McGraw Hill

*****

BEIT404P

INTERNET PROGRAMMING

(Practical Credit: 01)

Teaching Scheme:	Examination Scheme:
Practical: 2 Hours/week	Practical: P (U): 25 Marks P (I): 25 Marks
	Duration of University Exam. : 02 Hours

==

Note:

1. Practicals are based on INTERNET PROGRAMMING syllabus (subject code: BEIT404T)
2. Practicals are to be performed using Apache Tomcat and Eclipse IDE
3. There should be at the most two practicals per unit
4. Minimum ten practicals have to be performed
5. Do not include study experiments

*****

BEIT605T FUNCTIONAL ENGLISH

(Theory Credit: 03)

Teaching Scheme:	Examination Scheme:
Lecture: 2 Hours/week	Theory: T (U): 40 Marks T (I): 10 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 02 Hours

===

Objective: At the end of the semester, students will have enough confidence to face competitive examinations(IELTES/ TOEFL/CAT/ MAT/ XAT/SNAP/GMAT/GATE etc.)to pursue masters degree. They will also acquire language skills required to write their Reviews/Projects/Reports. They will be able to organize their thoughts in English and hence face job interviews more confidently.

Scope: The Curriculum designed is student –centered and it is guidance for their career

Course Structure

Unit 1. Functional Grammar: (4 periods) (3+3+2+2=10)

Common errors , Transformation of Sentences, Phrases, Idioms & Proverbs.
[50 sentences of common errors, 50 examples of Transformation of Sentences, (5 each type), 50 noun/prepositional phrases, 50 idioms/proverbs)

Unit II. English for Competitive Exams & Interview Techniques: (6 periods)
3+3+2+2=10 or (10X1=10)

IPA (vowel & consonant phonemes), Word building [English words /phrases derived from other languages), Technical Jargons, Synonyms/Antonyms, Analogies, Give one word for, Types & Techniques of Interview

Assignment :[25 Words for teaching IPA, 25 words/phrases of foreign origin, 25 technical jargons, 25 words for Synonyms/ Antonyms, 25 words for Analogies, 50 examples of give one word for]

Unit III (A) Formal Correspondence (8 periods) (10X1=10)

Business Letters, Technical Report Writing, Writing Resumes, e-mail etiquettes
[Orders, Complaints , Enquiries, Job applications & Resume Writing ,Writing Memoranda]

(B) Analytical comprehension: [Four fictional & four non-fictional unseen texts]

Unit 1V. Technical & Scientific Writing: (4 periods) (10X1=10)

Writing Reviews, Features of Technical Writing, Writing Scientific Projects, Writing Research papers.
Assignment: (Any one project/review as assignment)

Total number of periods required = 22 for each Branch of Engineering
Reference Books:

1. Oxford Learners' Dictionary of Current English
2. Business Communication - KK Sinha, Galgotia Publishers
3. Developing Communication skills- Krishna Mohan & Meera Banerjee
4. Effective technical Communication –Barun K Mitra
5. Effective Business Communication – Herta A Murphy, Habert Hidebrandt, Jane P Thomas

Evaluation Pattern:

Internal Examination: Weightage = 10 mrks

Written Examination: 05 marks

Project Seminar : 05 marks

External Examination: Weightage = 40 marks

Question Pattern for End Semester Examination.

Q No.	Unit No	Que.type	No. of Questions	Weightage
1 or 2	I	objective	2 bunches of 4 questions each	(3+3+2+2)=10)
3 or 4	II	Objective	2 bunch of 4 questions each	(3+3+2+2)=10 or (10X1=10)
5 or 6	III	subjective	1 out of 2	(10X1=10)
7 or 8	IV	Subjective	1 out of 2	(10X1=10)

* * * * *

BEIT606P MINI PROJECT AND INDUSTRIAL VISIT

(Practical Credit: 02)

Teaching Scheme:	Examination Scheme:
Practical: 2 Hours/week	Practical: P (U): 25 Marks P (I): 25 Marks
	Duration of University Exam. : 02 Hours

==

Course Objective:

1. To develop an understanding of applications in real life
2. To develop research skills of students
3. To help the students in exploring career opportunities in their areas of interest.
4. To give an insight into the overall functioning of the organisations where students visited.
5. To develop Institute-Industry Interaction
6. To provide means to immerse students in actual supervised professional experiences

Constraints:

1. The students shall work in groups of 4-5 each and work on small application or research based/Industry oriented real time problems.
2. Local Mentor and Industry Mentor shall work in coordination if students are doing project in industry.
3. Industry visit should be planned to explore students about real time problems.
4. Students shall work on providing solutions to identified problems
5. Detailed reports are expected to be submitted at the end
6. Evaluation should be done based on feedback of Local and Industry Mentor

Expected Outcome:

1. Problem Identification and Definition
2. Defining data requirements and Identifying data sources
3. Literature Survey
4. Primary data collection
5. Software and Hardware requirements
6. Overall Project development as per the phases of SDLC
7. Outcome of the project
8. Utility of the project to the organisation

*****

SYLLABUS OF INFORMATION TECHNOLOGY

RTM NAGPUR UNIVERSITY, NAGPUR

ACADEMIC SESSION: 2015-2016

SEVENTH AND EIGHTH SEMESTERS

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Absorption Scheme for New course(C.B.S.) to Old course of Seventh Semester
B. E. (Information Technology)

As per Old course scheme of RTM, Nagpur University | **As per New course(C.B.S.) scheme of RTM, Nagpur University**

Sr. No	Sub Code	Subjects	Th/ Pr		Subject Code	Subjects	Th/ Pr
1	8IT47	Distributed Databases and Object Oriented Databases	Th		BEIT701T	Data Warehousing and Mining	Th
2	8IT47	Distributed Databases and Object Oriented Databases	Pr		BEIT701P	Data Warehousing and Mining	Pr
3	7IT43	Computer System Security	Th		BEIT702T	Computer System Security	Th
4	7IT41	Computer Network and Internet	Pr		BEIT702P	Computer System Security	Pr
5	7IT44	Elective-I Artificial Intelligence	Th		BEIT703T	Artificial Intelligence	Th
6	8IT51	Elective-II Mobile Communication	Th		BEIT704T1	Elective-I Mobile Computing	Th
7	7IT45	Elective-II Multimedia Systems	Th		BEIT704T2	Elective-I Multimedia Systems	Th
8	-----	------	-----		BEIT704T3	Elective-I Bio-informatics	Th
9	-----	------	-----		BEIT704T4	Elective-I Compiler Design	Th
10	-----	------	-----		BEIT705T1	Elective-II Software Testing and Quality Assurance	Th
11	8IT51	Elective-II Parallel Processing	Th		BEIT705T2	Elective-II Cluster and Grid Computing	Th
12	7IT42	Digital Signal Processing	Th		BEIT705T3	Elective-II Digital Signal Processing	Th
13	-----	------	-----		BEIT705T4	Elective-II Digital Forensic for Information Technology	Th
14	7IT46	Mini Project	Pr		BEIT706P	Seminar on Project	Pr
15	7IT42	Digital Signal Processing	Pr		-----	------	-----
16	7IT44	Elective-I Operation Research	Th		-----	------	-----
17	7IT44	Elective-I VLSI Design	Th		-----	------	-----
18	7IT45	Elective-II Fuzzy System and Neural Networks	Th		-----	------	-----
19	7IT45	Elective-II Digital Image Processing	Th		-----	------	-----
20	7IT45	Elective-II CAD/CAM	Th		-----	------	-----
21	7IT45	Elective-II Management Information Systems	Th		-----	------	-----
22	7IT41	Computer Network and Internet	Th		-----	------	-----

Members,
BOS (CE/IT)

Chairman,
BOS (CE/IT)

Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Absorbtion Scheme for New course(C. B. S.) to Old course of Eighth Semester
B. E. (Information Technology)

As per Old course scheme of RTM, Nagpur University

As per New course (C. B. S.)scheme of RTM, Nagpur University

Sl. No	Sub Code	Subjects	Th/ Pr		Subject Code	Subjects	Th/ Pr
1	-----	------	-----		BEIT801T	Distributed Systems	Th
2	-----	------	-----		BEIT801P	Distributed Systems	Pr
3	-----	------	-----		BEIT802T	Gaming Architecture and Programming	Th
4	-----	------	-----		BEIT802P	Gaming Architecture and Programming	Pr
5	8IT50	Elective-I Real Time Systems	Th		BEIT803T1	Elective-III Embedded Systems	Th
6	7IT45	Elective-II Digital Image Processing	Th		BEIT803T2	Elective-III Digital Image Processing	Th
7	8IT51	Elective-II Pattern Recognition	Th		BEIT803T3	Elective-III Pattern Recognition	Th
8	7IT45	Elective-II Fuzzy System and Neural Networks	Th		BEIT803T4	Elective-III Machine Learning	Th
9	-----	------	-----		BEIT804T1	Elective-IV Cyber Security	Th
10	-----	------	-----		BEIT804T2	Elective-IV Cloud Computing	Th
11	8IT49	E-Commerce	Th		BEIT804T3	Elective-IV E-Commerce and Enterprise Resource Planning	Th
12	8IT50	Elective-I Enterprise Resource Planning	Th				
13	8II50	Elective-I Fibre Optical Communication	Th		BEIT804T4	Elective-IV Wireless Sensor Networks	Th
14	8IT52	Project	Pr		BEIT805P	Project	Pr
15	8IT50	Elective-I Modelling and Simulation	Th		-----	------	-----
16	8IT51	Elective-II Advanced Microprocessor	Th		-----	------	-----
17	8IT51	Elective-II Parallel Processing	Th		-----	------	-----
18	8IT47	Distributed Databases and Object Oriented Databases	Th		-----	------	-----
19	8IT47	Distributed Databases and Object Oriented Databases	Pr		-----	------	-----
20	8IT48	Web Technologies	Th		-----	------	-----
21	8IT48	Web Technologies	Pr		-----	------	-----
22	8IT51	Elective-II Mobile Communication	Th		-----	------	-----

Members,
BOS (CE/IT)

Chairman,
BOS (CE/IT)

Annexure J

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: SEVENTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/ Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT701T	Data Warehousing and Mining	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT701P	Data Warehousing and Mining	-	2	-	2	-	1	-	1	-	-	25	25	50
3	BEIT702T	Computer System Security	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT702P	Computer System Security	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT703T	Artificial Intelligence	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT704T	Elective -I	4	-	1	5	4	-	1	5	20	80	-	-	100
7	BEIT705T	Elective -II	4	-	1	5	4	-	1	5	20	80	-	-	100
8	BEIT706P	Seminar on Project	-	2	-	2	-	2	-	2	-	-	50	-	50
		Total	**20**	**6**	**5**	**31**	**20**	**4**	**5**	**29**	**100**	**400**	**100**	**50**	**650**

Elective I:

BEIT704T1: Mobile Computing
BEIT704T2: Multimedia Systems
BEIT704T3: Bio-informatics
BEIT704T4: Compiler Design

Elective II:

BEIT705T1: Software Testing and Quality Assurance
BEIT705T2: Cluster and Grid Computing
BEIT705T3: Digital Signal Processing
BEIT705T4: Digital Forensic for Info. Tech.

Annexure J

FOUR YEAR BACHELOR OF ENGINEERING (B. E.) DEGREE COURSE
SEMESTER: EIGHTH
BRANCH: INFORMATION TECHNOLOGY

Sr. No.	Subject Code	Subjects	Workload				Credit				Marks				
			L	P	T	Total Hrs/ Week	L	P	T	Total	Theory		Practical		Total Marks
											Sess.	Univ.	Sess.	Univ.	
1	BEIT801T	Distributed Systems	4	-	1	5	4	-	1	5	20	80	-	-	100
2	BEIT801P	Distributed Systems	-	2	-	2	-	1	-	1	-	-	25	25	50
3	BEIT802T	Gaming Architecture and Programming	4	-	1	5	4	-	1	5	20	80	-	-	100
4	BEIT802P	Gaming Architecture and Programming	-	2	-	2	-	1	-	1	-	-	25	25	50
5	BEIT803T	Elective-III	4	-	1	5	4	-	1	5	20	80	-	-	100
6	BEIT804T	Elective-IV	4	-	1	5	4	-	1	5	20	80	-	-	100
7	BEIT805P	Project	-	4	-	4	-	4	-	4	-	-	75	75	150
		Total	**16**	**8**	**4**	**28**	**16**	**6**	**4**	**26**	**80**	**320**	**125**	**125**	**650**

Elective III:
BEIT803T1: Embedded Systems
BEIT803T2: Digital Image Processing
BEIT803T3: Pattern Recognition
BEIT803T4: Machine Learning

Elective IV:
BEIT804T1: Cyber Security
BEIT804T2: Cloud Computing
BEIT804T3: E-Commerce and Enterprise Resource Planning
BEIT804T4: Wireless Sensor Networks

BEIT701T DATA WAREHOUSING AND MINING

(Theory Credit: 05)

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hours/week	Theory: T (U): 80 Marks T (I): 20 Marks
Tutorial: 1 Hour/week	Duration of University Exam. : 03 Hours

===

UNIT I:
Introduction to Data Warehousing:

Evolution of decision support systems, Failure of past decision support system, Operational v/s decision support systems, Data warehousing lifecycle, Architecture, Building blocks, Components of DW, Data Marts and Metadata

UNIT II:
Data Preprocessing:

Why preprocess the data?, Descriptive data summarization, Data cleaning, Data integration and transformation, Data reduction, Data Discretization and Concept Hierarchy Generation.

UNIT III:
OLAP Analytical Processing:

OLAP in Data warehouse, Demand for online analytical processing, need for multidimensional analysis, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions. OLAP models- ROLAP, MOLAP, HOLAP, Differentiation, Data cubes and operations on cubes

UNIT IV:
Introduction of Data Mining:

Motivation, Importance, Data Mining functionalities, KDD and Data Mining, Data Mining v/s Query tools, Interesting patterns, Architecture, Classification of Data Mining systems, Major issues from Data warehousing and Data Mining, Applications of Data Mining.

UNIT V:
Mining Frequent Patterns and Association:

Basic Concepts: Market Basket analysis, motivating example, Frequent Item sets, Closed Item sets and Association rules, Frequent Pattern Mining Efficient and Scalable Frequent Item set. Mining Methods: Apriori Algorithm, Generating Association rules from Frequent Item sets, mining various kinds of association rules.

UNIT VI:
Business Intelligence and Big Data:

BI-Defining Business Intelligence, Important factors in BI, BI Architecture, BI framework, Development of BI system, BI applications in Marketing, Logistics and Production, Retail Industry. Big Data: - Understanding the challenges of Big data, Big data meets hadoop. Hadoop: Meeting Big data challenges, Hadoop Ecosystem, Core components, developing applications with Hadoop.

Text Books:

1. Data Mining (Concepts and Techniques) - Han and Kamber
2. Data Mining and Business Intelligence - Shinde and Chandrashekhar, Dreamtech Press
3. Professional Hadoop Solutions - Lublinsky, Smith, Yakubovich, Wiley

Reference Books:

1. Introduction to Data Mining – Tan, Steinbach, Vipin Kumar, Pearson Education.
2. Fundamentals of Data Warehouses, Jarke, Vassiliou, 2nd Edition, Springer.
3. Data Warehousing in Real World - Anahory, Murray, Pearson Education
4. Data Warehousing - Paulraj Ponniah

******

BEIT701P DATA WAREHOUSING AND MINING

(Practical Credit: 01)

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hours/week	**Practical: P (U): 25 Marks P (I): 25 Marks**
	Duration of University Exam. : 02 Hours

===

Note:

1. Practicals are based on DATA WAREHOUSING AND MINING syllabus (subject code: BEIT701T)
2. Practicals have to be performed on any open source tool.
3. There should be at the most two practicals per unit

******

BEIT702T COMPUTER SYSTEM SECURITY

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Introduction:

Need of information security, OSI security Architecture, Attacks, services, mechanism, Model of network security, Classical Encryption Techniques: Symmetric, Asymmetric, cipher model; substitution – Ceasor cipher, monoalphabetic, play fair; Transposition-Railfence, columnar; Steganography, S-DES, DES, TDES, AES; Block cipher principle, Mode, strength of DES.

UNIT II:

Differential and linear Cryptanalysis, Blowfish, RC2, RC5, IDEA, CAST-128, Characteristic of advance symmetric block cipher, Euler function, Chinese remainder theorem, Discrete logarithm, confidentiality using conventional encryption, placement of encryption function traffic, confidentiality, key distribution, random number generator.

UNIT III:

Public key cryptography- principles, RSA algorithm, key management, Diffie-Hellman key exchange, elliptic curve cryptography, Message Authentication, hash function Authentication requirements, functions, codes, hash functions, Security of hash function and MACs, Hash and MAC algorithm, MD5, Message Digest algorithm.

UNIT IV:

Secure hash algorithm (SHA-1), RIPEMD-160, HMAC, digital signatures and Authentication protocol-digital signature, authentication protocol, digital signature standard. Network Security practices, authentication applications-Kerberos, x.509 directory authentication service, Kerberos encryption technique

UNIT V:

E-mail security-Pretty Good Privacy, S/MIME, data compression using ZIP, radix-64 conversion, PGP random number generation, IP Security-Overview, Architecture, authentication header, Encapsulating security payload, combining security association, key management.

UNIT VI:

Web Security requirements, secure socket layer and transport layer security, secure electronic transaction, network management security-basic concepts of SNMP, SNMP V1, community facility, SNMP V3; System security-intruders, viruses and worms and related threads firewall-design principles, trusted system, DOS.

Text Books:

1. Forouzan, ''Cryptography and Network Security", Tata-McGraw hill.
2. William Stallings, "Cryptography and Network Security: Principle and Practice", Fifth Edition, Pearson.
3. Atul Kahate, "Cryptography and Network Security", Tata-McGraw hill.

Reference Books:

1. Josef Pieprzyk, Thomas Hardjono, Jennifer Seberry, "Fundamentals of computer Security", Springer.

******

BEIT702P COMPUTER SYSTEM SECURITY

(Practical Credit: 01)

Teaching Scheme:	Examination Scheme:
Practical: 2 Hours/week	Practical: P (U): 25 Marks P (I): 25 Marks
	Duration of University Exam. : 02 Hours

==

Note:

1. Practicals are based on COMPUTER SYSTEM SECURITY syllabus (subject code: BEIT702T)
2. There should be at the most two practicals per unit

******

BEIT703T ARTIFICIAL INTELLIGENCE

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

History and Application of AI, the Turing Test approach, AI Problems and AI Techniques, Defining problem as state space representation, Production system, Problem characteristics, monotonic and non-monotonic production systems, Solving problems by searching-Toy problems, Real-World problems.

UNIT II:

Uniformed Search Strategies:

Breadth-first search, Depth-first search, Comparing uniformed search techniques.

Informed search strategies:

Generate-and-test, Hill climbing, best-first search, problem reduction, constraint satisfaction, Mean-ends analysis

UNIT III:

Knowledge Representation:

Issues in knowledge representation, Approaches to knowledge representation, introduction to ontology

Logic and Inferences:

Formal logic, history of logic and knowledge, propositional logic, resolution method in propositional logic

UNIT IV:

Structural Knowledge Representation:

Frames, scripts, predicate logic, semantic network, example of knowledge representation schemes, Truth maintenance system. Transition networks: RTN, ATN. Basic techniques of NLP, application of NLP

UNIT V:

Expert system:

Knowledge acquisition methods, knowledge engineering process, goals in knowledge system development, basic architecture of expert system, problem domain versus knowledge domain, Development of ES and life cycle of ES. Advantages of expert system, structure of Rule based expert system, characteristics of conventional system and expert system.

UNIT VI:

Statistical Reasoning:

Probability and Bayes theorem, Certainty factor, Dempster-Shafer theory, Fuzzy logic: crisp sets, application of fuzzy logic.

Text Books:

1. Artificial Intelligence (Third Edition) McGraw-Hill Elaine Rich, Kevin Knight.
2. A First course in Artificial Intelligence (McGraw-Hill) Deepak Khemani.
3. Artificial Intelligence A modern approach (Second Edition) Pearson, Stuart Russell, and Peter Norvig.

Reference Books:

1. Fuzzy Logic with Engineering application (Third edition) Timothy J.Rose

******

ELECTIVE: I

BEIT704T1 MOBILE COMPUTING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Introduction to Mobile Computing:

Wireless Communication and examples, Applications cellular communication (1G to 4G Networks), GSM (Mobile services, system architecture protocol, Localization and Calling, Handover, Security)

UNIT II:

Mobile Computing Architecture:

Internet the ubiquitous network, Architecture for Mobile Computing three tier architecture, Design consideration for Mobile Computing, Mobile Computing, Mobile Computing through Internet.

UNIT III:

Wireless LAN:

Wireless LAN advantages, Applications, IEEE 802.11 standards, System Architecture, Protocol Architecture, Physical layer, Medium access control layer, MAC management roaming.

UNIT IV:

Mobility Management and Control:

Mobile agents, characteristics, requirement for Mobile Agent system, Platform (Aglet object Model, Agent Tcl architecture)

UNIT V:

Wireless Application Protocol:

WAP model, architecture, wireless datagram protocol, wireless transaction protocol, wireless session protocols.

UNIT VI:

Introduction to Android:

Layer android components, Mapping applications to process, Android development basics, Hardware tools, Android SDK features.

Text Books:

1. Mobile Communications: 2nd Edition, Jochen Schiller, Pearson Education.
2. Wireless Communication-Principles and Practice-2nd Edition, Theodore S. Rappaport, PHI Publications

Reference Books:

1. Mobile Computing- Technology, Applications and services creation-Ashok K. Talukder, Roopa R. Yavagal, TMH.
2. Mobile Computing-Theory and Practice-Kumkum Garg-Pearson Publications

******

ELECTIVE: I

BEIT704T2 MULTIMEDIA SYSTEMS

(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction : Definition of multimedia, Multimedia Basics, Where to use Multimedia, Multimedia Elements, Multimedia Applications

Multimedia Systems Architecture: Multimedia Workstation Architecture, High resolution Graphic displays, Multimedia Architecture Based on interface bus, Network architecture for Multimedia systems.

Evolving Technologies For Multimedia Systems: Hyper Speech, HDTV and UDTV, 3D Technologies and Holography, Virtual Reality, Video conferencing.

UNIT II:

Hardware: Macintosh Versus Windows Platform, Connections, Memory and Storage Devices, Input Devices, Output Hardware, Communication Devices

Basic Software Tools : Text Editing, Word Processing, OCR Software, Painting and Drawing Tools, 3D Modeling and Animation Tools, Image Editing, Sound Editing, Animation, Video, Digital Movie tools, Movie Editors, Compressing Movie Files

Making instant Multimedia : Linking Multimedia Object, office suites, word processors , spread sheets, databases, presentation tools, power point

Multimedia authoring tools: Types of authoring tools, card and page based authoring tools, Icon based authoring tools, and Time based authoring tools.

UNIT III:

Text: About Fonts and Faces, Using Text in Multimedia, Designing with Text, Hypermedia and Hypertext, The Power of Hypertext, Using Hypertext, Hypermedia Structures, Hypertext tools.

Images: Making Still Images, Bitmaps, 1 bit images, 8-bit gray level images, 8-bit color images, Dithering, 24 bit color images, Vector Drawing, Vector-Drawn Objects vs. Bitmaps, 3-D Drawing and Rendering, Color, Understanding Natural Light and Color, Computerized Color, Color Palettes, Color Look-up table.

Sound : The Power of Sound, Digital Audio, Making Digital Audio Files, MIDI Audio, MIDI vs. Digital Audio, Multimedia System Sounds, Adding Sound to Your Multimedia Project, Audio Recording, Keeping Track of Your Sounds, Audio CDs, Sound for Your Mobile, Sound for the Internet.

Animation: the Power of Motion, Principles of Animation, Animation by Computer, Animation Techniques.

Video: Using Video, How Video Works and Is Displayed, Analog Video, Digital Video, Displays, Digital Video Containers, Codec, Video Format Converters, Obtaining Video Clips, Shooting and Editing Video.

UNIT IV:

Data Compression: Need for Data compression, General Data compression Scheme, Compression standards, Non-lossy compression for images, Lossy compression for Photographs and video, Hardware Vs Software Compression.

Compression Schemes and standards:(Only Concepts of) Binary image compression, Color, Gray Scale image compression, JPEG, video image compression, Multimedia Standards for Video, Requirements for Full-motion Video Compression, MPEG, Audio compression, Fractal compression, advantages / disadvantages.

UNIT V:

Data and File Format Standards: Popular File Formats: RTF, RIFF, GIF, PNG, TIFF, MIDI, JPEG, JFIF, AVI, WAV, BMP, WMF, MIX, MPEG standards - TWAIN. **Multimedia Databases**, Storage and Retrieval, Database Management systems, Database Organization and Transaction management for multimedia systems.

Multimedia Skills: The Team, Project Manager, Multimedia Designer, Interface Designer, Writer, Video Specialist, Audio Specialist, Multimedia Programmer, Producer of Multimedia for the Web.

UNIT VI:

Designing and Producing: Designing, Designing the Structure, and Designing the User Interface, Producing, Tracking, Copyrights, Virtual reality designing and modeling (VRML).

The Internet and Multimedia: The Bandwidth Bottleneck, Internet Services, MIME Types, Multimedia on the Web, Web Page Makers and Site Builders, Plug-ins and Delivery Vehicles.

Designing for the World Wide Web: Developing for the Web, The Desktop Workspace and the Small, Device Workspace, Text for the Web, Images for the Web, GIF and PNG Images, JPEG Images, Clickable Buttons, Client-Side Image Maps, Sound for the Web, Animation for the Web, GIF89a - Video for the Web.

Delivering: Testing-Preparing for Delivery, File Archives, Delivering on CD-ROM, Delivering on DVD.

Text Books:

1. Multimedia: Making It Work By Tay Vaughan Eighth Edition, TMH
2. Fundamental of Multimedia - Ze-Nian Li & M. S. Drew ,PHI
3. Multimedia Systems Design - Prabhat k. Andleigh, Kiran Thakra
4. Multimedia Systems - John F. Koegel Buford

Reference Books:

1. Computer Graphics Multimedia and Animation - Malay K. Pakhira PHI, New Delhi - Second edition.
2. Principles of Multimedia by Ranjan Parekh - 2nd Edition TMH.
3. Computer Graphics and Multimedia - Anirban Mukhapathyay, Aruop Chattopadhyay - Vikas Publishing Ltd - Second Edition
4. Multimedia Technology and Applications- David Hillman Galgotia Publications Pvt Ltd.- Second Edition

******

ELECTIVE: I

BEIT704T3 **BIO-INFORMATICS**

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

UNIT I:

Introduction:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary and reference systems, finding new type of data online.

UNIT II:

Molecular Biology and Bioinformatics:

Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, Overview of the bioinformatics applications.

UNIT III:

The Information Molecules and Information Flow:

Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

UNIT IV:

Perl:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, Understanding and Using Biological Databases, Java clients, CORBA, Introduction to biostatics.

UNIT V:

Nucleotide sequence data:

Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

UNIT VI:

Biological data types and their special requirements:

Sequences, macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: alignments, regular expressions, hierarchies and graphical models.

Text Books:

1. O'Reilly, "Developing Bio informatics computer skills", Indian Edition's publication.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics concepts, skills & Applications", CBS Publishers.
3. Rashidi, Hooman and Lukas K. Buehler, "Bioinformatics Basic Applications" CRC Press.
4. "Bioinformatics" , Addison Wesley, Stephen Misner & Stephen Krawetz, "Bioinformatics- Methods & Protocols"

******

ELECTIVE: I

BEIT704T4 **COMPILER DESIGN**

(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction To Compilers:

Compilers and translators, structure of realistic compiler, types of compilers, cross compiler, Bootstrapping, Compiler writing tools, Design of Lexical Analyzer, FLEX tool, Parser generator tool: YACC

UNIT II:

Syntax Analysis:

Specification of syntax of programming languages using CFG, Top-Down parser -predictive parser, recursive descent parser, design of LL(1) parser, Bottom-up parsing techniques, LR parsing algorithm, Design of SLR, LARL, CLR parsers, Examples on LL and LR parsers

UNIT III:

Syntax Directed Translation:

Study of syntax directed definition and syntax directed translation schemes, evaluation orders of SDD's , implementation of SDTS, intermediate: postfix syntax tree, TAC, Translation of expression ,Control structures, declaration procedure calls and array reference

UNIT IV:

Storage Allocation And Error Handling:

Runtime Memory Management – Storage Organization, Storage allocation strategies, symbol table management and organization.

Error Detection And Recovery:

Lexical, syntactic, semantic errors, error recovery for LL and LR parsers

UNIT V:

Code Optimization: Principle sources of optimization, importance code optimization techniques, loop optimization, control flow analysis, data flow analysis, loop invariant compilation, induction variable removal, elimination of common Subexpression.

UNIT VI:

Code Generation: Problem in code generation, simple code generator, code generation algorithm, register allocation and assignment, code generation from DAG, heuristic ordering of DAGs, Labeling algorithm, peephole optimization

Text Books:

1. Principle of compiler Design: Alfred V. Aho and Jeffery D. Ullman, Narosa Pub.
2. Compilers Principles, Techniques, and Tools: Alfred Aho, Ravi Sethi, J. D. Ullman, 2nd Edition, Pearson
3. Principles and Practice of Compiler Writing: Aho, Sethi and Ullman, Addiison Wesley.
4. Compiler Construction: K. V. N. Sunitha, Pearson Education
5. Compiler Design: O.G. Kakde, 4th Edition, University Science Press.

Reference Books:

1. Principles of Compiler Design: V. Raghavan, TMH.
2. Fundamentals of Compiler Design: A. K. Pandey, S. K. Kataria and Sons, N. Delhi

******

ELECTIVE: II

BEIT705T1 SOFTWARE TESTING AND QUALITY ASSURANCE

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Basic concepts of Testing: Need of Testing, Basic concepts- errors, faults, defects, failures, objective of testing, central issue in testing, Testing activities, V-Model, Sources of information for test cases, Monitoring and Measuring Test Execution, Test tools and Automation, Limitation of Testing.

UNIT II:

Unit Testing: Concepts of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging, Unit Testing in Extreme Programming, Tools for Unit Testing.

UNIT III:

Control Flow Testing: Outline of Control Flow Testing, Control Flow Graphs, Path in Control Flow Graph, Path selection criteria, All path coverage criteria, Statement coverage, Path coverage, Predicate coverage criteria, Generating Test input, Examples of Data selection.

UNIT IV:

Data Flow and System Integration Testing: Introduction Data flow testing, Data flow graph, Data flow testing criteria, Comparison of Data flow test selection criteria. Fundamentals of System Integration: Types of interfaces and interface errors, System integration testing, Software and Hardware integration, Test plan, Off-the shelf component integration and testing.

UNIT V:

System Test Categories and Test Design: Taxonomy of system test, Basic Test, Functionality test, Robustness test, Performance test, Scalability test, Stress test, Load and Stability test, Reliability test, Regression test, Documentation Test. Test Design: Test cases, Necessity of test case documentation, Test case design methods, Functional specification based test case design, Use case bases, Application based test case design, Level of test execution.

UNIT VI:

Acceptance Testing and Software Quality: Types of acceptance testing, Acceptance criteria, Acceptance test plan and execution, Special Tests: Client server testing, Web application testing and Mobile application testing, fire view of software quality, ISO-9126 quality characteristics, ISO-9000:2000 software quality standard, ISO - 9000:2000 fundamentals.

Text Books:

1. Software Testing and Quality Assurance by Kshirsager Naik and Priyadarshini Tripathi (Wiley)
2. Software Testing Concepts and Tools by Nageswara Rao Pusuluri (Dream Tech Press)
3. Software Testing Principles, Techniques and tools, 1st Edition, by M. G. Limaye McGraw Hills

Reference Books:

1. “Foundations of Software Testing” 2E by Aditya P. Mathur , Pearson Education
2. Effective Methods for Software Testing- William E Perry, (Wiley). 2. Software Testing Tools by Dr. K. V. K. K. Prasad (Dream Tech)

******

ELECTIVE: II

BEIT705T2 CLUSTER AND GRID COMPUTING

(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT II:

Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

UNIT III:

Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT IV:

System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Introduction to Globus Toolkit 3 and GT 4

UNIT V:

Semantic Grid and Autonomic Computing , Metadata and Ontology in semantic Web , Semantic Web Services, Layered Structure of Semantic Grid , Semantic Grid Activities , Autonomic Computing

UNIT VI:

Basic Services: Grid Security, Grid Monitoring, GMA, Review criteria overview of Grid Monitoring system – Autopilot. Grid Scheduling and Resource Management: Scheduling Paradigms, working of Scheduling

Text Books:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. The Grid (Chapter 1,2,3,4,5) Core Technologies by Maozhen Li, Mark Baker (John Wiley and Sons)
3. Cloud Computing for Dummies (Chapter 6,7) by Judith Hurwitz, R.Bloor, M. Kanfman, F. Halper (Wiley India Edition)
4. Cloud Security and Privacy (Chapter 8) by Tim Malhar, S.Kumaraswammy, S.Latif (SPD,O’REILLY)

Reference Books:

1. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
2. Cloud Computing: A Practical Approach by J. Vette, Toby J. Vette, Robert Elsenpeter (Tata McGraw Hill)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox,Kai Hwang,Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Distributed Systems: Principles and Paradigms, Second Edition, Andrew S. Tanenbaum, Maarten Van Steen, Person Eduction
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

******

ELECTIVE: II

BEIT705T3 DIGITAL SIGNAL PROCESSING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Basic elements of DSP and its requirement, advantage of digital over analog signal processing, Discrete time Signals and Systems, Classification of discrete time Systems, Response of LTI System to various inputs, Sampling Theorem, sampling process and reconstruction , Linear Convolution, Correlation(Auto and Cross).

UNIT II:

Z-Transform: Definition, Properties of Z-Transform, ROC's of Finite length and Infinite length Signals, Theorem of Z-Transform (Initial value and Final value Theorem), system function of LTI system, Relation of Z-Transform with Laplace and Fourier Transform.

Inverse Z-Transform: Power Series expansion, Partial fraction Expansion method causality and stability.

UNIT III:

Frequency Domain description of signal and system, Definition of Fourier transform and properties of Fourier transform, inverse Fourier transform, Definition of discrete Fourier transform and properties of DFT, inverse IDFT, DFT's of typical time signals, Circular Convolution using DFT and IDFT.

UNIT IV:

Design of IIR filter from Analog filter using approximation of derivative, Impulse Invariance, Bilinear Transformation, IIR filter structure: Direct-I, Direct-II, parallel and cascade form

UNIT V:

Design of FIR Filter based on Windows: Rectangular, Hamming, Hanning, Bartlett and blackman Window. FIR filter structure: Direct and cascade form

UNIT VI:

Introduction to FFT algorithm: Decimation in Time-FFT algorithm, Decimation in Frequency-FFT algorithm, Inverse FFT algorithm, Discrete Cosine Transform.

Text Books:

1. J. G. Proakis, Manolakis " Digital Signal Processing : Principle, Algorithms and applications, Pearson Education
2. A. V. Oppenheim, R. W. Schafer, "Discrete Time Signal Processing ", Pearson Education

Reference Books:

1. S. Salivahanana, A Vallaraj, C, Ganapriya" Digital Signal Processing", McGraw Hill

******

ELECTIVE: II

BEIT705T4 DIGITAL FORENSIC FOR INFORMATION TECHNOLOGY

(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam. : 03 Hours

==

UNIT I:

Digital Forensics Fundamentals: What is Digital forensics?, Use of Digital forensics in law enforcement, computer forensics assistance, to human resources/employment proceedings, benefits of professional forensics methodology, steps taken by Digital forensics specialists Cyber Crimes: Definition, motives, and classification of cyber crimes. Modus operandi of cyber crime, types of cyber crimes,

UNIT II:

Computer Forensics Evidence Capture: Data recovery defined, data backup and recovery, the role of backup in data recovery, the data recovery solution Evidence Collection and Data Seizure: evidence, collection options, obstacles, types of evidence, the rules of evidence, volatile evidence, general procedure, collection and archiving, methods of collection, artifacts, collection steps controlling contamination: the chain of custody, Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools

UNIT III:

Duplication and Preservation of Digital Evidence: Preserving the digital crime scene computer evidence processing steps, legal aspects of collecting and preserving computer forensic evidence, Computer Forensics Analysis and Validation: Determining what data to collect and analyze, validating forensic data, addressing data, hiding techniques, and performing remote acquisitions

UNIT IV:

Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private sector incident scenes, processing law enforcement crime scenes, preparing for a search securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT V:

E-mail Investigations: Exploring the role of e-mail in investigations, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools,

Cell phone and mobile device forensics: Understanding mobile device forensics, understanding Acquisition procedures for cell phones and mobile devices, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems,

Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques

UNIT VI:

Working with Windows and DOS Systems: Understanding file systems, exploring Microsoft file structures, examining NTFS disks, understanding whole disc encryption, windows registry, Microsoft startup tasks, MSDOS startup tasks, virtual machines, Current Forensic Tools: Evaluating computer forensic tool needs, computer forensic software Tools, computer forensic hardware tools, validating and testing forensic software

Text Books:

1. The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics by John Sammons, Edition 1, Published by Elsevier February 24, 2012, ISBN: 978-1-59749-661-2

Reference Books:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson B, Phillips A, Enfinger F, Stuart C., "Guide to Computer Forensics and Investigations, 2nd ed., Thomson Course Technology, 2006, ISBN: 0-619-21706-5.

******

BEIT706P SEMINAR ON PROJECT

(Practical Credit: 02)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 00 Marks P (I): 50 Marks

===

Note:

1. The topic of Seminar on project should be assigned to the students in the group of maximum five students based on recent trends in Information Technology and allied branches.

2. Senior faculty members should work as guide.

3. The research paper publication / presentation in reputed national and international journals / conferences should be given some weightage while evaluation.

4. Seminar reports should be written using technical research writing tools (e.g. Latex) and submitted to the department for internal evaluation.

5. The project should be carried out upto design phase during this semester.

6. The same project has to be considered and extended for eighth semester project head (BEIT805P).

******

BEIT801T DISTRIBUTED SYSTEMS

(Theory Credit: 05)

Teaching Scheme:
Lecture: 4 Hours/week
Tutorial: 1 Hour/week

Examination Scheme:
Theory: T (U): 80 Marks T (I): 20 Marks
Duration of University Exam. : 03 Hours

==

UNIT I:

Introduction: Distributed Computing Models, Software Concepts, Hardware Concepts, The Client-Server model, Issues in design of a distributed operating system.

UNIT II:

COMMUNICATION: Introduction to Message Passing, Advantages and features of message passing, Message format, Message Buffering, Remote Procedure Call, Extended RPC Models, Remote Object Invocation, Message Oriented Communication.

UNIT III:

Processes And Synchronization: Threads, code migration, clock synchronization, logical clocks, global state, Election algorithms, mutual exclusion, Distributed transaction.

UNIT IV:

Distributed Deadlock Detection: System model, Resources vs. communication deadlocks, deadlock prevention, avoidance, detection and resolution, Centralized deadlock detection, distributed deadlock detection, path pushing and edge chasing algorithm

UNIT V:

Distributed Shared Memory: Introduction, General architecture of distributed shared memory, Design and implementation, Issues of DSM, Granularity, structure of shared memory space, consistency models, thrashing, advantages of DSM

UNIT VI:

Distributed File System: Introduction, Desirable features of good distributed file system, file models, file accessing, sharing, caching methods, file replication, fault tolerance, Case Study: CORBA(CORBA RMI and Services)

Text Books:

1. Andrew Tanenbaum, Maarten Van Steen, "Distributed System- Principals Paradigm", PHI Publication.
2. Singhal and Shivratri, "Advanced Concept in Operating Systems", McGraw Hill.

BEIT801P DISTRIBUTED SYSTEMS

(Practical Credit: 01)

Teaching Scheme:
Practical: 2 Hours/week

Examination Scheme:
Practical: P (U): 25 Marks P (I): 25 Marks
Duration of University Exam. : 02 Hours

==

Note:

1. Practicals are based on DISTRIBUTED SYSTEMS syllabus (subject code: BEIT801T)
2. There should be at the most two practicals per unit

******

BEIT802T GAMING ARCHITECTURE AND PROGRAMMING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Core Design: What Is a Game? Games Aren't Everything. Games Mean Gameplay. Creating the Game Spec. Example Game Spec, Initial Design: The Beginning. Hardware Abstraction. The Problem Domain. Thinking in Tokens.

UNIT II:

Use of Technology: The State of the Art. Blue-Sky Research. Reinventing the Wheel. Use of Object Technology, Building Bricks: Reusability in Software, Initial Architecture Design: The Birth of Architecture. The Tier System. Architecture Design.

UNIT III:

Development: The Development Process. Code Quality. Coding Priorities. Debugging and Module Completion. The Seven Golden Gambits. The Three Lead Balloons. GAME PROGRAMMING: Technologies: Display, Mixing 2D and 3D, DirectX, User Interface code, Resource caching, the main loop.

UNIT IV:

Design Practices: Smart & naked pointers, using memory correctly, Game scripting languages, Building your game: Creating a project, source code repositories and version control, Building the game and scripts, User interface programming and input devices: Getting the Device State, Working with the Mouse (and Joystick), Working with the Keyboard, User Interface Components, More Control Properties.

UNIT V:

2D Drawing and DirectX:

2D Drawing and DirectX, Basic 2D Drawing Concepts, Drawing Text, Working with Sprites, Graphics File Formats, Initialization and the Main Loop: Initialization, Some C++ Initialization Pitfalls, Initializing your Game, the Main Loop, Stick the Landing: A Nice Clean Exit.

UNIT VI:

Loading and Caching Game Resources:

Art and Sound Formats, Resource Files, Data Compression, IPac: A Resource File Builder, the Resource Cache, World Design and Cache Prediction, 3D Graphics and 3D Engines: 3D Graphics Pipeline, Setting Up a Project, Using a Scene Graph, 3D Middleware Review, Rolling Your Own 3D Engine.

Text Books:

1. Game Architecture and Programming, Shankarmani, Jain, Sinha, Wiley Publication, India
2. Fundamentals of Game Design, 3rd Edition, Ernest Adams, Pearson Publication

Reference Books:

1. Game Theory: An Introduction, E. N. Barron, Wiley Student Edition.
2. ActionScript 3.0 Game Programming University, 2nd Edition, Gary Rosenzweig, Pearson Education.
3. “Game Architecture and Design”, Andrew Rollings and Dave Morris
4. “Professional Game Programming” Mike McShaffry, Dreamtech Press.

******

BEIT802P GAMING ARCHITECTURE AND PROGRAMMING

(Practical Credit: 01)

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hours/week	**Practical: P (U): 25 Marks P (I): 25 Marks**
	Duration of University Exam. : 02 Hours

==

Note:

1. Practicals are based on GAMING ARCHITECTURE AND PROGRAMMING syllabus (subject code: BEIT802T)
2. Students are suggested to choose at least One game idea, possibly:
    1. Single player (Puzzle, Educational, Strategy etc.)
    2. Multiplayer (Adventure, fighting, sports etc.)

    Then work on both the ideas covering following aspects:

    1. Feasibility and Design
    2. Planning for each stage with objective to achieve.
    3. Technical Architecture
    4. Component building
    5. Integration and testing
    6. Complexity level
    7. Review (This can taken from other students of same class or junior class).
3. Following are the Open Source Game Engine Tools recommended for implementation.
    1. GDevelop
    2. PlayConvas
    3. Unity
    4. Aleph One
    5. Adventure Game Studio
    6. Crystal Space
    7. Delta 3D
    8. Game Play 3D and many more

******

ELECTIVE: III

BEIT803T1 EMBEDDED SYSYTEMS

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Introduction to Embedded System:

Introduction, Embedded system vs General computing system, History of embedded system, Processor embedded into a system, Embedded hardware units and devices in a system, Embedded software in a system, examples in a embedded system, Embedded SoC, Complex system design and processors, Design process in ES, Formalization of system design, Classification of Es, Skills required in Embedded system design, Characteristics and quality attributes of Embedded system.

UNIT II:

Embedded System Design:

Hardware and Software design, Co-design, Embedded Software development Tools: In Circuit Emulators, Cross compilers, cross assemblers and tool chain, linker locator, Address resolution, PROM programmer, Rom Emulator. Memories: EPROM, PROM, Flash.

UNIT III:

RTOS for Embedded System:

Architecture of the kernel, Tasks and Task Scheduler, Threads , ISR, Multiprocessing and Multitasking, Semaphore and Shared Data, Mutex, Mailboxes, Message Queue, Events, Pipes, Timers, Signals, Memory Management, RTOS Task Scheduling Models, Interrupt Latency, Response of the task, OS Security issues, Introduction to Android.

UNIT IV:

Devices and Communication:

Serial Communication devices, Parallel device port, Buses: I^2C, UART, USART, CAN Bus, Devices: Wireless Devices, Timer and Counting Devices, Watch Dog Timer, Real Time Clock, Network Embedded System.

UNIT V:

Programming for Embedded System:

Software programming in assembly language (ALP) and High Level language 'C', C program element: Header and Source Files, Preprocessor Directives, Macros and Functions, Data Types, Data Structures, Modifiers, Statements, Loops and Pointers, Object Oriented Programming, Embedded Programming in C++, Embedded Programming in Java.

UNIT VI:

Microcontroller 8051:

Introduction, Architecture, Memory Management, Addressing Modes and Instruction Sets, I/O Ports, Timers/Counters, Routing Interface with OS, Wireless Communication Protocol, Routing Methodologies

Text Books:

1. Embedded System Architecture, Programming and Design by Raj Kamal, 3rd Edition TMH.
2. Introduction to Embedded System by Shibu K. V. 3rd Edition TMH.
3. The 8051 Microcontroller Based Embedded System By Manish K. Patel TMH.
4. An Embedded Software Primer by David E. Simon (Pearson Edu. Asia).
5. 8051 Microcontroller and Embedded System by Muhammad Ali Mazidi, Janice Mazidi, Janice Gillispie Mazidi, Pearson Edition.
6. Embedded / Real Time Systems: Concepts, Design and Programming (Black Book) By Dr. K. V. K. K. Prasad Dreamtech Press.
7. Embedded Systems Engineering, C. R. Sarma, University Press.

******

ELECTIVE: III

BEIT803T2 DIGITAL IMAGE PROCESSING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II:

IMAGE ENHANCEMENT

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphic filtering, Color image fundamentals - RGB, HSI models, Color image enhancement.

UNIT III:

IMAGE RESTORATION

Image Restoration - degradation model, unconstrained restoration - Lagrange multiplier and constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV:

IMAGE SEGMENTATION

Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Segmentation by morphological watersheds, basic concepts, Dam construction, and Watershed segmentation algorithm.

UNIT V:

IMAGE COMPRESSION

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG

UNIT VI:

FEATURE EXTRACTION

Representation, Topological Attributes, Geometric Attributes Description, Boundary-based Description, Region-based Description, Relationship, Object Recognition, Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson Education, Third Edition, 2008.
2. Anil K. Jain, Fundamentals of Digital Image Processing', Pearson 2002.

Reference Books:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.
3. D. E. Dudgeon and RM. Mersereau, Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, Digital Image Processing' , John Wiley, New York, 2002
5. Milan Sonka etaI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

******

ELECTIVE: III

BEIT803T3 PATTERN RECOGNITION

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Pattern Classifier: Overview of Pattern recognition, Discriminant functions, supervised learning, parametric estimation, Maximum Likelihood Estimation,

UNIT II:

Bayes Classifier: Bayesian parameter Estimation, Problems with Bayes approach, Pattern classification by distance functions, Minimum distance pattern classifier.

UNIT III:

Clustering: Clustering for unsupervised learning and classification Clustering concept, C Means algorithm, Hierarchical clustering, Graph theoretic approach to pattern Clustering, Validity of Clusters.

UNIT IV:

Feature Extraction and Structural Pattern Recognition: KL Transforms, Feature selection through functional approximation, Binary selection, Elements of formal grammars, Syntactic description, stochastic grammars, Structural representation.

UNIT V:

Hidden Markov model and Support Vector Machine: State machine, Hidden Markov model, Training, Classification, Support vector machine, Feature Selection.

UNIT VI:

Recent Advances:

Fuzzy logic, Fuzzy Pattern Classifier, Pattern classification using genetic algorithms, Case study using Fuzzy pattern classifier and perception

Text Books:

1. M. Narasimha Murthy and V. Susheela Devi, "Pattern Recognition", Springer 2011
2. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Ed., Academic Press, 2009.
3. Robert J. Schalkoff, "Pattern Recognition Statistical, Structural and Neural Approaches", John Wiley and Sons Inc., New York, 1992.
4. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

******

ELECTIVE: III

BEIT803T4 **MACHINE LEARNING**

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Introduction:

Machine Learning, Machine Learning Foundations, Overview, applications, Types of machine learning, basic concepts in machine learning, Examples of Machine Learning , Applications, Linear Models for Regression, Linear Basis Function Models, The Bias, Variance Decomposition, Bayesian Linear Regression, Bayesian Model Comparison

UNIT II:

Supervised Learning:

Linear Models for Classification, Discriminate Functions, Single layer neural network, linear reparability, general gradient descent, perception learning algorithm, multi-Layer perception: two-layers universal approximations, back propagation learning, important parameters, Margin of a classifier, dual perception algorithm, learning non-linear hypotheses with perception.

UNIT III:

Unsupervised Learning: Clustering, K-means, EM, Mixtures of Gaussians, The EM Algorithm in General, Model selection for latent variable models, high-dimensional spaces, The Curse of Dimensionality, Dimensionality Reduction, Factor analysis, Principal Component Analysis, Probabilistic PCA, Independent components analysis. Neural Networks, Feed-forward Network Functions, Error Back, propagation, Regularization , Mixture Density and Bayesian Neural Networks, Kernel Methods, Dual Representations , Radial Basis Function Networks. Ensemble methods, Bagging, Boosting

UNIT IV:

Instance-Based Learning:

Nearest neighbor classification, k-nearest neighbor, nearest neighbor error probability Machine, Machine learning concepts and limitations: Learning theory, formal model of the learnable, sample complexity, learning in zero-bayes and realizable case, VC-dimension, fundamental algorithm independent concepts, hypothesis class, target class, inductive bias, Occam’s razor, empirical risk, limitations of inference machines, approximation and estimation errors, Tradeoff.

UNIT V:

Support Vector Machine (SVM): Kernel functions, implicit non-linear feature space, theory, zero-Bayes, realizable infinite hypothesis class, finite covering, margin-based bounds on risk, maximal margin classifier. Machine learning assessment and Improvement: Statistical model selection, structural risk minimization, bootstrapping, bagging, boosting.

UNIT VI:

Advanced Learning:

Sampling, Basic sampling methods, Monte Carlo, Reinforcement Learning, K-Armed Bandit-Elements, Model-Based Learning, Value Iteration, Policy Iteration. Temporal Difference Learning, Exploration Strategies, Deterministic and Non-deterministic Rewards and Actions, Eligibility Traces, Generalization, Partially Observable States, the Setting-Example, Semi - Supervised Learning. Computational Learning Theory: Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

Text Books:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005

Reference Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2006
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012
3. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009

******

ELECTIVE: IV

BEIT804T1 CYBER SECURITY

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

==

UNIT I:

Introduction: Cyber Crime; definitions, An origin of the Word, cyber crime - and information security, who are criminals? classification of cyber crimes; email spoofing, spamming, cyber defamation, internet time theft, salami attack or salami technique, data diddling, forgery, web jacking, news group spam or crimes emanating from usenet NewsGroup, Industrial spying or Industrial Espionage, hacking, online fraud, Pronography offenses, software piracy, Computer Sabotage, email bombing, mail bombs, usenet NewsGroup as a source of cyber crimes, computer network intrusion, password sniffing, credit crad fraud, identity theft.

UNIT II:

Introduction, categories of cyber crime, how criminals plan the attack: Reconnaissance, passive and active attacks, scamming/scrutinizing gathered information, attack (Gaining and maintaining the system access, Social engineering, classification of social engineering, cyber stalking, types of stalkers, cases reported on cyber stalking, how stalking works? Real life incidents of cyber stalking, cyber cafe and cyber crimes, fuel for cyber crimes, Botnet, attack vector, cloud computing: why cloud computing? types of services, cyber crime and cloud computing.

UNIT III:

Cyber crime: Mobile and wireless devices: Introduction proliferation of mobile and wireless devices trained in mobility, credit card fraud in mobile and wireless computing era - types and technique of credit card fraud, security challenges posed by mobile devices, registry selling for mobile devices, authentication service security - cryptographic security for mobile devices, LDAP security for handheld mobile computing devices, RAS security for mobile devices, Media player control security, networking API security for mobile computing applications, attacks on mobile phone - mobile phone theft, mobile viruses, mishing, vishing, hacking Bluetooth mobile devices, security implications for organizations, managing diversity and proliferation of hand-held devices, unconventional or stealth storage devices threats through cost and stolen devices. Protecting data on lost devices educating the laptop user, organizational measures of handling mobiles, device related security issues, organizational security policies and measures in mobile computing era.

UNIT IV:

Tools and methods used in Cyber crime: Introduction proxy servers and ananymizers phishing, password cracking - online attacks, offline attacks, strong, weak and rand password, random password, key loggers and spywares: s/w key loggers hardware key loggers, anti loggers, spywares, virus and worms, types of virus, Trojan horse and backdoors: backdoors, protection from Trojan horse, steganography, DoS and DDos attacks, SQL injection buffer overflow, attacks on wireless networks.

UNIT V:

Phishing and Identity theft: Introduction, phishing - methods of phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkit and spy phishing, phishing counter measures, Identity theft (ID theft) - Personally Identifiable Information (PII), types of identity theft, techniques of ID theft, Identity theft: counter measures, how to efface your Identity.

UNIT VI:

Cybercrime AND Cyber-security: The legal perspectives - Introduction, cybercrime and the legal landscape around the world, why do we need cyber laws: Indian context, The Indian Act, challenges of Indian law and cyber crime scenario in India, consequences of not adverting the weakness in Information Technology ACT, digital signature and the Indian ACT, Amendments to the Indian ACT, cybercrime and punishment, cyber laws, technology and student: Indian Scenario.

Text Books:

1. Naina Godbole, Sunil Belapure, "Cyber Security - Understanding Cybercrime, Computer forensic and legal perspective", Wiley India Pvt. Ltd.

Reference Books:

1. Thomas J. Mowbray, "Cyber security Managing systems- Conducting, Testing and Investigating Intrusion", Wiley

******

ELECTIVE: IV

BEIT804T2 CLOUD COMPUTING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Defining Cloud Computing: Cloud computing in a nutshell, cloud type - NIST Model, cloud cube model, deployment model, service model, Characteristics of cloud computing, cloud computing stack, open stack.

UNIT II:

Understanding Services and Virtualization Technology:

Understanding services and applications, defining Infrastructure as a Service (IaaS), Platform as a service, Software as a Service, Identity as a Service, Compliance as a Service, Using virtualization technologies, Load balancing and virtualization, understanding Hypervisors, understanding machine Imaging, porting applications, Salesforce.com versus Force.com, SaaS versus PaaS.

UNIT III:

Using Cloud Platform:

Using Google web services, using Amazon web services, using Microsoft cloud services, Aneka integration of private and public cloud

UNIT IV:

Cloud Migration:

Broad approaches to migration, seven steps model of migration, mobbing applications to the cloud, Applications in the cloud, Application in cloud API

UNIT V:

Cloud Security and Storage:

Securing the cloud, securing data, working with cloud based storage - measuring the digital universe, provisioning cloud storage, Exploring cloud back-up solutions

UNIT VI:

Cloud Computing Tools and Future Cloud:

Open source cloud computing platform - Eucalyptus, Open Nebula, Programming in the cloud Map Reduce Dryad. Future cloud - Future trends in cloud computing, defining the mobile market, using Smart phones with the cloud.

Text Books:

1. "Cloud Computing Bible", Barrie Sosinsky; Wiley India Pvt. Ltd.
2. "Cloud Computing - Principals and Paradigms", Rajkumar Buyya, James Broberg, Andrzej Goscinski; Wiley India Pvt. Ltd.
3. Cloud Computing, A Hands on Approach, Bahga, Madisetti, University Press,
4. "Mastering Cloud Computing", Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Tata McGraw Hill.

Reference Books:

1. "Cloud Computing - A practical approach for learning and implementation", A. Shrinivasan, J. Suresh; Pearson
2. "Cloud Computing - Fundamentals, Industry approach and trends", Rishabh Sharma; Wiley India Pvt. Ltd.

******

ELECTIVE: IV

BEIT804T3 E-COMMERCE AND ENTERPRISE RESOURCE PLANNING

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Introduction to electronics-commerce: The scope of E-COM, definition of E-COM, E-COM and trade cycle, electronic market, electronic data interchange, internet commerce, E-Commerce in perspective, the value chain, supply chains. Electronic Commerce Software: What kind of software solutions do you need? Marketing smarts, hosting services, basic packages, midrange package, enterprise solutions for large firms.

UNIT II:

Business to Business Electronics-commerce: Inter-organizational transactions, electronics markets, electronic data interchange (EDI), EDI-technology, EDI and business, inter organizational e-com. Business to consumer electronic commerce: consumer trade transactions, the elements of e-commerce– elements, e-visibility, the e-shop, online payment, delivering the goods, after sales service, internet e-com security, a website evolution mode.

UNIT III:

Electronics payment system: The basics of electronic payment systems. Electronics cash, electronics wallets, smart cards, credit and charge cards. The environment of electronic commerce: international legal, ethical and tax issues: International nature of electronic commerce, the legal environment of electronic commerce, taxation and E-COM, business plans for implementing E-COM: Planning the E-Commerce project, managing electronic commerce implementation.

UNIT IV:

Introduction to ERP: ERP: An Overview, Enterprise – An Overview, ERP architecture, ERP 2 tier and 3 tier Architecture, Benefits of ERP, Risks of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, OLAP, SCM,CRM

UNIT V:

ERP Implementation Lifecycle, Implementation Methodology, ERP project Teams, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring , Success and Failure Factors of an ERP Implementation.

UNIT VI:

The Business Module: Business Modules of an ERP package, Finance, Manufacturing Human Resources, Plant maintenance, Materials Management, Quality management Sales and Distribution, Case study for Architecture and integration of SAP ERP, ERP PRESENT AND FUTURE :-ERP and e-Commerce, ERP Internet and WWW, ERP and E-Business

Text Books:

1. E-Commerce by David Whitely (McGrew Hill Pub.)
2. Electronics-Commerce by Gary P. Schneider and James T. Perry. (COURSE TECHNOLOGY Thomson Learning)
3. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2000
4. E-business and E-commerce management strategy, implementation and practice, 5th Edition, Dave Chaffey, Pearson Education
5. Enterprise Resource Planning by Parag Diwan and Sunil Sharma (Pentagon Press.)

Reference Books:

1. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI, New Delhi, 2003
2. Business on the net by K. N. Agarwal, A. Lal, Deekjha Agarwal (Macmillan Pub.)
3. The Architecture of SAP ERP: Understand how successful software works by Jochen Boeder, Bernhard Groene

******

ELECTIVE: IV

BEIT804T4 WIRELESS SENSOR NETWORKS

(Theory Credit: 05)

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hours/week	**Theory: T (U): 80 Marks T (I): 20 Marks**
Tutorial: 1 Hour/week	**Duration of University Exam. : 03 Hours**

===

UNIT I:

Introduction to wireless Sensor Network:

Network Characteristics, Network application, Network design challenges, Sensor network architectural elements, WSN standards, IEEE 802.15.4, Zig-bee.

UNIT II:

Basic Wireless Sensor Technology:

Sensor node structures, Sensor network architecture, Classification of WSN, Protocol Stack for WSN.

UNIT III:

Medium Access Control:

Fundamental MAC Protocol, MAC design for WSN, S-MAC, DS-MAC, MS-MAC, Traffic adaptive medium access, Self organizing MAC.

UNIT IV:

Routing in WSN:

Data dissemination and gathering, Routing challenges and design issues in WSN, Routing strategies, Flooding and it's variants, Low energy adaptive clustering, Geographical routing.

UNIT V:

Transport Protocol:

Traditional transport protocol, Transport protocol design, Authenticity: Message authentication code, Signature, Authenticating public key, Broadcast and Multicast authentication.

UNIT VI:

Network Management and Operating System for WSN:

Traditional network management models, network management design issues, Example of management architecture: MANNA, Operating system design issues, Operating System: Tiny OS, Mate OS, Magnet OS.

Text Books:

1. Kazem Sohraby, Daniel Minoli, Taieb Znati, “Wireless Sensor Networks Technology, Protocols & Application”, Wiley Student Edition
2. Jun Zheng, Abbas Jamalipour, “Wireless Sensor Network, A Network Perspective”, Wiley Student Edition.

References Books:

1. Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks, Theory and Practice”, Wiley Student Edition.

******

BEIT805P PROJECT

(Practical Credit: 04)

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hours/week	**Practical: P (U): 75 Marks P (I): 75 Marks**
	Duration of University Exam. : 02 Hours

==

Note:

1. The topic of the project decided in seventh semester should be considered and extended to implementation and testing phases.

2. The research paper publication / presentation in reputed national and international journals / conferences should be given some weightage while evaluation.

3. The project report should be written using technical research writing tools (e.g. Latex) and submitted to the department for internal as well as external evaluation.

******

JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING & MANAGEMENT
KATOL ROAD, NAGPUR
Department of CSE-IT
"A Place to Learn; A Chance to Grow"
Session 2018-19

REPORT ON WEBINAR ON DATED 25th June, 2018

J D College of Engineering & Management, Nagpur
Activity : Online Webinar
Date : **25th** June, 2018
Time : 12 noon
WeinarTopic : Career opportunities in Web Development
Honorable Guest : Mr. Santosh Selokar

- **Objective:**

  As we are seeing a continuous rise in the number of businesses going online, the demand for web designers and developers is also increasing by the minute. However, we need to be different in the sense that we should be able to help businesses create a unique presence online. The competitive nature of the market demands business websites to understand buyer behavior and be developed in a way that makes buyers decide in favor of buying from that business.

- **Activity Details**:

This Webinar was organized for the students of all Semester CSE/IT. Rohan Lade gave an introduction and welcomed all. Mr. Santosh Selokar has Addressed students on the topic Career opportunities in Web Development. He explains the different job profiles available in the web development, Which Languages students' needs to learn, how to get in any IT Company by learning different latest technologies, live demonstration of front end and back end. At last gave vote of thanks and ends the webinar.

The guest lecture was attended by all present students along with a few faculty members of CSE /IT.

- **Committee Members:**
  1. Prof. Sonali Zunke (Webinar in Charge)
  2. Prof. Rohan Kokate (Asst. Professor)
  3. Prof. Prasana lohe(HOD)
  4. Prof. Sonali Zunke (Academic I/C)

- **Targeted Audience:**

Our targeted Audience was Students and Faculty of Information Technology & Computer Science & Engg. Department.

- **Total No. of Participants Turned up:**

Total = 93

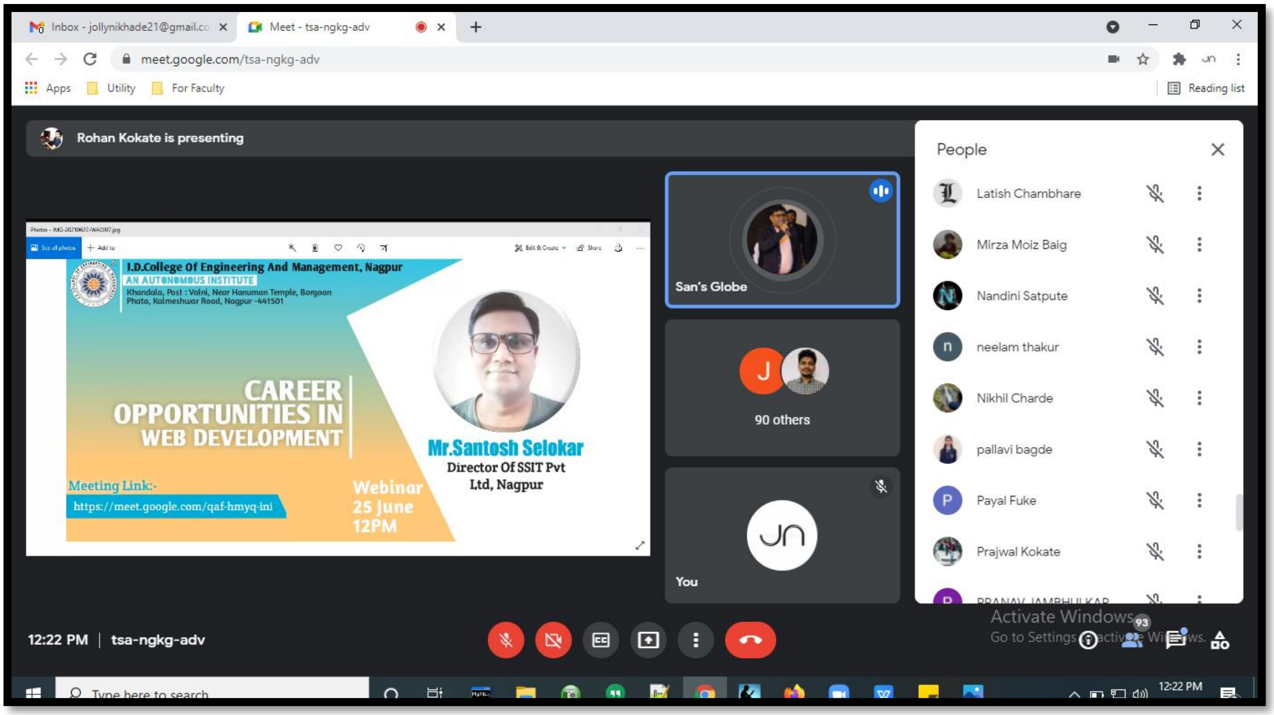
- **No. of Bus/Vehicles Used - NIL**
- **Total Expenditure - NIL**
- **Sponsorship Amount - NIL**
- **Registration Fees - NIL**

- **Outcome of Activity:**
  1. The Online Webinar was successfully arranged on 25th June, 2018 by the Department of CSE/IT. The directions were followed as per the academic policies of JDCOEM under the guidelines of Head of Department. Students gain knowledge about the different job opportunities in Web Development, also the students were informed about latest technologies which will be helpful for the future perspective.

Jaidev Education Society's patronage and directions were followed while conduction this expert lecture and Hon. Principal, had greeted the department for conduction such fruitful session in the department.

Photographs:

J.D.College Of Engineering And Management, Nagpur
AN AUTONOMOUS INSTITUTE
Khandala, Post : Valni, Near Hanuman Temple, Borgoan
Phata, Kalmeshwar Road, Nagpur -441501
CAREER
OPPORTUNITIES IN
WEB DEVELOPMENT
Mr.Santosh Selokar
Director Of SSIT Pvt
Ltd, Nagpur
Meeting Link:-
https://meet.google.com/qaf-hmyq-ini
Webinar
25 June
12PM



J.D.College Of Engineering And Management, Nagpur
AN AUTONOMOUS INSTITUTE
Khandala, Post : Valni, Near Hanuman Temple, Borgaon Phata, Kalmeshwar Road, Nagpur -441501

CAREER OPPORTUNITIES IN WEB DEVELOPMENT

Mr.Santosh Selokar
Director Of SSIT Pvt Ltd, Nagpur

Meeting Link:-
https://meet.google.com/qaf-hmyq-ini

Webinar
25 June
12PM

Prof. Sonali Zunke (Forum In charge)	Prof. Sonali Zunke (Academic I/C)	Prof. Supriya Sawwashere (H.O.D.)

Education to Eternity

Jaidev Education Society's

J D College of Engineering & Management , Nagpur

Department of Electronics / Electronics & Telecommunication

"Rectifying Ideas, Amplifying Knowledge"

IETE Students Forum (ISF)

Session: 2018-19

Date: 11/07/2018

1) Name of the Event : Seminar on 3-D printing

2) Under the Aegis of : Institute of Electronics & Telecommunication Engineers.

3) Date & Time : July 18, 2018 from 1:45:00p.m. To 3:30p.m.

4) Program Coordinators : Prof. Shweta Sharma,
Prof. Sangeeta Palekar.

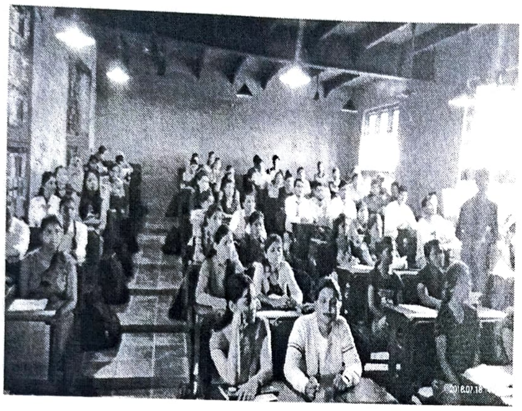
5) Targeted Audience : V & VII Semester Students

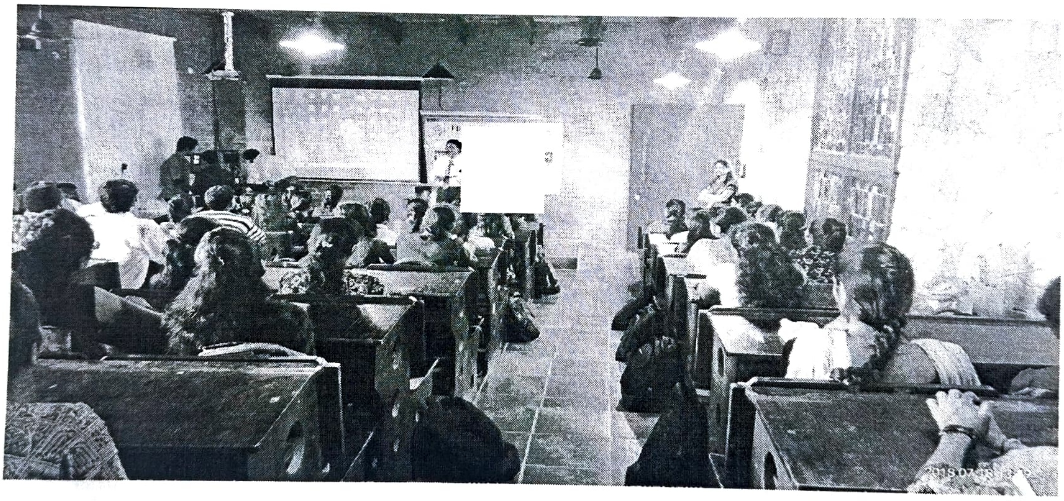
6) Event details:

J D College of Engineering & Management, in association with IETE Nagpur centre organized a Seminar on July 18, 2018 for the students of 5th& 7th semester EN/ETC Department. The Seminar was conducted by Mr. Mahinder Singh, PETTSI organisation. The Seminar was aimed in making the students aware about the technical knowledge of 3-D design using 3-D printer technology and briefed about Artificial Intelligence in brief. The Seminar received an overwhelming response from the students. At the end of the seminar, students got cleared with the doubt session by Prof. Kunal Thakkar. Prof. Shweta Sharma co-ordinated the programme and

Sangeeta Palekar co-coordinator encouraged the students for this seminar, constant support was provided by Prof. N. N. Gyanchandani. This seminar was a part of events which college organizes regularly for the students to make them aware of the happenings in outer world.

6) Photographs of the Event:





Sharma

Prof. S. D. Palekar
Prof. S. S. Sharma
IETE Co-coordinator

Prof. Avinash K. Ikhar
IETE Coordinator

Prof. Vaibhav Choudhari
Academic Incharge

Prof. Pravin Kshirsagar
HOD (EN/ETC)

Jaidev Education Society's
J D College of Engineering & Management, Katol Road, Nagpur
Department of Electrical Engineering

Session 2018-19

VISIT TO DINSHAW'S ICE CREAM FACTORY, MIDC, BUTIBORI.

The Department of Electrical Engineering at J D College of Engineering and Management, Nagpur organized an industrial visit to "DINSHAW'S ICE CREAM FACTORY, MIDC, BUTIBORI" on 28/09/2018 for the students of 3rd SEM Electrical Engineering . Total 53 students of 3rd SEM EE as well as 2 faculty member Prof. Y.Mundhada & Prof.H.Harnapure accompanied students to this Industrial visit. Dinshaw's ice cream factory, MIDC, Butibori, is the leading ice cream manufacturing company. The butibori plant is a dedicated ice cream making unit of Dinshaw's Dairy Food Ltd. The visit was conducted for students to gain understanding basic process of ice cream making and plant operations. Students were able to gain onsite knowledge of various units like pasteurizing units, blending units, filling units, packing unit. Plant operation were fully automated. Students got an overview of total process of industry.

Dinshaw's
ICE CREAM FACTORY
दिनशा
आइस्क्रिम फॅक्टरी
JAIDEV EDUCATION SOCIETY'S
J D College Of Engineering & Management
Katol Road, Nagpur (M.S)
Program Under
2018-2019
DELTA
Department of Electrical Leading Team Association

Industrial Visit Incharge HOD

Jaidev Education Society's
J D College of Engineering & Management, Katol Road, Nagpur
Department of Mechanical Engineering
Session 2018-2019
।। तमसो मा ज्योतिर्गमय ।।

REPORT ON INDUSTRY VISIT AT WELDFAST ELECTRODE PVT. LTD., NAGPUR

J D College of Engineering & Management, Nagpur

Activity : Industry Visit
Date : 04/08/2018
Time : 11:30am to 3:30 pm
Event : Industry Visit
Event Venue : Weldfast Electrode Pvt. Ltd., Nagpur

- **Objective :**
  To create awareness regarding new industrial technology, updated manufacturing process & industry work culture

Activity Details :

Industry visit conducted on 04/08/2018 at Weldfast Electrode Pvt. Ltd., Nagpur. 40 students of Third Year - Fifth Semester from Department of Mechanical Engineering were present for the visit. Prof. Abhijit Getme & Prof. Dharmesh Agarwal took great efforts for making this visit grand sucessful. Students were thankful to Weldfast Electrode Pvt. Ltd.,& JDCOEM for this wonderful opportunity of interact with industry people and technology.

- **Committee Members :**
  1. Prof. Abhijit Getme
  2. Prof. Dharmesh Agarwal
- **Targeted Audience :** Third Year - Fifth Semester ,DOME, JDCOEM
- **Total No. of Student Turned up :** Total =40 Students (V Semester -Third Year)
- **No. of Bus/Vehicles Used** **- 01**
- **Total Expenditure** **- Nil**
- **Snack Provided** **- Nil**
- **Sponsorship Amount** **- Nil**
- **Registration Fees** **- Nil**
- **Guest** **- Nil**
- **Guest of Honour** **- Nil**
- **Outcome of Activity :**

Industrial visit provides the students with "dynamic" real time experience that is very useful in the program learning outcomes process. It enables educational institutions to build close ties with industrial experts and also to achieve the learning outcomes to students. These include student's internships, funded research projects, curriculum development, student career opportunities. More over students will gain the subject learning outcome by means of pre, after and post industrial visit. This has resulted in enhanced visibility for the students among their learning outcomes theoretically and practically.

Weldfast Electrode Pvt. Ltd., Nagpur

Anup A. Junankar
IndustryVisit Incharge
DOME,JDCOEM

Pravin M.Gupta
Academic Incharge
DOME,JDCOEM

Bhushan R.Mahajan
Head
DOME,JDCOEM

Head of Department
Mechanical Engineering
ollege of Engineering & Management
Nagpur

JDCOEM

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING & MANAGEMENT

POST: VALNI, AT: KHANDALA, KATOL ROAD, NAGPUR - 441 501

Department of Management Studies

REPORT OF BUSINESS BAZAAR:

Event Name : Business Bazaar

Department : Department of Management Studies

Date : 26/03/2019

Time : 10.00 am onward

Venue : Area between Takshila & Vikramshila

Objectives of the Event:

1) To increase entrepreneurial acumen amongst students.
2) To make them understand and experience, the management and organizing activities.
3) To provide them with a platform to showcase their talent and skills.
4) To provide them with an opportunity to earn profit.
5) To make them understand the importance of team efforts.

Activity Details:

Department of Management Studies of JD College of Engineering & Management organized a fun filled event Business Bazaar, under the banner of Brainwaves – 2018. Prof. Aditi Saha was the coordinator of the event. The team of MBA students had put great efforts for the organizing of the event.

The event was conducted to increase entrepreneurial acumen amongst the students. Participants were required to have food and game stalls and were judged on various parameters. 10 teams participated in the event having delicious food items like chat, Chill shake etc. adding to the fun were interesting games. Faculty and students, including management of the college, enjoyed the food and games in the stalls.

Judge for the Event: Mrs. Lalita Kumar and. Mrs N Krishnakumar on various parameters.

Winning Team: Aao, Khelo aur Jeeto – Fun with Game Team

Targeted Participants:

Students of Management Department.

Targeted Audience:

All the members associated with J D College of Engineering & Management, i.e. Management, Faculty Members, Staff Members and Student

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING & MANAGEMENT

POST: VALNI, AT: KHANDALA, KATOL ROAD, NAGPUR - 441 501

Department of Management Studies

Education to Eternity

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

KATOL ROAD, NAGPUR

Website: www.jdcoem.ac.in **E-mail:** info@jdcoem.ac.i

An Autonomous Institute, with NAAC "A" Grade

Affiliated to DBATU, RTMNU & MSBTE, Mumbai

Department of Civil Engineering

"Building Better Development"

Session 2018-19

।।ज्ञानम् सर्वार्थ साधनम्।।

VISION	**MISSION**
To be a well-known center for shaping professional leaders of Global Standards in Civil Engineering	Provide quality education and excellent learning Environment for overall development of students. Making Sustainable efforts for integrating academics with Industry.

Semester- III

Sr. No.	**Subject Code**	**Subject**	**Contact Hours**			**Credit**
			L	**T**	**P**	
		Theory				
01	BTBSC301	Mathematics – III	3	1	-	4
02	BTCVC302	Mechanics of Solids	3	1	✓	4
03	BTCVC303	Hydraulics I	2	1	✓	3
04	BTCVC304	Surveying I	2	1	✓	3
05	BTCVC305	Building Construction	2	-	✓	2
06	BTCVC306	Engineering Geology	2	-	✓	2
07	BTHM303	Soft Skills Development	2	-	-	AU
		Practical / Drawing and/or Design				
08	BTCVL307	Hydraulics Laboratory I	-	-	2	1
09	BTCVL308	Surveying Laboratory I	-	-	2	1
10	BTCVL309	Building Construction - Drawings Laboratory	-	-	2	1
11	BTCVL310	Engineering Geology Lab	-	-	2	1
12	BTCVS311	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
13	BTCVF312	Field Training / Internship/Industrial Training Evaluation (from semester II)	-	-	-	1
		Sub-Total	16	4	09	
		Total	**29**			**23**

Semester- IV

Sr. No.	**Subject Code**	**Subject**	**Contact Hours**			**Credit**
			L	**T**	**P**	
		Theory				
01	BTCVC401	Hydraulics II	2	1	✓	3
02	BTCVC402	Surveying – II	2	1	✓	3
03	BTCVC403	Structural Mechanics-I	3	1	-	4

04	BTID405	Product Design Engineering	1	2	-	3
05	CV E1	**Elective I**	3	-	-	3
06	BTCVC406	Engineering Management	1	-	-	AU
07	BTHM3401	Basic Human Rights	2	-	-	AU
Practical / Drawing and/or Design						
8	BTCVL407	Hydraulics Laboratory II	-	-	2	1
09	BTCVL408	Surveying Laboratory II	-	-	4	2
10	BTCVL409	Mechanics of Solids Laboratory	-	-	2	1
11	BTCVM410	Mini Project	-	-	2	1
12	BTCVF411	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	1
		Sub-Total	**14**	**5**	11	
		Total	**31**			**22**
Elective I						
	BTCVE404A BTCVE404B BTCVE404C	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

Detailed Syllabus

Semester III

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
Theory						
01	BTBSC301	Mathematics – III	3	1	-	4
02	BTCVC302	Mechanics of Solids	3	1	✓	4
03	BTCVC303	Hydraulics I	2	1	✓	3
04	BTCVC304	Surveying I	2	1	✓	3
05	BTCVC305	Building Construction	2	-	✓	2
06	BTCVC306	Engineering Geology	2	-	✓	2
07	BTHM303	Soft Skills Development	2	-	-	AU
Practical / Drawing and/or Design						
08	BTCVL307	Hydraulics Laboratory I	-	-	2	1
09	BTCVL308	Surveying Laboratory I	-	-	2	1
10	BTCVL309	Building Construction - Drawings Laboratory	-	-	2	1
11	BTCVL310	Engineering Geology Lab	-	-	2	1
12	BTCVS311	Seminar on Topic of Field Visit to Foundation Work	-	-	1	AU
13	BTCVF312	Field Training / Internship/Industrial Training Evaluation (from semester II)	-	-	-	1
		Sub-Total	16	4	09	
		Total	**29**			**23**

BTBSC 301 Mathematics – III

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Laplace Transform (Lectures 08)

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by tn, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

Module 2: Inverse Laplace Transform (Lectures 08)

Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

Module 3: Fourier Transform (Lectures 05)

Definitions – integral transforms; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Module 4: Partial Differential Equations and Their Applications (Lectures 05)

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one-dimensional heat flow equation $\left(\frac{6u}{6t} = c^2 \frac{6^2u}{6x^2}\right)$, and two-dimensional heat flow equation (i.e. Laplace equation: $\frac{6^2u}{6x^2} + \frac{6^2u}{6y^2} = 0$)

Module5: Functions of Complex Variables (Differential calculus)(Lectures 05)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

Module6: Functions of Complex Variables (Integral calculus) (Lectures 07)
Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books

1) Grewal B. S., "Higher Engineering Mathematics" Khanna Publishers, New Delhi.
2) Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New York.
3) Das H. K. and Er. VermaRajnish, "Higher Engineering Mathematics", S. Chand & Co. Pvt. Ltd., New Delhi.
4) Dr. Singh B. B., "A course in Engineering Mathematics (Vol III)", Synergy Knowledgeware, Mumbai.
5) Wartikar J.N. and Wartikar P.N., "Engineering Mathematics Vol. I & II", Pune VidyarthiGrihaPrakashan, Pune, 1992
6) Ramana B. V., "Higher Engineering Mathematics", Tata McGraw-Hill Publications, New Delhi.

Reference Books

1) Peter O' Neil, "A Text Book of Engineering Mathematics" Thomson Asia Pte Ltd., Singapore.
2) Wylie C. R. & Barrett L. C., "Advanced Engineering Mathematics", Tata Mcgraw-Hill Publishing Co. Ltd., N. Delhi.
3) Dr. Singh B. B., "Integral Transforms and their Engineering Applications", Synergy Knowledgeware, Mumbai.
4) Sneddon I. N., "Integral Transforms", Tata McGraw-Hill , New York.

Course Outcomes: On completion of the course, student will be able to formulate and solve mathematical model of civil engineering phenomena in field of structures, survey, fluid mechanics and soil mechanics.

✓✓✓✓✓✓✓✓✓✓✓✓

BTCVC 302 Mechanics of Solids

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Stress and Strain

Simple stress -Analysis of internal forces, simple stress, shearing stress, bearing stress, diaphragm or skin stresses in thin walled vessels, statically indeterminate members and thermal stresses

Simple strains -Stress strain diagram for different engineering materials and its importance for elastic and plastic analysis, Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and tri -axial deformations, variation of stress with inclination of element, relationship between modulus of rigidity and modulus of elasticity, variation of stress at a point: analytical derivation, introduction to strain measurement devices, Sensors: working principle

Module 2: Axial Force, Shear Force and Moment in Beams
Axial force, shear force and moment in beams – concept of unbalanced forces at a transverse section, axial forces, shear forces and moment – interaction of these, relations among load shear and moment, introduction to moving loads

Module 3: Stresses in beams: Theory of cylindrical bending,Relationship between intensity of loading, shear force and bending moment over elemental length, Derivation of flexural formula, economic sections, analysis of flexural action, derivation of formula for shearing stress, concept of shear flow, shear lag and shear center

Torsion -Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous shafts

Module 4: Columns and Struts

Concept of short and long columns, formulae by Euler and Rankin, Euler's Crippling load for different end conditions, limitation of Euler's formula, equivalent length, eccentrically loaded short compression members, Kern of a section; load applied off the axes of symmetry, introduction to combined axial and flexural loads,

Module 5: Combined Stresses

State of simple shear, Analytical and graphical representation of state of combined stress at a point, absolute maximum shearing stress, application of Mohr's circle to combined loading, principal stresses and strains

Module 6: Theories of Failure: Concept of failure in strength and failure in deformation, statement and application of maximum principal stress theory, maximum principal strain theory, maximum strain energy theory, maximum shear stress theory, maximum shear strain theory

Text Books

- Singer F.L. and Pytle, "Strength of Materials", Harper Collins Publishers, Fourth Edition
- Junnarkar S.B. (2014), "Mechanics of Structures", Charotor Publishers, Anand, 31st edition,
- Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
- Sadhu Singh, "Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-048-7
- Prasad I.B, "A text book of Strength of Materials", Khanna Publishers, N. Dehli, ISBN NO:978-81-7409-069-X
- Timoshenko S.P. and Young D.H., "Elements of Strength of Materials", East West Press, 4th edition 1962, New Delhi
- Prasad I.B, "A text book of Strength of Materials", ISBN: 978-81-7409-069-X
- Dr. Sadhu Singh, "Strength of Materials", ISBN: 978-81-7409-048-7
- Ramamrutham S., "Strength of Materials", Dhanpatrai and Sons, Delhi

Reference Books

- Beer F P., Jhonston E. R., John. T. D E wolf, "Mechanics of Materials" TMH, 7th edition
- Popov E.P., "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005
- Crandall S.H., Dahl N.C., & Lardner T.J., "An Introduction to Mechanics of Solids", Tata McGraw Hill, 2^{nd} Edi, 1978
- Nash W., "Strength of Materials Schaum's outline series", McGraw Hill, fourth edition
- Punmia B. C., "Mechanics of Materials" Laxmi Publications, revised edition, 2016
- Subramanian R., "Strength of Materials" Oxford University Press, 2nd edition, New Delhi
- Dr. Sadhu Singh, "Theory and Solved Problems in Adv. Strength of Materials", ISBN: 978-81-7409-212-7

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform the stress-strain analysis.

CO2: Draw force distribution diagrams for members and determinate beams.

CO3: Find deflections in determinant beams.

CO4: Visualize force deformation behavior of bodies.

* * *

BTCVC 303 Hydraulics I

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Fundamental Concepts **(Lectures 06)**

Definition of fluids, fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, types of fluids - Newtonian and non-Newtonian fluid, continuum, fluid pressure

Module 2: Fluid Statics (Lectures 06)

Forces on fluid elements, fundamental equation, manometers, hydrostatic thrust on submerged surfaces, buoyancy, stability of unconstrained bodies, fluids in rigid body motion

Module 3: Fluid Kinematics (Lectures 06)

Types of flow, continuity equation, derivation and applications of momentum equation, Euler's equation, Bernoulli's equation, velocity potential and stream function, concept of flow net

Module 4: Laminar Flow (Lectures 06)

Fully developed laminar flow between infinite parallel plates, both plates stationary, upper plate moving with constant speed, fully developed laminar flow in pipe.

Turbulent flow: Shear stress distribution and turbulent velocity profiles in fully developed pipe flow, velocity distribution and shear stresses in turbulent flow, Prandtl mixing length theory, Nikuradse's experiment, Introduction to Boundary Layer Theory

Module 5: Dimensional Analysis and Similitude (Lectures 06)

Nature of dimensional analysis, Rayleigh’s Method, Buckingham pi theorem, dimensionless groups and their physical significance, flow similarity and model studies, Scale Effects, Distorted and Undistorted Models

Module 6: Flow Measurement (Lectures 06)

Direct methods, restriction flow meters, linear flow meters, traversing methods, measurements in open channel flow

Flow Through Pipes: Loss of energy in pipes, pipe discharging from a reservoir, pipe connecting two reservoirs in series and parallel, siphon, transmission of power through nozzle, water hammer in pipes- rigid and elastic water column theory, surge tanks - function, calculation of head loss, introduction to Moody's chart, nomograms and other pipe diagrams

Text Books

- Fox. R. W. andMc-Donald. A. T., “Introduction to Fluid Mechanics”, John Wiley and Sons, Fifth Edition
- Modi and Seth, “Fluid Mechanics and Hydraulic Machinery”, Standard Book House, Tenth Edition , 1991
- Kumar K. L., “Fluid Mechanics”
- Bansal R. K., “Fluid Mechanics”
- Jain A.K, “Fluid Mechanics including Hydraulic Machines” ISBN: 978-81-7409-194-7

Reference Books

- Streeter V. L., Bedford K. W. and Wylie E. B., “Fluid Dynamics”, New York, McGraw-Hill, Ninth Edition, 1998
- Som S. K. & Biswas G., “Introduction to Fluid Mechanics & Fluid Machines”, Tata McGraw-Hill, 2nd Edi., 2003

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calibrate the various flow measuring devices.

CO2: Determine the properties of fluid and pressure and their measurement.

CO3: Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network.

CO4: Visualize fluid flow phenomena observed in Civil Engineering systems.

* * *

BTCVC 304 Surveying – I

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Chain Surveying (Lectures 08)

Definition, principles, classification, fields and office work, scales, conventional signs, survey instruments, their care and adjustment, ranging and chaining, reciprocal ranging, setting perpendiculars, well-conditioned triangles, traversing, plotting , enlarging and reducing figures

Module 2: Compass Surveying (Lectures 08)

Prismatic compass, surveyor's compass, bearing systems and conversions, local attraction, magnetic declination, dip traversing, adjustment of errors

Module 3: Plane Table Surveying **(Lectures 05)**

Plane table instruments and accessories, merits and demerits, methods: radiation, intersection, resection, traversing

Module 4: Leveling and Applications **(Lectures 08)**

Level line - Horizontal line - Levels and Staves, Sprit level – Sensitiveness, Bench marks - Temporary and permanent adjustments, Fly and Check leveling, Booking, reduction, Curvature and Refraction – reciprocal leveling - Longitudinal and cross sections - Plotting - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs. Planimeter-Types, Theory, concept of zero circle, Study of Digital Planimeter, Computation of Areas and Volumes

Module 5: Theodolite Surveying **(Lectures 05)**

Theodolite - Vernier and micro-optic - Description and uses - temporary and permanent adjustments of vernier transit – Angles: Horizontal - Vertical - Heights and Distances - Traversing - Closing error and distribution - Gales's table - Omitted measurements

Module 6: Engineering Surveys **(Lectures 05)**

Reconnaissance, Preliminary and location surveys for engineering projects, Layout, Setting out works, Route Surveys for highways, railways and waterways, introduction to curve ranging, Mine Surveying - Instruments – Tunnels: correlation of underground and surface surveys, shafts

Text Books

- Kanetkar T.P. and Kulkarni S. V., "Surveying and Leveling", Vols. I, II and III, VidyarthiGruhPrakashan, Pune
- Punmia B.C., “Surveying”, Vols. I, II and III, Laxmi Publications, 16th edition, 2016

Reference Books

- Clark D., “Plane and Geodetic Surveying", Vol. I & II, C.B.S. Pub. &Distri., N. Delhi, 6th edi.
- Anderson J. M. and Mikhail E. M., “Introduction to Surveying”, McGraw Hill Book Company
- Bannister A. and Raymond S., “Surveying", ELBS, Sixth Edition, 1992
- KahmenHeribert and Faig Wolfgang, “Surveying”, Walter de Gruyter, 1995

Course Outcomes: On completion of the course, the students will be able to:

CO1: Perform measurements in linear/angular methods.

CO2: Perform plane table surveying in general terrain.

CO3: Know the basics of leveling and theodolite survey in elevation and angular measurements.

BTCVC 305 Building Construction

Teaching Scheme: (2 Lectures) hours/week

Course Contents

Module 1: Masonry Construction **(Lectures 06)**

Stone masonry: Random rubble, un-coursed rubble, coursed rubble & ashlar brickwork & brick bonds - english, flemish, principles to be observed during construction composite masonry, various partition walls, brick, aluminum & timber, solid concrete blocks, hollow concrete blocks and light weight blocks (aerated autoclaved), soil stabilized blocks, fly ash blocks, cement concrete walls

Module 2: Concrete for Construction **(Lectures 06)**

Introduction and properties of ingredients, importance of admixture materials such as pozzolona, fly ash, specific purpose chemical admixtures, Properties of fresh and hardened concrete

Module 3: Arches and Lintels (Lectures 06)

Arches and their stability, technical terms in arches, types of arches, methods of construction; Lintel: Necessity, materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels, beams: types according to material, layout such as primary an d secondary, continuous beams, formwork for RCC elements: function, requirements

Module 4: Means of Lateral Communication (Lectures 08)

Doors and windows

Doors - classification based on parameters such as material, geometry, fixtures and fastening

Windows - classification based on parameters such as material, geometry, fixtures and fastening

Use of composite materials for doors and window frames and shutters, laying out of passages

Stairs: Terminology, requirements of a good stair, various types, uses and limitations

Ramps: Requirements and types, planning aspects for physically handicapped persons

Elevators: Types and their Use

Module 5: Flooring Roofs and Types (Lectures 06)

Flooring: Types, factors for selections of floorings, flooring in ground and upper floors, various types of tiled flooring: natural, composite, synthetic, and special purpose flooring, concrete flooring for industrial purpose: tremix flooring

Roof coverings: Terms used, roof and their selection, pitched roofs and their types, roof coverings and their selection. Natural, composite, synthetic, and special purpose roof coverings, timber trusses (King Post and Queen Post), steel trusses types and their suitability

Module 6: Precast and Pre-engineered Buildings (Lectures 05)

Principles- advantages and disadvantages, types of prefabricate, standardization, basic, nominal and actual dimensions, tolerances, joints production, transportation and erection

Text Books

- Punmia B.C., Jain A. K., “Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi
- Arora S. P. and Bindra S. P., “Text Book of Building Construction”, DhanpatRai Publications
- Kumar Sushil, “Building Construction” Standard Publishers, 20th Edition, 2010.
- P. Purushothama Raj, “Building Construction Materials and Techniques”, Pearson Education
- Jain V.K., “Automation Systems in Smart and Green Buildings” ISBN NO: 978-81-7409-237-3

Reference Books

- NBC 2005, National Building Code of India, Parts III, IV, VII and IX, B.I.S. New Delhi
- Chudley R., "Construction Technology", Vol.1, 2, 3 and 4 ELBS Publisher
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi
- Sikka V. B., “A Course in Civil Engineering Drawing”, S. K. Kataria and Sons
- Catalogues. Information Brochures, Trade Literature by material or product manufacturers
- Mehta, Scarborough, Armpriest, “Building Construction”, Pearson Education
- Macay W.B, “Building Construction”, Vol. I, II, III, IV, Pearson Education
- Jain V.K., “Handbook of Designing and Installation of Services in High Rise Building Complexes” ISBN : 978-81-7409-245-8

Course Outcomes: On completion of the course, students will be able to:

CO1: Understand types of masonry structures.
CO2: Understand composition of concrete and effect of various parameters affecting strength.
CO3: Comprehend components of building and there purposes.
CO4: Comprehend the precast and pre-engineered building construction techniques.

* * *

BTCVC 306 Engineering Geology

Teaching Scheme:(2 Lectures) hours/week

Course Contents

Module 1: Introduction and Physical Geology **(Lectures 06)**

Definition, Scope and subdivisions, applications of Geology in Civil Engineering, Major features of the Earth's structure, internal structure of earth, and Geological work of river: features of erosion, deposition and transportation, Civil Engineer ing Significance, Geological work of wind: Processes and features of erosion, deposition and transportation, Civil Engineering Significance. Volcano: Central and Fissure types, Products of volcano, Mountain: Origin and formation, types, examples

Module 2: Mineralogy and Petrology **(Lectures 07)**

Mineralogy: Physical properties of mineral, Classification of minerals, Petrology: Definition, rock cycle, Igneous rocks: Origin, Textures and Structures, Classification, Concordant and Dis-concordant Intrusions, Civil Engineering significance, Secondary rocks: Formation, Classification, Residual deposits: Soil, Laterite and Bauxite and their importance, Sedimentary deposits: Formation, Textures, Classification and Structures, Civil Engineering significance, Chemical and organic deposits, Metamorphic rocks: Agents and Types of Metamorphism, Stress and anti-stress Minerals, Structures, Products of metamorphism

Module 3: Structural Geology **(Lectures 05)**

Outcrop, Strike and Dip, Unconformity-Types, Outliers and Inliers, Overlap Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance Joint: Types, Civil engineering considerations

Module 4: Building Stones **(Lectures 05)**

Properties of rocks, Requirement of good building stone, Building stones of India

Groundwater: Sources of groundwater, water table, Zones of groundwater, Porosity and permeability

Module 5: Geology of Dams and Reservoirs, Tunnels and Bridges **(Lectures 08)**

Preliminary geological survey, Influence of geological conditions on location, alignment, Design and Type of a dam, geological considerations in site selection for dams, Site improvement techniques, dams on carbonate rocks, sedimentary rocks, folded strata and Deccan traps, favorable and unfavorable geological conditions for reservoir site

Tunnels and Bridges: Influence of geological conditions on tunneling, difficulties during tunneling, tunnel lining, tunneling in folded strata, sedimentary rocks and Deccan traps, dependence of types of bridges on geological conditions

Module 6: Preliminary Geological Investigations **(Lectures 06)**

Steps in geological investigations, consideration of structural features exploratory drilling: Observations, Preservation of cores, Core logging, Core recovery, Graphical representation of core log, Limitation of exploratory drilling method

Text Books

- Singh Prabin, "Engineering and General Geology", S. K. Katariya and sons, Delhi
- Mukerjee P. K., "A Text Book of Geology", World Press Pvt. Ltd., Calcutta
- Gokhale K.V.G.K. and Rao D. M., "Experiments in Engineering Geology", TMN, New-Delhi
- Gupte R. B., "A Text Book of Engineering Geology", Pune VidyarthiGrihaPrakashan, Pune
- SubinoyGangopadhyay, "Engineering Geology ",oxford university

Reference Books

- G. W. Tyrrell, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi
- A. Holmes, "Principles of Physical Geology", ELBS Chapman & Hall, London
- Billings M. P., "Structural Geology", Prentice Hall of India Private Ltd., New Delhi
- Legget R. F., "Geology Hand book in Civil Engineering", McGraw-Hill, New York
- Krynine D. P. & Judd W. R., "Principles of Engineering Geology & Geo-technics", CBS Publishers &Distri., New Delhi
- Reddy Dr. D. V., "Engineering Geology for Civil Engineering", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi

- Read H. H., “Rultey’s Elements of Mineralogy”, CBS Publishers & Distributors, Delhi

Course Outcomes: On completion of the course, the students will be able to:

CO1: Recognize the different land forms which are formed by various geological agents.
CO2: Identify the origin, texture and structure of various rocks and physical properties of mineral.
CO3: Emphasize distinct geological structures which have influence on the civil engineering structure.
CO4: Understand how the various geological conditions affect the design parameters of structures.

* * *

BTHM 303 Soft Skills Development

Teaching Scheme:(2 Lectures) hours/week

Program Educational Objectives:

1) To build the skills like team building so that they can work efficiently in groups.
2) To provide knowledge of conflict management while working in large organizations.
3) To develop management skills required in routine work environment.
4) To polish the personality of the learners in order to make them good leaders and employees.
5) To imbibe qualities like manners & etiquettes co-ordination, mutual understanding while working in a group.

Module 1: Development of Proficiency in English (Lectures 02)

Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws& 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis

Module 2:Self-Management (Lectures 02)

Self-Evaluation, Self-discipline, Self-criticism, Recognition of one’s own limits and deficiencies, dependency, etc., Self-Awareness, Self-Management, Identifying one’s strengths and weaknesses, Planning & Goal setting, Managing self -emotions, ego, pride, Leadership & Team Dynamics

Module 3: Time Management Techniques (Lectures 02)

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time

Module 4: Motivation/ Inspiration (Lectures 02)

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation

Motivation techniques: Motivation techniques based on needs and field situations

Module 5: Interpersonal Skills Development (Lectures 02)

Positive Relationship, Positive Attitudesand Empathies: comprehending others’ opinions, points of views, and face them with understanding Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Module 6: Effective Computing Skills (Lectures 02)

Designing an effective Presentation, Contents, appearance, themes in a presentation, -Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference Books

1) Mitra, Barun, “Personality Development and Soft Skills”, Oxford University Press, 2016

2) Ramesh, Gopalswamy, “The Ace of Soft Skills: Attitude, Communication & Etiquette for Success”, Pearson Education, 2013

3) Covey, Stephen R., “Seven Habits of Highly Effective People: Powerful Lessons in Personal Change”

4) Rosenberg Marshall B., “Nonviolent Communication: A Language of Life”

***Program* Educational Outcomes**

1) Learners will acquire interpersonal communication skills.

2) Learners will develop the ability to work independently.

3) Learners will develop the qualities like self-discipline, self-criticism and self-management.

4) Learners will have the qualities of time management and discipline.

5) Learners would be able to present themselves as an inspiration for others.

* * *

BTCVL 307 Hydraulic Engineering Laboratory I

Practical:2 hours / week

Practical Work consists of at least eight performances from list below and detailed reporting in form of journal. Practical examination shall be based on above.

1) Measurement of Viscosity of various fluids
2) Demonstration of working of different types of valves and pipe fittings
3) Measurement of pressure Piezometer, manometers, Pressure gauges
4) Measurement of discharge - Calibration of measuring tank, Use of hook or point gauge.
5) Verification of Bernoulli's Theorem
6) Determination of metacentric height.
7) Calibration of an orifice / mouthpiece / venturimeter / orifice meter
8) Study of factors affecting coefficient of friction for pipe flow (for two different materials and two different diameters)
9) Determination of loss of head due to Pipe Fittings

Use of computer programs such as MS Excel is desirable for post-processing of results.

BTCVL 308 Surveying Laboratory - I

Practical:2 hours / week

Practical Work consists of performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Practical examination shall be based on above practical course.

Essential Practical

1) Use of Dumpy Level, Auto Level and Tilting Level.
2) Sensitivity of Bubble Tube using Dumpy Level.
3) Evaluation of constant of Planimeter, and use of Digital Planimeter for measurement of areas.
4) Study of Theodolite.
5) Methods of Plane Table Survey
6) Study and use of Total Station

Among following any four shall be performed

1) Reciprocal Levelling.
2) Illustration of Permanent adjustment of Dumpy Level
3) Measurement of Horizontal Angle by Various Methods
4) Measurement of Magnetic Bearing and Vertical Angle by Theodolite
5) Two Point and Three Point Problems
6) Study and use of Minor Instruments

Course Outcomes: On completion of the course, the students will be able to:

CO1: Use the theodolite along with chain/tape, compass on the field.
CO2: Apply geometric and trigonometric principles of basic surveying calculations.
CO3: Plan a survey, taking accurate measurements, field booking, and adjustment of errors.
CO4: Apply field procedures in basic types of surveys, as part of a surveying team.
CO5: Employ drawing techniques in the development of a topographic map.

* * *

BTCVL 309 Building Construction - Drawings Laboratory

Practical: 2 hours / week

List of Drawing Assignments

1) Sketch Book consisting of free hand proportional scale sketches for items to be drawn on drawing sheets as mentioned below under (2)
2) Drawing to scale on a half imperial drawing sheet covering following aspects.
    a) Lettering, Symbols, Types of lines and dimensioning as per IS 962.
    b) Foundations: - Isolated, Combined Footings, Under Reamed Piles, Rafts.
    c) Types of Stone Masonry: Elevation and Sectional Drawings.
    d) Types of Brick masonry: Elevation and Sectional Drawings.
    e) Types of Doors: Elevation and Sectional Drawings.
    f) Types of Windows: Elevation and Sectional Drawings, Standard Aluminum Sections.
    g) Types of Stairs: Plan and Sectional Drawings.
    h) Trusses: Various types, various roof covering materials, sketches for sectional profiles
    i) Typical plan for a single room and sectional views.
3) Site visit: To understand various building materials and their use.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Draw plan, elevation and section of various structures.

CO2: Apply the principles of planning and by laws used for building planning.

CO3: Prepare detailed working drawing for doors and windows.

BTCVL 310 Engineering Geology Laboratory

Practical:2 hours / Week

List of Experiments

Practical Work consists of study of relevant rock and mineral samples. Detailed report is expected.

- Megascopic study of Rock forming minerals
- Megascopic study of Ore forming minerals
- Megascopic study of Igneous rocks
- Megascopic study of Secondary rocks
- Megascopic study of Metamorphic rocks
- Cross-section Preparation and interpretation of geological maps
- Study of Structural Geological models
- Preparation of bore log /lithologs
- Interpretation of bore- hole data

Study tour to the places of Engineering Geological importance.

A Journal containing record of above practical work shall be examined as Term Work. Practical examination shall be based on above practical course.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Calculate the linear measurement on surface.

CO2: Find out engineering properties of various geological materials.

CO3: Draw subsurface lithologs.

CO4: Identify minerals and rocks by studying physical properties.

BTCVS 311 Seminar on Topic of Field Visit to Foundation Work

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of foundation execution. It is desirable to collect basic information of geotechnical aspects of foundations, types and components of foundations, tools and plants, construction machinery, etc. Intention is to introduce students to process of collection and presentation of technical information. Report shall be submitted to cover above aspects as studied.

BTCVF 312 Field Training (from semester II)

Student shall undergo field training / industrial training / internship during summer vacation after Semester II. This training is at elementary level expecting exposure to field practices. A brief report shall be submitted. Evaluation shall be based on report and power point presentation.

* * *

Semester- IV

Sr. No.	**Subject Code**	**Subject**	**Contact Hours**			**Credit**
			L	**T**	**P**	
		Theory				
01	BTCVC401	Hydraulics II	2	1	✓	3
02	BTCVC402	Surveying – II	2	1	✓	3
03	BTCVC403	Structural Mechanics-I	3	1	-	4
04	BTID405	Product Design Engineering	1	2	-	3
05	CV E1	**Elective I**	3	-	-	3
06	BTCVC406	Engineering Management	1	-	-	AU
07	BTHM3401	Basic Human Rights	2	-	-	AU
		Practical / Drawing and/or Design				
8	BTCVL407	Hydraulics Laboratory II	-	-	2	1
09	BTCVL408	Surveying Laboratory II	-	-	4	2
10	BTCVL409	Mechanics of Solids Laboratory	-	-	2	1
11	BTCVM410	Mini Project	-	-	2	1
12	BTCVF411	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	1
		Sub-Total	**14**	**5**	11	
		Total	**31**			**22**
		Elective I				
	BTCVE404A BTCVE404B BTCVE404C	Numerical Methods in Engineering Planning for Sustainable Development Instrumentation & Sensor Technologies for Civil Engineering Applications	3	-	-	3

BTCVC 401 Hydraulics II

Teaching Scheme:(2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Uniform Flow in Open Channel **(Lectures 06)**

Introduction, difference between pipe flow and open channel flow, types of open channels, types of flows in open channel, geometric elements, velocity distribution, measurement of velocity-(pitot lube, current meter) weir & spillway: sharp, broad & round crested weirs, calibration of weir, time of emptying tank with weir, profile of ogee spillway, flow below gates

Module 2: Steady & Uniform Flow **(Lecture 05)**

Chezy's& Manning's formula, Roughosity coefficient, uniform flow computations, hydraulically efficient section-considerations for rectangular, triangular, trapezoidal, circular sections

Specific energy: definition & diagram, concept of critical, sub-critical, super-critical flow, specific force, specific discharge derivation of relationships and numerical computations

Module 3: Varied Flow **(Lectures 07)**

Gradually (G.V.F.): Definition, classification of channel Slopes, dynamic equation of G.V.F. (Assumption and derivation), classification of G.V.F. profiles-examples, direct step method of computation of G.V.F. profiles

Rapidly varied flow (R.V.F.): Definition, examples, hydraulic jump- phenomenon, relation of conjugate depths, parameters, uses, types of hydraulic jump

Module 4: Impact of Jet **(Lectures 05)**

Impulse momentum principle, impact of jet on Vanes-flat, curved (stationary and moving), inlet & outlet velocity triangles under various conditions, Series of flat, curved vanes mounted on wheel

Module 5: Hydraulic Machines **(Lectures 08)**

Turbines: Importance of hydro-power, classification of turbines, description, typical dimensions and working principle of Pelton, Francis & Kaplan turbine (detailed design need not to be dealt with), Module quantities, specific speed, performance characteristics, selection of type of turbine, description & function of draft tube, Thomas's cavitation number

Pumps: Classification, component parts, working of centrifugal pump, performance characteristics, pump selection, common troubles & remedies, introduction to different types of pumps: reciprocating, multi-stage, jet, air lift, submersible pump

Module6: Boundary Layer Theory **(Lectures 06)**

Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy. Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation, Introduction to Drag and Lift on submerged bodies (Flat plates, Sphere, Cylinder, aerofoil), Stokes law, Concept of Drag and Lift coefficients

Text Books

- Modi, Seth, “Fluid Mechanics – Hydraulic & Hydraulic Mechanics” Standard Book House
- Bansal R.K., “Fluid Mechanics”, Laxmi Publications, 9th edition 2017
- Garde R. J., “Fluid Mechanics through Problems”, New Age Publications, 3rd edition 2011
- Jain A. K., “Fluid Mechanics”, Khanna Publications, 8th edition, 2003, Delhi
- Kumar K. L., “Fluid Mechanics”, Eurasia Publication House, 11th edition, Delhi
- Rangaraju, “Open Channel flow”, Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., “Fluid Mechanics through Problems” Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., “Flow in Open Channel”, Edition V, Tata McGraw-Hill Pub. Co., Delhi

Reference Books

- Streeter, “Fluid Mechanics” McGraw-Hill International Book Co., 3rd edition, Auckland
- Shames, “Mechanics of Fluids”, McGraw Hill, 4th edition

- Chaw V. T., “Flow in Open Channel”, McGraw-Hill International Book Co., Auckland
- Hughes & Brighton, “Fluid Mechanics”, Tata McGraw Hill

Course Outcomes: On completion of the course, the students will

CO1: Design open channel sections in a most economical way.

CO2: Know about the non-uniform flows in open channel and the characteristics of hydraulic jump.

CO3: Understand application of momentum principle of impact of jets on plane

BTCVC 402 Surveying – II

Teaching Scheme: (2 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Tachometry (Lectures 08)

Significance and systems, principle, constants, basic formulae and field work stadia method, auto reduction tachometer, tangential system

Electronic Distance Measurement: Importance, principles of electronic distance measuring (EDM) instruments, classification of EDM’s based on carrier waves used, study and use of total station

Module 2: Triangulation (Lectures 06)

Principle & classification, system, selection of station, base line measurement, correction and use of subtense bar, signals, satellite station, reduction to center, spherical excess, angular observations, tri-iteration

Triangulation Adjustments: Theory of errors, laws of weights, concept of most probable value

Module 3: Field Astronomy (Lectures 06)

Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

Module 4: Curves (Lectures 06)

Horizontal and vertical curves, simple curves, setting with chain and tapes, tangential angles by theodolite, double theodolite, compound and reverse curves, transition curves, functions and requirements, setting out by offsets and angles, vertical curve s, sight distance requirements

Module 5: Photogrammetry (Lectures 06)

Terms, types, vertical photographs, scale, ground coordinates, relief displacement, flight planning photomaps and mosaics, stereoscopy and photo interpretation

Module 6: Remote Sensing (Lectures 06)

Introduction, classification and principles, electromagnetic energy and its interaction with matter, idealized systems, sensors, platforms, and application in civil engineering, G.P.S & G.I.S. as surveying techniques – Overview, uses and applications

Text Books

- Bannister A., Raymond S., Wartikar J.N., Wartikar P.N., “Surveying", ELBS, 6th Editon, 1992
- HeribertKahmen and Wolfgang Faig, “Surveying ", Walter de Gruyter, 1995
- Kanetkar T.P., "Surveying and Leveling", Vols. I, II and III, VidyarthiGruhPrakashan, Pune
- Punmia B.C., “Surveying”, Vols. I , II and III, Laxmi Publications

Reference Books

- James M. Anderson and Edward M. Mikhail, “Introduction to Surveying”, McGraw Hill Book Company
- Clark D., “Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition
- Agor, “Advanced Surveying”, Khanna Publications, Delhi
- Arora K. L., “Surveying”, Vol.1 & 2
- Basak, “Surveying and Levelling”Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi

- Duggal S. K., “Surveying”, Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi
- Gopi S., Satikumar R. and Madhu N., “Advanced Surveying”, Pearson Education,
- Chandra A. M., “Higher Surveying”, New Age International Publication

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand basics different types of curves on roads and their preliminary survey.
CO2: Perform setting of curves, buildings, culverts and tunnels.
CO3: Comprehend different geodetic methods of survey such as triangulation, trigonometric leveling.
CO4: Comprehend modern advanced surveying techniques.

* * *

BTCVC 403 Structural Mechanics – I

Teaching Scheme:(3 Lectures +1 Tutorial) hours/week

Course Contents

Module 1: Beam Deflections **(Lectures 06)**

Calculations of deflection for determinate beams by double integration, Macaulay’s method, moment area method, conjugate beam method, deflection by method of superposition

Module 2: Energy Principles **(Lectures 05)**

Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion - Castiglano's and Engessor's energy theorems, principle of virtual work, application of energy theorems for computing deflections in beams, Maxwell's reciprocal theorem, Williot Mohr diagrams

Module 3: Method of Consistent Deformation **(Lectures 07)**

Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns, Castiglano'stheorem

Indeterminate Beams: Analysis of indeterminate beams: Propped cantilever and fixed beams - fixed end moments and reactions for standard cases of loading – slopes and deflections in fixed beams

Module 4: Moment Distribution Method **(Lectures 06)**

Analysis of continuous beams propped cantilevers, continuous beams - theorem of three moments - analysis of continuous beams settlement effects, thermal effect, Shear Force and Bending Moment diagrams for continuous beams, portal frames with and without sway

Module 5: Slope Deflection Method **(Lectures 06)**

Analysis of continuous beams, analysis of rigid frames, frames without sway and with sway, settlement effects, introduction to difficulties in frames with sloping legs and gabled frames

Module 6: Thin Cylinders **(Lectures 07)**

Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders, thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, maximum shear stress, concept of stresses in thick cylinders

Text Books

- Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill,3rd edition 2010
- Wang C.K., “Statically Indeterminate Structures”, McGraw Hill
- Vazirani V.N., Ratwani M.M and Duggal S.K., “Analysis of Structures - Vol. I”, ISBN NO: 978-81-7409-140-8
- Khurmi R.S., “Theory of Structures”, S Chand, Delhi
- Punmia B.C., “Structural Analysis”, Laxmi Publications

Reference Books

- Timoshenko and Young, “Theory of structures”, McGraw Hill

- Norris C. H. and Wilbur J. B., “Elementary Structural Analysis”, McGraw Hill
- Kinney J. S., “Indeterminate Structural Analysis”, Oxford and IBH
- Hibbler R. C., “Structural Analysis”, Pearson Publications, 9th Edition
- Schodek, “Structures”, Pearson Education, 7th edition
- Ramamrutham S. and Narayanan R., “Theory of Structures” DhanpatRai Publishers, Delhi

Course Outcomes: On completion of the course, the students will be able to:

CO1: Describe the concept of structural analysis, degree of indeterminacy.
CO2: Calculate slopes and deflection at various locations for different types of beams.
CO3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses
Perform the distribution of the moments the in continuous beam and frame.

* * *

BTID 405 Product Design Engineering

Course Contents

Pre Requisites: Knowledge of Basic Sciences, Mathematics and Engineering Drawing

Design Studio:2 hr / week to develop designs through sketching,practical skills and learning digital tools

Continuous Assessment: Documentation of steps in the selected product design

Final Assessment: Product Design in Studio with final product specifications

Course Outcomes: At the end of the course, students will be able to

1. Create simple design of components or a system as whole
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively in a team

Subject refers to products in civil engineering. Product may an entity such as a building, bridge, road, railway, airport, tunnel, port, harbor, water supply or disposal schemes or components involved in such entities as tiles, doors, windows, walls, structural members, abutment, pier, etc., or even materials produced in industry such as cement, steel, composits, FRP, bricks or blocks etc. It is intended to refer to few of these products which may be chosen by student. Group activity is encouraged.

Module1:Introduction to Engineering Product Design: (Lectures 02)

Concept of a product, Problem solving approach for Product Design, Trigger for Product/ Process/ System, Disassembling existing Product(s) and understanding relationship of components with each other, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failed products, Public/Society’s perception of products, and its input into product design.

Module 2: Ideation (Lectures 02)

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or group of individuals, Sketching of products, Market research for need, competitions, scale and cost, Initial specifications of products

Module 3: Conceptualization (Lectures 02)

Computer operation principles and image editing through a graphical Composition; Computer aided 2D drafting and 3D Modeling through simple exercises.

Designing of components, Drawings of parts and synthesis of a product from its component parts, idea of rendering designs for 3-D visualization and to create a photo image, Parametric modelling of product, 3-D Visualization of mechanical products,Detail Engineering drawings of components

Module 4:Detailing (Lectures 02)

Managing assembling, Product specifications- data Sheet, Simple component designs, Workshop and erection safety and health issues, Create documents for knowledge sharing

Hands-on Activity Charts for Use of Digital Tools using software such as Autodesk Fusion 360 or similar freeware

Activity 1	Learn the basic vector sketching tools.	2
Activity 2	General understanding of shading for adding depth to objects. Understanding of editing vectors	2
Activity 3	Begin developing a thought process for using digital sketching.	3
Activity 4	Create a basic shape objects sphere, box cylinders	3
Activity 5	Create Automotive wheel concepts	3
Activity 6	Understanding Navigation and Data Panel Interface	2
Activity 7	Solid and Surface modelling, Rendering 3-D models	4
Activity 8	Product market and Product Specification Sheet	3
Activity 9	Documentation for the product	2

Reference Books

- Model Curriculum for “Product Design Engineer –Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Ver 1.0, NSQF Level: 7)
- Eppinger, S., & Ulrich, K. (2015), “Product Design and Development”. McGraw-Hill Higher Education.
- Green, W., & Jordan, P. W. (1999), “Human Factors in Product Design: Current Practice and Future Trends”, CRC Press.
- Sanders, M. S., & McCormick, E. J. (1993), “Human Factors in Engineering and Design”, McGraw-Hill Book Company
- Roozenburg, N. F., &Eekels, J. (1995), “Product Design: Fundamentals and Methods (Vol. 2)”, John Wiley & Sons Inc.
- Lidwell, W., Holden, K., & Butler, J. (2010), “Universal Principles of Designs: Revised and Updated: 125 ways to Enhance Usability, Influence Perception, Increase Appeal, make Better Design Decisions and Teach through Design”, Rockport Pub.

BTCVE 404 A Numerical Methods in Engineering

Teaching Scheme:(3 Lectures) hours/week

Pre Requisites: Mathematics - I and Mathematics – II

Course Contents

Module 1(Lectures 06)

Basis of Computations, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Cholesky Decomposition method, Gauss Jordan and Gauss Sceidal Methods

Module 2 (Lectures 06)

Roots of Equation, Trial and Error, Bisection, Secant Iteration, Newton Rapson Method, Solution of Ordinary Differential Equation, Euler’s Method, Modified Euler’s Method and RungaKutta Methods.

Module 3 (Lectures 06)

Interpolation with Newton's Divided Differences, Lagrange's Polynomial, Finite Difference Method, Central, Forward and Backward Differences, Least Square Polynomial Approximations Application in Deflection of Determinate Beams, Buckling Load of Long Columns

Module 4 (Lectures 04)

Numerical Integration: Trapezoidal Rule, Simpon’s Rules, Gauss Quadrature Rules

Module 5 **(Lectures 04)**

Statistical Analysis of Experimental Data, Mean, Median, Mode, Deviation, Measures of Dispersion, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

Module 6 **(Lectures 04)**

Implementation of above methods by algorithm development leading to programming in Spreadsheets / Fortran / C / C++

Text Books

- Balaguruswami E., “Numerical Methods”, Tata Mc-Graw Hill
- Scheid F, “Numerical Analysis (Schaum’s series)”, Tata Mc-Graw Hill
- Chapra. S. C. and Canale R. P., “Numerical Methods for Engineers”, by, Tata Mc-Graw Hill
- Shantha Kumar M , “Computer Based Numerical Analysis”, Khanna Publication
- Grewal B.S. and Grewal J.S., “Numerical Methods in Engineering and Science”, Khanna Publication, N. Delhi
- Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi

Reference Books

- Jain, Aryengon, “Numerical Methods for Scientific and Engineering Applications”, Wiley Eastern Publication
- Numerical Recipe , Oxford Publishing
- Manuals for the Commercial Computer Programmes

BTCVE 404 B Planning for Sustainable Development

Teaching Scheme:(3 Lectures) hours/week

Course Contents

Module 1: **(Lectures 06)**

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

Module 2: **(Lectures 06)**

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

Module 3: **(Lectures 04)**

Innovation for sustainable development- Environmental management and innovation strategies.

Module 4: **(Lectures 04)**

Societal transformations. Institutional theory.

Module 5: **(Lectures 04)**

Governance for sustainable development. Policy responses to environmental degradation.

Module 6: **(Lectures 04)**

Capacity development for innovation. Research methods.

Text/Reference Books:

- Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment
- Institute, working paper 00-04, available at: http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF
- Robinson, J. (2004), “Squaring the circle? Some thoughts on idea of sustainable Development” Ecological Economics 48(4): 369-384.
- Hjorth, P. & A. Bagheri (2006), “Navigating towards Sustainable Development: A System Dynamics Approach”, Futures 38: 74-92.

- Mog, J.M. (2004) „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs", World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
- Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
- Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding & fostering innovation, London, Zed Books.

* * *

BTCVC 406 Engineering Management

Teaching Scheme:(1 Lecture) hours/week

Course Contents

Module 1: Evolution of Management Thought (Lectures 02)

Scientific, human behavior, system approach, introduction to elements of systems – input, output, process restriction, feedback, contingency approach, contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (theory X and theory Y), H. L. Gantt, Maslow

Module 2: Functions of Management (Lectures 02)

Planning – nature and purpose of planning, strategies and policies, management by objectives, formal and informal organization, centralization, decentralization, line, line and staff, functional organization, principles of site layout, lea ding and directing, controlling and coordination (introduction only), communication process, motivation

Module 3: Decision Making (Lectures 02)

Importance of decision making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monitory value, decision tree, theory of games (dominance pure and mixed strategy).

Module 4: Operations Research (Lectures 04)

Linear programming, simple l-p model, simplex method - duality, sensitivity analysis, application of linear programming in transportation and assignment models

Module 5: Simulation Studies (Lectures 02)

Monte-Carlo simulation, queuing or waiting line theory (simple problems), dynamic programming, introduction to emerging optimization techniques

Module 6: Material Management (Lectures 02)

Material management – purchasing principles, stores, coding system function, responsibilities, record and accounting. Inventory control – an introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks

Text Books

- Deshpande S. H., "Operation Research"
- Deshpande A. S., "A Text book of Management"
- Gopal Krishnan, "Material Management", Sdueshan.
- Taha, "Operation Research"
- Banga and Sharma, "Engineering Managnment"

References

- Stoner, "Engineering Management"
- Davar, "Principles of Management"
- Koontz, Dounell and Weigrick, "Essentials of Management"
- Kast and Rosinweig, "Management and Organization", Tata McGraw Hill Publication.

- Wagner, “Operation Research”, Wikey Easter Ltd., New Delhi
- Zhamb L.C., “Quantitative Techniques in Management”, Vol. I,
- Miller and Stars, “Executive Decisions & Operation Research”, Prentice Hall of India

Course Outcomes: On completion of the course, the students will be able to:

CO1: Demonstrate the nuances of management functions.
CO2: Analyze the framework of a business organization.
CO3: Adopt an empirical approach toward business situations.
CO4: Apply various Management techniques.

BTHM 3401 Basic Human Rights

Teaching Scheme:(2 Lectures) hours/week

Course Contents

Module 1: Basic Concepts **(Lectures 04)**

Individual, group, civil society, state, equality, justice. Human Values, Human rights & Human Duties: Origin, Contribution of American bill of rights, French revolution. Declaration of independence, Rights of citizen, Rights of working & exploited people

Module 2: Fundamental Rights and Economic Program **(Lectures 04)**

Society, religion, culture, and their inter-relationship. Impact of social structure on human behavior, Social Structure and Social Problems: Social and communal conflicts and social harmony, rural poverty, unemployment, bonded labour.

Module 3: Workers and Human Rights **(Lectures 04)**

Migrant workers and human rights violations, human rights of mentally and physically challenged. State, Individual liberty, Freedom and democracy.

Module 4: NGOs and Human Rights in India **(Lectures 04)**

Land, Water, Forest issues.

Module 5: Human Rights in Indian Constitution and Law **(Lectures 04)**

i) The Constitution of India: Preamble; ii) Fundamental rights; iii) Directive principles of state policy; iv) Fundamental duties; v) Some other provisions

Module 6: UDHR and Indian Constitution **(Lectures 04)**

Universal declaration of human rights and provisions of India; Constitution and law; National human rights commission and state human rights commission.

References

1) Shastry, T. S. N., “India and Human Rights: Reflections”, Concept Publishing Company India (P Ltd.), 2005.
2) C. J. Nirmal, “Human Rights in India: Historical, Social and Political Perspectives (Law in India)”, Oxford India.

BTCVL 407 Hydraulic Engineering Laboratory II

Practical:2 hours / week

Practical Work consists of at least three performances from groups listed below and detailed reporting in form of journal.

Practical examination shall be based on above.

Group (A)

1) Calibration of V notch / Rectangular notch.
2) Calibration of Ogee Weir.
3) Study of hydraulic jump

    a) Verification of sequent depths,
    b) Determination of loss in jump.
    c) Study of parameters with respect to Fraud Number: i) Y2/Y1; ii) Length; iii) Energy loss

4) Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
5) Velocity distribution in open channel in transverse direction of flow.

Group (B)

1) Impact of jet.
2) Study of Turbines (Demonstration).
3) Tests on Centrifugal Pump.
4) Study of Charts for Selection of Pumps

Use of computer programs such as MS Excel is desirable for post-processing of results.

Course Outcomes: On completion of the course, the students will be able to:

CO1: Understand various properties of fluids and measurement techniques.
CO2: Carry out calibrations of various flow measuring devices.
CO3: Understand mechanism of hydraulic jump, various jets and pumps.

* * *

BTCVL 408 Surveying Laboratory - II

Practical:4 hours / week

Practical Work consists of performing field practical from the list below and detailed reporting in form of journal. Practical examination shall be based on above.

1. Tacheometry
a) Determination of tachometric constants, b) Determination of grade of a line.
2. Use of subtense bar for distance measurement.
3. Setting out of curves
    a) Simple circular curves, b) Transition curves
4. Study of topo sheets
5. Study of Aerial Photographs under Stereoscope
6. Traversing by Total Station.

Projects: 1) Road Project 2) Radial Contouring. 3) Block Contouring Project 4) Theodolite Traversing

Course Outcomes: On completion of the course, the students will be able to:

CO1: Determine contour level of field.
CO2: Determine the tachometric constants and grade of a line.
CO3: Use sub tense bar for distance measurement.

* * *

BTCVL 409 Solid Mechanics Laboratory

Practical: 2 hours / week

Practical Work consists of performance of at least seven experiments from the list below (excluding the eleventh study) experiment: Detailed report is expected.

List of Experiments

1. Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)
2. Compression test on mild steel, aluminum, concrete, and wood.

3. Shear test on mild steel and aluminum (single and double shear tests).
4. Torsion test on mild steel and cast iron solid bars and pipes.
5. Flexure test on timber and cast iron beams.
6. Deflection test on mild steel and wooden beam specimens.
7. Graphical solution method for principal stress problems.
8. Impact test on mild steel, brass, Aluminum, and cast iron specimens.
9. Experimental on thermal stresses.
10. Strain measurement involving strain gauges / rosettes.

Assignment involving computer programming for simple problems of stress, strain computations.

Course Outcomes: On completion of the course, the students will be able to:

Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.
Determine the strength of coarse aggregates.
Find the compressive strength of concrete cubes and bricks.
Determine physical properties of given coarse aggregates, fine aggregates and cement samples.

BTCVM 410 Mini Project

Practical: 2 hours / week

Students shall take up work leading to product development. Needs of community around may be of prime concern. Work may target at easing out conventional construction operation by improvement of traditional devices / tools or development of altogether new approach.

BTCVF 411 Seminar on Topic of Field Visit to works involving Superstructure Construction

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of superstructure of buildings or other. It is desirable to collect basic information on components of superstructure, tools and plants, construction machinery, etc. Intention of the work is to introduce the student to the chronological order of execution of works and generate data on vocabulary of terms in field.

* * *

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Semester: Fifth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	Assessment of Marks for Theory				Assessment of Marks for Practicals				
							College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE501T	Structural Analysis -II	3	1		4	4	20	80	100	40					3
BECVE501P	Structural Analysis -II			2	2	1					25	25	50	25	
BECVE502T	Reinforced Cement Concrete (RCC) Structures	3	1		4	4	20	80	100	40					4
BECVE502P	Reinforced Cement Concrete (RCC) Structures			2	2	1					25	25	50	25	
BECVE503T	Fluid Mechanics -I	3	1		4	4	20	80	100	40					3
BECVE503P	Fluid Mechanics -I			2	2	1					25	25	50	25	
BECVE504T	Geotechnical Engineering -II	3	1		4	4	20	80	100	40					3
BECVE505T	Hydrology & Water Resources (HWR)	4			4	4	20	80	100	40					3
BECVE506P	Communicative English & Technical Writing			3	3	2					25	25	50	25	
Total		**16**	**4**	**9**	**29**	**25**	**100**	**400**	**500**		**100**	**100**	**200**		

Note: 1."Technical Writing" shall consist of detailed report on Summer Training- 1 (ST-1) underwent after 4th Semester.

2. Equal weightage shall be given to the components of "Communicative English" and "Technical Writing"

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology
CIVIL ENGINEERING
Scheme of Examination & Evaluation
Semester: Sixth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practicals				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE601T	Steel Structures	3	1		4	4	20	80	100	40					4
BECVE601P	Steel Structures			2	2	1					25	25	50	25	
BECVE602T	Surveying-II	3	1		4	4	20	80	100	40					3
BECVE602P	Surveying-II			4	4	2					25	25	50	25	
BECVE603T	Fluid Mechanics -II	3	1		4	4	20	80	100	40					3
BECVE603P	Fluid Mechanics -II			2	2	1					25	25	50	25	
BECVE604P	Building Design and Drawing			4	4	4					50	50	100	50	
BECVE605T	Environmental Engineering-II	3	1		4	4	20	80	100	40					3
BECVE606P	Site Visit & Mini Project			3	3	3					25	25	50		
Total		**12**	**4**	**15**	**31**	**27**	**80**	**320**	**400**		**150**	**150**	**300**		

Summer Training - 2 (ST-2) of 2-4 Weeks duration during Summer Vacation is mandatory and will be evaluated in Seventh Semester.

Note:
1. External Practical Evaluation of Building Design and Drawing shall be performance based by drawing assigned problem given jointly by the Internal & External Examiners on AutoCAD
2. "Site Visit" shall cover minimum Five Site Visits.
3. "Mini Project" shall include report on Site Visits and Assigned Mini Project/Software Training, etc.
4. Equal weightage shall be given for components of "Site Visits" and "Mini Project".

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

V Semester

Code No.	Name of Subject in Semester Pattern	Code No.		Name of Equivalent Subject in Credit Based Semester Pattern
5CE01	Steel Structures (T)	BECVE601T		Steel Structures
5CE01	Steel Structures (P)		BECVE601P	Steel Structures
5CE02	Environmental Engineering - II	BECVE605		Environmental Engineering - II
5CE03	Surveying - II (T)	BECVE602T		Surveying – II
5CE03	Surveying - II (P)		BECVE602P	Surveying – II
5CE04	Transportation Engineering - I (T)	BECVE403T		Transportation Engineering - I
5CE04	Transportation Engineering - I (P)		BECVE403P	Transportation Engineering - I
5CE05	Building Design and Drawing (T)		BECVE604P	Building Design and Drawing
5CE05	Building Design and Drawing (P)		BECVE604P	Building Design and Drawing
5CE06	Project Management	BECVE704		Construction Management and Law
5CE07	Site Visit		BECVE606P	Site Visit and Mini Project

VI Semester

Code No.	Name of Subject in Semester Pattern	Code No.		Name of Equivalent Subject in Credit Based Semester Pattern
6CE01	Structural Analysis - II (T)	BECVE501T		Structural Analysis - II
6CE01	Structural Analysis - II (P)		BECVE501P	Structural Analysis - II
6CE02	RCC Structures (T)	BECVE502T		Reinforced Cement Concrete (RCC) Structures
6CE02	RCC Structures (P)		BECVE502P	Reinforced Cement Concrete (RCC) Structures
6CE03	Geotechnical Engineering - II	BECVE504T		Geotechnical Engineering - II
6CE04	Fluid Mechanics - II (T)	BECVE603T		Fluid Mechanics - II
6CE04	Fluid Mechanics - (P)		BECVE603P	Fluid Mechanics - II
6CE05	Computer Applications in Civil Engineering		Semester - I, Serial No. 8	Computational Skills
6CE06	Technical Writing	BECVE506		Communicative English and Technical Writing

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU's relevant ordinance.

STRUCTURAL ANALYSIS –II

BECVE501T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Apply the different methods of analysis of frames in practical problems
2. Formulation of stiffness matrix, transformation matrix, load matrix for various structural components for analysis purposes.
3. Understand the basics of finite element method in the analysis of structural components.
4. Understand the concepts related to structural dynamics.

Unit – I

Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

Unit - II

Analysis of Continuous Beams & Simple Portal frames (sway and Non Sway) Using Moment Distribution.

Unit - III

Basic concept, Degree of Freedom, Basic concept of Direct Stiffness Method. Formulation of elemental/local stiffness matrix and global stiffness matrix for plane truss. Transformation Matrix, Assembly of Global/ Structural stiffness matrix up to (8x8). Member load matrix including lack of fit, temperature, Assembly of Global/ Structure load matrix, Solution to problems with maximum degree of freedom three.

Unit - IV

Formulation of element/local stiffness matrix and global stiffness matrix for beam members (without axial deformations) for continuous beams, Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, Assembly of global/ structure load matrix up to Three Elements. Solution to problems with maximum degree of freedom Three.

Unit – V

Formulation of element/ local stiffness matrix and global stiffness matrix for Plane frame members (without axial deformations), Transformation matrix Assembly of global/ structural stiffness matrix, Member load matrix due to concentrated loads, uniformly distributed Loads, temperature Moments Assembly of global/ structural load matrix.

Solution to Plane frame problems with maximum degree of freedom six inclined member problems.

Unit - VI

Introduction to structural dynamics, D'Alembert principle, inertia force, equation of motion (free vibration), SDOF system, Damping, natural frequency, (MDOF (up to 3 DOF), mode shape and nodal frequency).

Introduction to finite Element method, basic concepts, discretization of structures, Rayleigh Ritz method for bar elements (prismatic/Non-prismatic) Displacement based bar elements (Prismatic/Non-prismatic)

REFERENCE BOOKS:

1. C K Wang, 'Intermediate Structural Analysis"
2. S P Timoshenko, 'Theory of Structure'
3. Jain, Jain Krishna, 'Plain & Reinforced Concrete Structures', Vol-II
4. Rally and Dally, 'Experimental Stress Analysis'

STRUCTURAL ANALYSIS –II

BECVE501P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

Minimum Eight Problems, on complete syllabus with hand calculations using scientific calculators and also solution to same problems by using available application software.

(Solution is restricted to four degree of freedom problems and assembly restricted to eight degree of freedom problems)

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 4 hrs**

COURSE OUTCOMES: The students shall be able to

1. Understand the basic concepts of structural design Methods of RCC to the practical problem
2. Understand the composite action of reinforced steel and concrete in reinforced concrete structural members
3. Use the knowledge of the structural properties of materials i.e. steel and concrete in assessing the strength.
4. Use the knowledge in structural planning and design of various components of buildings.
5. Apply the concepts and applications of prestressed concrete in real problems

Unit – I

Introduction to the Working Stress Method of RCC design. Basic concepts in design for flexure, assumptions, design constants. Analysis of the rectangular section, Balanced, under-reinforced and over-reinforced sections; Drawbacks and limitations of Working stress methods.

Unit – II

Prestressed Concrete: Properties of high grade/strength materials, concepts of prestressed concrete, methods of prestressing, losses in prestressing. Various systems of prestressing with particular reference to Freyssinet, Magnel Blatton and Gifford Udall systems Analysis of rectangular, T and I section. Design of prestressed slab/ rectangular beam

Unit - III

Introduction to Limit State Design: Concept of probabilistic design and limit state design. Characteristic values, partial safety factors, stress strain relationship stress block parameters, failure criteria, types and properties of reinforcement, limit state of Serviceability and limit state of collapse, other limit states. Review of IS – 456-2000.

Limit state of collapse in flexure: Analysis and design of singly reinforced rectangular section. Balanced failure mode, primary tension failure mode and primary compression failure mode

Analysis & Design of Doubly reinforced sections

Unit - IV

Limit state of collapse in flexure: Analysis and design of Tee and L-beam section.
Limit state of collapse in compression: Analysis & design of short axially loaded column. Columns subjected to uniaxial bending, use of interaction curves.

Design of rectangular pad/ slopped footing for axial load

Unit - V

Limit state of Collapse in Shear & Bond: Design of beam for shear, shear span, post cracking resistance, shear mechanism approach, shear failure modes and collapse loads, interaction of shear, flexure and force. Check for bond.

Limit state of Serviceability:

Causes and control cracking: Crack in plastic concrete at early age, Cracks due to temperature and shrinkage, restrain induced cracks, Cracks due to loading. Needs for crack width control

Moment- curvature relationship, deflection control of beams; Deflection calculation for beam.

Limit state of collapse in torsion: Concepts of interaction to torsion, shear and flexure Analysis & design of rectangular section for torsion, shear and flexure

Unit – VI (with LSM)

Design of one-way, simply supported, single span and cantilever slabs, and continuous slab/ beam with IS coefficients.

Design of RCC Two way slab with various end conditions using IS code coefficient.
Deflection calculation for one-way slabs

REINFORCED CEMENT CONCRETE (RCC) STRUCTURES

BECVE502P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Student shall undertake Practicals on:

1. Design of beams, columns, slab and foundation as per relevant IS Code
2. Understanding the professional RCC drawing.
3. Minimum One Site visit pertaining to above design

FLUID MECHANICS-I

BECVE503T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Measure and determine fluid pressures and forces on plates/surfaces, pipe bends, etc.
2. Apply the Bernoulli's equation to solve the problems in fluid.
3. Understand the concepts of dimensional analysis use the dimensionless number suitably.
4. Understand the basic concepts related to laminar and turbulent flow.
5. Apply the principles of hydrostatics and determine the forces.

Unit-I :

Fluids and their Properties: Definition of fluid, fluid properties, mass density, specific weight and specific gravity, viscosity; Newton's equation, coefficients of dynamic and kinematic viscosity. Rheological Diagram. Ideal and real fluids. Compressibility and bulk modulus, Surface tension capillarity, pressure inside a bulb and cylindrical jet, vapor pressure and cavitations. Effects of pressure and temperature on fluid properties.

Fluids Pressure and its Measurement: Fluid pressure, law of fluid pressure, variation of fluid pressure with depth, pressure and head, Atmospheric pressure, Gauge pressures. Pressure measurements using manometer, differential manometer and gauges

Unit-II

Hydrostatics: Hydrostatic pressure on plane and curved surface. Centre of pressure, fluids in relative equilibrium; fluid masses subjected to horizontal, vertical and inclined acceleration.
Buoyancy and Floatation: Buoyant force and centre of buoyancy, Archimedes principle, Metacenter and Metacentric height - its determination by analytical and experimental methods. Stability of floating bodies and three states of equilibrium

Unit-III

Fundamentals of Fluid Flow-I: Kinematics of Flow: Velocity, its variation with space and time; Steady, unsteady, uniform & non-uniform; One, two and three dimensional; rotational, irrotational flow. Acceleration of fluid particles, Normal and Tangential acceleration. Stream line, path line & streak line; Lagrangian and Eularian approaches in fluid flow description. Equation of continuity in Cartesian co-ordinates, stream functions, velocity potential and potential flow. Relationship between stream function and velocity potential, flow nets, circulation, vortices, source and sink. Free and forced vortices.

Unit-IV

Fundamentals of Fluid Flow-II: Kinetics of Flow: Factors influencing motion, Euler's equations of motion. Bernoulli's equation, Assumptions, derivation, limitations and application, Kinetic energy correction factor. Momentum equation, Impact of Jets, forces on plates, pipe bends and closed conduits.

Fluid Measurement-I: Velocity measurement; pitot tube, pitot-static tube and Prandit tube. Discharge measurement: Venturimeter, Orificemeter and flow nozzles.

Unit-V

Fluid Measurement-II: Orifices and Mouth pieces- Orifice: definition, types, Hydraulic coefficients, factors affecting them and their experiments. Large/small orifices and submerged orifices. Time for emptying tanks by orifices Mouthpieces: Definition, types and utility, pressure at Vena contracta, Coefficients of discharge.

Flow Measurement and Control: Notches & Weirs – Definitions, Types; Rectangular, triangular and trapezoidal, End contraction. Co-efficient of discharge and its determination; Error in measurement of head. Velocity of approach and its effects Cipolletti, broad-crested and submerged weirs

.

Unit-VI

Dimensional Analysis And Theory of Models: Dimensional Analysis: Fundamentals, methods, (Raleigh's and Buckingham); Similitude, Geometric, Kinematic and Dynamic similarities. Predominant forces, Dimension-less numbers and their significances.

Behavior of Real Fluids: Viscous flow - Laminar and Turbulent flows, Reynolds apparatus critical velocity. Reynolds Number, simple problems on determination of Laminar and Turbulent flows in pipes.

FLUID MECHANICS-I

BECVE503P **Evaluation Scheme: (25-Internal/25-External)**
(P – 2 Hrs/Week); Total Credit - 1

Minimum eight practicals from the given below list should be performed

1. To verify Bernoulli’s theorem
2. To determine the coefficient of discharge of Venturimeter
3. To determine the coefficient of discharge of Orifice meter
4. To determine the coefficient of discharge of Rectangular Notch
5. To determine the coefficient of discharge of Triangular Notch
6. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice and mouth piece.
7. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
8. To determine the variation of friction factor ‘f’ for turbulent flow in commercial pipes.
9. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number

GEOTECHNICAL ENGINEERING-II

BECVE504T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hr/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of different soil exploration techniques to ascertain the properties of soil
2. To analyze the stability of natural slopes, safety & sustainability of the slopes, design of retaining structures, reinforced earth walls, etc.
3. Practice Ground Improvement Techniques.
4. Design the shallow & deep foundation.

Unit- I: GEOTECHNICAL EXPLORATION

Importance and objective of field exploration , geophysical methods and its limitations, methods of subsurface exploration, methods of boring, number, location and depth of boring, types of soil samples and samplers, principles of design of samplers, collection & shipments of samples, boring and sampling record.

Unit- II: STABILITY OF SLOPES

Causes and types of slope failure, stability analysis of infinite slopes, Taylor's stability numbers & stability charts, stability analysis of finite slope for purely C- soils and C - □ soils, center of critical slip circle, (Swedish circle method), slices method for homogeneous C - □ soil slopes with pore pressure consideration, Friction circle method, method of improving stability of slopes; types, selection and design of graded filters.

Unit- III: LATERAL EARTH PRESSURE

Earth pressure at rest, active and passive pressure; general & local states of plastic equilibrium in soil. Rankine's and Coulomb's theories of earth pressure. Effects of surcharge & submergence. Determination of Active earth pressure through graphical construction; Rebhann's and Culman's method

Unit- IV: GROUND IMPROVEMENT

Need of ground improvement, ground improvement techniques, stabilization using lime, cement & flyash; prealoading concept, vibrocompaction/flotation, concept of sand drains, stone columns, encased stone column, concept of NPVD (natural prefabricated vertical drain) and PPVD (polymer prefabricated vertical drain). Basic concept of reinforced soil, different types of Geo-synthetics, Geo-synthetic application and functions in civil engineering

Unit- V: SHALLOW FOUNDATION

Bearing capacity of soil: Factor affecting bearing capacity, Terzaghis theory, its validity and limitation, types of shear failure in foundation soil, effect of water table on bearing capacity, (introduction to IS method, factor affecting bearing capacity, field determination of bearing capacity through plate load test and standard penetration test,) Settlement of shallow foundation: Causes of settlement, elastic and consolidation settlement, differential settlement, control of excessive settlement. (Standard penetration test, corrections for N - values to obtain design soil parameters**.)**

Unit- VI: PILE FOUNDATION

Classification of piles, constructional features of cast- in – situ & pre cast concrete piles. Pile driving methods, effect of pile driving on ground. Pile capacity by static formula & dynamic formulae, pile load test, group action of piles, spacing of piles in group, settlement of group of pile (pile group,) negative skin friction and its effect on pile capacity, general features of under reamed piles.

REFERENCE BOOKS:

1. Gopal Ranjan &Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
2. Arora K.R. : Soil Mechanics & Foundation Engineering
3. Punmia B. C. : Soil Mechanics & Foundation
4. P Raj : Geotechnical Engineer,Mc Graw Hill Education,2000

HYDROLOGY AND WATER RESOURCES

BECVE505T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits- 4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Use of knowledge of basics of hydrology in calculating infiltration, evaporation, total runoff.
2. Use the techniques of the Hydrographs to forecast flood discharge at various durations.
3. Apply the Statistical techniques to analyze the flood occurrence & frequency.
4. Use the knowledge pertaining to the flood to plan flood routine & emergency plans.
5. Apply the knowledge of geo-hydrology terms in planning, assessing & computation of ground water potential and its assessment using various techniques.
6. Take-up planning of water resources mini project.

Unit – I

Introduction: Hydrology, definition, engineering hydrology, and its importance, development of hydrology and allied science, hydrological cycle, hydrological evolution and brief description of its components, the earth and its atmosphere, importance of temperature, humidity, and wind in hydrological study.

Precipitation: Definition anticipation, artificial rains, types of precipitation, orthographic, conventional and cyclonic, factors affecting precipitation with reference to physiographic divisions of India

Measurement of precipitation: non automatic and automatic rain gauges, selection of site, density and adequacy of rain gauge stations, optimal number of rain gauge, radar measurement of rainfall, mass curve, supplementary rainfall data missing records, intensity duration frequently and depth area duration analysis

Unit - II

Infiltration: definition, mechanism, factors affecting infiltration, infiltration indices, measurement, application, problems.

Evaporation and transportation: definition, mechanism and factors affecting evaporation, evaporation estimations by pan, water budget, energy budget and imperial formula, control of evaporation. Evapo-transpiration and its measurement. Interception and its measurement.

Unit - III

Runoff: Source and components of run-off, classification of streams, factors affecting the runoff processes, estimation methods, measurement of discharge of streams by area-slope and area-velocity method.

Hydro-graphics: flood hydrology, definition, typical flood hydrograph and its components, base flow and base flow separation, unit hydrograph, theory, S-curve and its use, instantaneous UHG.

Unit - IV

Statistical Methods: statistics in hydrological analysis, probability and probability distributions, average measure of dispersion, co-relation. Analysis of time series, frequency analysis.

Floods: causes and effects, factors affecting peak flows and estimation of peak flows, low flow, basin flood, flood routine and flood forecasting, economic planning for flood control (Emergency action plan)

Unit - V

Geo-hydrology: Introduction, occurrence and distribution of ground water, water table and water table maps, aquifer, aquiclude, aquitard and aquifuge. Groundwater exploration, electrical sensitivity method, confined and unconfined aquifer, porosity, permeability, specific yield, specific retention, Darcy’s law, introduction to hydraulic wells, open wells, safe yield test.

Unit - VI

Groundwater recharge: Concept of recharge, selection of recharge sites, recharging methods, spreading method, induced recharge method, recharge well method, sub-surface dams, waste water recharge, recharge by urban storm runoff, recharge through rain water harvesting

Project planning for water resources: multipurpose projects inter basin water transfer and inter-state river dispute. Water resource planning through watershed management, (Instrument used for measurement of climatic parameter, wind vane, anemometer, Sunshine Recorder,
Stavenson’s Screen, Different types of thermometers, Thermo hydro graph).

COMMUNICATIVE ENGLISH & TECHNICAL WRITING

BECVE506P **Evaluation Scheme: (25-Internal/25-External)**

(P-3 Hrs/Week); Total Credits-2

Outcomes:

Students will be:

1. Adept in using functional grammar
2. Able to write at work
3. Able to draft reports and letters
4. To understand the planning and procedure of carrying out research work
5. Dexterous in presentation skills and participate in GD

Practical 1- Language and style

Grammar, Mechanics, Punctuations, Spellings, Vocabulary & Word Watch (List of Technical and Business terms with usage

Assignments: 4 Nos. (3 worksheets on Grammar, 1 on Mechanics and Punctuation)

Grammar- *Subject and verb agreement, prepositional phrases, pronouns, pronoun references, avoiding shifts, avoiding sexism (avoiding gender bias), modifiers, the clause and simple sentence, compound sentences, transition words, parallelisms.*

Mechanics- *Fragments, run-ons, and comma splices abbreviations & acronyms.*

Punctuations - *colons and semicolons, end punctuations, parentheses, dashes, brackets, ellipses, slashes, and hyphens, apostrophes.*

Method / plan – Concept clearance using Worksheets with MCQ / activities

Practical 2- Writing at Work & Other Business Writing

Assignments: 4 Nos. (2 topics from A & B each)

A. Writing at Work

Types of Letters (inquiry, order, sales, complaint etc), Memos, E- mail, The Job Search (Resume & Cover letter), Fliers & Brochures.

Method / plan: analyzing errors in mails, resumes, letters and brochures with respect to practical- 1, practice writing with samples given

B. Other Business writing

Itinerary Writing, Inter –office Memorandum (memo), Circulars (Informative, Public, Official), Notice, Agenda and Minutes

Method / plan: analyzing errors in circulars, memos with respect to practical 1, practice writing with samples given as assignment

Practical 3- Report Strategies

Assignment: 2 Nos. (Any two reports from the given topics)

Reports (Trip / study tour / site visit), reports, Incident reports, Investigative Maintenance manual for buildings

Lab reports, Feasibility reports / Recommendation reports, Technical Proposals, The Summary,

Method / plan: Analyze reports and proposals in the area of your study. Attempt following all the rules in Practical -1 & Practical-5 and give a presentation to your class.

After attending a lecture / meeting / conference, summarize its contents. Provide the speakers name, location of the presentation, date of presentation for the source citation.

Sample for summary

Many textbooks begin or end chapters with summaries. Find such a summary in one of your textbooks. Then read the accompanying chapter. Is the summary effective? If so, why? If not, Why not? If the summary is ineffective, how would you rewrite it?

Practical 4- Orientation to Research

Planning and process, Structure, documentation, composing a bibliography for a research paper /report

Assignments: 3 Nos. (Preparation of a technical paper, Review of 10 technical papers on a particular subject, Study of Detailed Project Report & Preparing a summary)

Method / Plan: Assignments
1. Planning and process,

Structure- *Title, authors details, abstract, introduction, discussion, conclusion, footnotes / list of references, Bibliography*
Documentation- relevance and purpose, methods and systems available
composing a Bibliography for a research paper /report- *placement and arrangement, author, inclusive page numbers, citing an introduction, preface, foreword, or afterword, articles, online journals or website, Check list for a research paper*

2. **Choosing a Detailed Project Report / Carrying out feasibility study (prepare a summary based on the research)**

Sample

Many people are opening their own businesses. What does it take to open your own business? Before you can write an effective business plan and seek financing from a bank, you must research the project.

Choose a new venture, selling or a product or service of your choice. What would it cost to open this business? What would be your best location, or should your business

be online? What certification or licensing is needed? How many personnel would you need? What equipment is necessary? Who would be your clientele?

Based on research, write a proposal appropriate for presentation to a bank. In this proposal present your business plan for a new entrepreneurial opportunity

Practical 5- Dynamics of Professional Presentations

1. Introduction, planning, occasion, audience, purpose, thesis statement
2. Outlining and structuring, introduction, main body, conclusion
3. Nuances of delivery, modes of delivery, guidelines to effective delivery
4. Visual aids in presentation
5. Organizational GD

Activities : 2 Nos. (A PPT presentation on any one of the Research Project and GD)

Practical 6: Report Writing on Summer Training-1 (ST-1)

Note: Based on the 5 practicals prescribed, many assignments can be prepared and given to the students. Any innovative project and assignment will be highly appreciated.

Proper evidence of the execution of the projects/ Reports / assignments / worksheets should be maintained.

REFERENCE BOOKS:

1. **Technical Writing: Process and Product: S.J. Gerson and S. M. Gerson, Pearson Education Inc., Singapore (Printed in India by Anand Sons)**
2. **Basic Communication Skills for Technology: A.J. Rutherfoord, Darling Kindersley(India) Pvt. Ltd, India (Printed in India by Saurabh Printers Pvt. Ltd)**
3. **Effective Technical Communication: Rizvi. M Ashraf, Tata Mc Graw Hills, India**
4. **Communication Skills: Sanjay Kumar and Pushp Lata, Oxford University Press**

VI Semester

STEEL STRUCTURES

BECVE601T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**
.

COURSE OUTCOMES: The students shall be able to

1. Use the knowledge of structural properties in assessing its strength for the construction purpose.
2. Apply the knowledge of various techniques in analyzing the steel structural components.
3. Make use of knowledge of analysis in structural planning and design of various components of buildings.

NOTE: Use I.S Code. - 800-2007

Unit – I

Steel as a structural material, various grades of structural steel properties; various rolled steel sections (including cold formed section, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875 etc.

Introduction to Plastic Analysis, Shape Factor, Plastic hinge formation Collapse mechanism for beams

Design of axially loaded members: (a) Tension members. (b) Compression members. Design of roof truss: Load assessment for DL, LL and WL.

Unit - II

Structural Fasteners:

Behavior of bolted and welded connections (types, Designation, properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolt and welded connections. Moment resistant bolted and welded connection (bending and torsion)

Design of connection: Beam to beam, beam to column

Unit – III

Design of simple and built up beams: Laterally restrained and un-restrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. (Design of welded plate girder.)

Unit - IV

Design of single rolled steel section column subjected to axial load and biaxial moment including base design.

Design of axially loaded built up columns. Laced and battened (Column bases, slab base, gusseted base, and moment resistant bases).

STEEL STRUCTURES

BECVE601P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-1

Term Work –

Minimum three design assignment based on above topics along with the detailed structural drawings on A2 size sheets.

Practical Examination shall be based on the above Practical work.

SURVEYING-II

BECVE602T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3hrs**

COURSE OUTCOMES: The students shall be able to

1. Carry forward the concepts of basic surveying techniques
2. Operate various survey instruments effectively with precision
3. Use different types of techniques in various surveying problems
4. Apply the concepts of modern surveying techniques & instrumentation.
5. Take – up mini project using different surveying techniques.

UNIT-I

Tacheometric Surveying: Classification, principal of stadia method, theory of Anallatic lens, distance and elevation formulae, tangential method, errors in stadia surveying.

UNIT II

Simple, Compound, Reverse Curves and Vertical Curves:

a) Simple Curves: Elements of simple curves, methods of curve ranging, obstacles in setting out curves.
b) Compound Curves: Elements of compound Curves, setting out the curve.
c) Reverse Curves: Elements of reverse Curves, setting out the curve.
d) Vertical Curves: Elements of vertical curves, types, tangent correction, location of highest or lowest point.

UNIT III

Transition Curves: Elements of transition curves, super elevation, length of transition curve, Ideal transition curve, characteristics of transition curve, setting out the transition curve.

UNIT IV

Geodetic Surveying and Triangulation Adjustment

Geodetic Surveying: Classification of triangulation survey, inter-visibility of stations, field work, reduction to centre, base line measurement, corrections.

Triangulation Adjustment: Definitions, weighted observations, laws of weights, station adjustment, figure adjustment (Triangle only)

UNIT V

Photographic Surveying: Basic definitions, terrestrial and aerial photography, scale of Aerial photo relief, Tilt and height displacements, heights from relief displacement and parallax measurements, flight planning, study of photo theodolite and stereoscope.

UNIT VI

Advanced Techniques in Surveying:

Total station, Electromagnetic Distance Measurement (EDM)

Remote Sensing: Introduction, definitions, Remote sensing systems, advantages, Basic Principles, energy interaction in the atmosphere, Indian remote sensing Satellite series and their characteristics

GIS & GPS: Components of geographical information system (GIS),advantages, function of GIS, Raster and vector data, advantages and disadvantages, global positioning system.(GPS),Introduction, definitions, GPS receivers, antenna, advantages of GPS.

REFERENCE BOOKS:

1. Surveying & Levelling by B.C. Punmia (Vol 2 & Vol 3)
2. Surveying & Levelling by Kanetkar & Kulkarni (Vol 2)
3. Remote sensing & G.I.S. by Dr. M. Anji Rddy

SURVEYING-II

BECVE602P **Evaluation Scheme: (25-Internal/25-External)**
(P-4 Hrs/Week); Total Credits - 2

A) PRACTICALS: Minimum Eight Practicals out of following

1. Determination of constants of Tacheometer
2. Determination of elevation of points by Tacheometric surveying
3. Determination of elevation of points and horizontal distance between them by Tacheometric survey.
4. Determination of gradient of given length of road by Tacheometric survey
5. Setting out of simple circular curve by offsets from chord produced method
6. Setting out of simple circular curve by Rankine method of tangential angle
7. Setting out of simple transition curve by tangential angle method
8. Use of Advanced techniques of surveying.
9. Toposheet: Understanding and identification of different features of drawing

B) SURVEY PROJECT:

Survey project should be carried out for minimum 2 days in the following areas (Any One)

1. Road Project,
2. Irrigation Project (canal alignment, watershed demarking, contouring)
3. Water Supply Project

FLUID MECHANICS –II

BECVE603T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**.

COURSE OUTCOMES: The students shall be able to

1. Understand the concepts related to boundary layer theory and determination of drag and lift forces.
2. Apply the knowledge of theories and equations of pipe flow in analyzing and designing the pipe network systems and its components including water hammer pressures.
3. Use the concepts of uniform and critical flow through open channels including design of efficient channel sections.
4. Understand the different techniques of dimensional analysis and its use in model testing.
5. Understand and apply basics related to Turbines & Pumps in Water Resources planning.
6. Make use of specific energy concepts in the analysis of open channel flow.
7. Undertake Gradually Varied Flow analysis and its computation.

UNIT-I

LAMINAR FLOW: Steady uniform laminar flow in circular pipes; Velocity and shear stress distribution; Hagen Poiseuille equation.

BOUNDARY LAYER THEORY: Nominal thickness, displacement thickness, momentum thickness of the boundary layer: Boundary layer along a long thin plate and its characteristics; Laminar boundary layer; turbulent boundary layer; laminar sub-layer: Separation of boundary layer on plane and curved surfaces.

REAL, INCOMPRESSIBLE FLUID FLOW AROUND IMMERSED BODIES: General definition of drag and lift; Flow past plates, cylinders and spheres; drag on sphere, cylinder and flat plate.

UNIT-II

FLOW THROUGH PIPES:

Hydraulically smooth and rough pipes; Frictional resistance to flow of fluid in smooth and rough pipes; Nikurade's experiment; Moody's chart; Darcy-Weisbach & Hazen- William's equation for frictional head loss; Hydraulic gradient and energy gradient: Pipes in series and parallel; Branched pipes; Siphon; transmission of power through pipes; Hardy-Cross method of pipe networks; Water-hammer, pressure head due to sudden closure of valve.

UNIT-III

FLOW THROUGH OPEN CHANNEL:

(A) GENERAL: Types of channel and their geometrical properties; Types of flow in open channel.

(B) UNIFORM FLOW: Chezy's and Manning's equations; Hydraulically most efficient rectangular, triangular and trapezoidal sections; Computations of normal depth of flow, conveyance of channel, section factor for uniform flow, normal slope and normal discharge.

(C) CRITICAL FLOW: Specific energy and its diagram; alternate depths; Computations of critical depth, section factor for critical flow, critical slope; normal, critical slope; Specific force and its diagram; Conditions of critical flow.

UNIT-IV

(A) APPLICATIONS OF SPECIFIC ENERGY, gradual transitions of channels.

(B) GRADUALLY VARIED FLOW: Dynamic equation for GVF; Classification and characteristics of surface profiles; Direct Step method of computing profile length.

(C) RAPIDLY VARIED FLOW: Definition of hydraulic jump; Equation of hydraulic jump in horizontal, rectangular channel; Length & height of jump; Energy loss in jump; Classifications of jump.

UNIT-V

HYDRAULIC MODELS: Difference between model and prototype; Similitude- type of similarities; Model Laws- Reynolds model law and Froude model law; Types of model-distorted, undistorted; Froude's method of determining resistance to partially submerged objects like ship.

UNIT-VI

FLUID MACHINERY:

(A) TURBINES: Definition: Gross and net heads; different efficiencies; Classification of turbines; component parts and working principles; selection of turbines on the basis of head and specific speed.

(B) RECIPROCATING PUMPS: Components parts, working principle, Work done of single & double acting pumps; Negative slip, Air vessels – Working principle and necessity.

(C) CENTRIFUGAL PUMP: Component parts; Working principle; Static and manometric heads; different efficiencies; Priming & priming devices, Specific speed; Theoretical aspects of multistage pumps; Trouble & remedies; operating characteristics curves. Selection of pumps, system head curves and pump head curves. Model testing of pumps

REFERENCE BOOKS:

1. Hydraulics & Fluid Mechanics- Dr.Modi & Dr. Seth
2. Fluid Mechanics-Streeter & Wylie
3. Fluid Mechanics- Dr. A.K.Jain
4. Fluid Mechanics through problems- Garde
5. Theory and applications of Fluid Mechanics- K. Subramanya
6. Foundation of Fluid Mechanics-Yuan
7. Flow through open channel – K.G.Rangaraju

FLUID MECHANICS –II

BECVE603P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits - 1

PRACTICALS:
Minimum TEN practicals, from the list given below shall be performed:

1. Study of flow around immersed bodies.
2. Determination of Darcy-Weisbach friction factor for given pipes.
3. Determination of Manning’s or Chezy’s constant for an open channel.
4. Developing specific energy diagram for a rectangular channel.
5. Study of GVF profiles.
6. Study of hydraulic jump in a horizontal rectangular channel.
7. Study and performance of Francis turbine.
8. Study and performance of Pelton Wheel turbine.
9. Study and performance of Centrifugal pump.
10. Study and performance of Reciprocating pump.
11. Problem on pipe network analysis manually and using application software.

BUILDING DESIGN & DRAWING

BECVE604P **Evaluation Scheme: (50-Internal/50-External)**
(P- 4 Hrs/Week); Total Credits-4

COURSE OUTCOMES: The students shall be able to

1. Understand building bye laws & building code
2. Apply the principles of building planning and design.
3. To draw submission/working drawing using suitable software.
4. Make use of knowledge to give layout on the field as per the plan.
5. To draw simple perspective drawings.
6. Understand Drawings and Detailing of Building services

UNIT-I

Introduction: Site requirements, requirements of owner and Building byelaws, Importance of Building drawing to Engineer. Use of building byelaws and National building code

UNIT-II

Method of Drawing: Selection of scales for various drawings, Thickness of lines, Dimensioning, Combined First angle and Third angle method of projection, Abbreviations and conventional representations as per IS 1962. a) Developing working drawings to scale as per IS. 1962 from the given sketch design and
general specifications for terraced and pitched roofs.
b) Developing submission drawings to scale with location site and block plan complete

UNIT-III
Designing of Buildings:

Introduction: Climate and design consideration, orientation, recommendations of CBR1, Roorki and general principles of planning with emphasis on functional planning. Graph paper design (line plans) based on various requirements for residential, public, education and industrial buildings.

UNIT-IV

(A) Two point perspective of Residential building neglecting small elements of building such as plinth offset, chajja projections etc.
(B) Drawings and Detailing of Building services; electrical, plumbing, sanitary, etc.

TERM WORK:

1. Working drawing of residential single storied building of terrace and pitched roofs with foundation plan of load bearing structure. (Two assignment one manual and one with Computer Aided Drafting)
2. Submission drawing of single storied residential building (framed structure) with access to terrace including all details and statements as per the local bye-laws. (One manual and one with Computer Aided Drafting)

3. Working drawing of multistoried Public/Educational/Health/Community/Industrial building including structural details and layout of services. (One assignment)
4. Two point perspective of the single storied Residential building neglecting small building elements. (one assignment - pitched or terraced roof)
5. Minimum 10 CAD based self explanatory dimensioned sketches of various building elements.
6. Line plans of various types of buildings e.g. public/educational/industrial/hospital/ community on graph sheets (04 assignments = 2 manual+2 CAD)
7. Submission drawing of two storied residential building framed structure including all details and statements as per the local byelaws.
8. One compulsory field exercise on layout of building etc.
9. Understanding professional architectural drawing.

NOTE:-

1. The internal practical exam includes drawing exam using AutoCAD of 20 marks and 30 Marks for continuous assessment.
2. The external practical exam shall consist of performance based on above syllabus on software of 30 marks and viva voce 20 marks

ENVIRONMENTAL ENGINEERING-II

BECVE605T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs.**

COURSE OUTCOMES: The students shall be able to

1. Use the concept related to water & its quality, sewage, sewer, storm water, etc in its hydraulic design
2. Apply the knowledge of different components of sewer in construction, testing & maintenance of sewers,
3. To test the sample of waste water in the laboratory for physical & chemical characteristics.
4. Take-up functional planning, layout and design of water treatment plant components.
5. Take-up functional planning, layout and design of sewage treatment plant components.
6. Plan for rural sanitation provisions, perform functional design of septic tank,
7. Analyze the industrial waste water for its treatment units.
8. Make use of knowledge & effect of air pollution, solid waste in planning for its prevention and control.

Unit-I

General Aspects of Environmental Engineering – Study of waste water, black water & grey water. System of collection and conveyance of sewage- separate and combined systems, patterns of sewage collection systems. Quantity of storm water and sanitary waste water, Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.)

Unit - II

Construction of sewer - Shoring, Trenching and laying to grade. Sewer materials, Sewer Appurtenances - manhole street inlets, storm water overflows, inverted syphons, flushing and ventilation: House plumbing systems, sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps. Sewage pumping - location of pumping station and types of pumps. Sewer testing and maintenance.

Unit - III

Physical and chemical characteristics of wastewater, significance of BOD, COD, BOD rate constant, Sewage treatment flow sheet, site selection for sewage treatment plant. Preliminary and primary treatment - Screens, Grit chambers, oil & grease removal. Primary settling tank (including simple design)

Unit- IV

Secondary treatment - Principle of Biological Treatment Activated sludge process, trickling filter, (Indian Standard for disposal), Methods of disposal, Sewage farming, self purification of stream (Streeter Phelp's equation, Oxygen sag curve). Recycle & reuse of sewage (Zero discharge concept). Sludge digestion, sludge drying beds.

Unit - V

Rural sanitation; Pit privy, aqua privy, bio-gas recovery Septic tank including soak pit, including design problem (as per relevant I.S. Code) Sullage collection and disposal

Industrial Waste Water Treatment - Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and processes (flow equalization, neutralization, adsorption, chemical and biological treatment (in brief)

Unit VI

Air pollution and solid waste: Sources, classification, Effects, prevention and control. Introduction to carbon credit system and climate change

REFERENCE BOOKS

1. B.C.Punmia," Waste Water Engineering" - Laxmi Publication
2. S.K.Garg, "Environmental Engineering" -Vol II Standard Publication
3. G.S.Birdie, "Water Supply & Sanitary Engineering"
4. M.J.Macghee, "Water Supply & Sewage" – McGraw Hill Publication
5. M.N.Rao & HV.N.Rao, "Air 'Pollution" McGraw Hill Publication
6. C.S.Rao,"Enviromental Pollution Control Engineering".

SITE VISITS & MINI PROJECT

BECVE606P **Evaluation Scheme: (25-Internal/25-External)**

(P-3 Hrs/Week); Total Credits-3

COURSE OUTCOMES: The students shall be able to

1. Get an idea of various project details such as contracts, layout, planning, drawing, estimates, Arbitration provision, licensee & licensor, architects, structural designer, etc

2. Get an idea of various construction equipment, manpower & techniques used at site, techniques of batching, mixing, transportation, and placement of different construction materials.

3. Get an overview on safety measures, basic amenities to provide, inventory control.

4. Write a legible, correct and technically sound report after the visit.

5. Ascertain the provisions and execution as per the working drawing.

Students should be taken for visit to various Civil Engineering construction sites such as R. C. C. Structures, Steel Structures, Bridges, culverts, Hydraulic Structures, water tanks, Roadwork, Railways, Water supply and Sanitary works, Geotechnical Exploration, Maintenance and Rehabilitation works, Irrigation systems, Formwork, Reconnaissance and Detailed Surveying & leveling etc.

- Minimum Five visits are expected.
- Students should submit a detailed report on the visit duly approved by the concerned teacher. **The Detailed Report should mainly consist of the following: -**
    - Name of Construction Site with address
    - Nature of construction work and various structural components
    - Nature of ownership, executing and supervising authority
    - Architect and Structural Engineer
    - Architectural concept and Design features
    - Commencement of the work and tentative completion
    - Present Status of work
    - Estimated cost of the work (Money spent till date)
    - Mode of availability of finance
    - Various types of manpower for the work
    - Various safety measures and amenities provided to manpower
    - Various construction equipments for the work
    - Various materials used for the work
    - CPM / PERT of the project
    - Type of inventory control
    - Resource planning implemented
    - Social benefits and implication
    - Safety measures during and posts construction
    - Post Construction Maintenance provisions
    - Effect on environmental aspect and sustainable development
    - Various of scaffolding, Formwork, lifting devices

- Site of precast units for the work and its mode of transportation
- Use of local available material like fly-ash, slag, silica-fumes, etc.
- Causes for delay / faulty construction

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology
CIVIL ENGINEERING
Scheme of Examination & Evaluation - CBS
Semester: Seventh

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE701T	Advanced Concrete Structures	3	1		4	4	20	80	100	40					4
BECVE701P	Advanced Concrete Structures			2	2	1					25	25	50	25	
BECVE702T	Estimating and Costing	3	1		4	4	20	80	100	40					4
BECVE702P	Estimating and Costing			2	2	1					50	50	100	50	
BECVE703T	Elective -I	3	1		4	4	20	80	100	40					3
BECVE704T	Construction Management and Law	4			4	4	20	80	100	40					3
BECVE705T	Transportation Engineering - II	3	1		4	4	20	80	100	40					3
BECVE706P	Industrial Case Study and Project Seminar			3	3	3					50	50	100	50	
Total		**16**	**4**	**7**	**27**	**25**	**100**	**400**	**500**		**125**	**125**	**250**		

Note: 1. External Practical Evaluation of “Estimating & Costing” shall be performance based (Manual or using suitable Software) on assigned problem by the External Examiner

2. Evaluation of Summer Training – 2 (ST-2) shall be done as Industrial Case Study Component & minimum two seminar should be delivered as continuous college assessment for project seminar component.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

Faculty of Engineering & Technology

CIVIL ENGINEERING

Scheme of Examination & Evaluation - CBS

Semester: Eighth

Subject Code	Course	Teaching Scheme (Clock Hours/ Week)					Evaluation Scheme								Duration of University Theory Exam (Hrs)
							Assessment of Marks for Theory				Assessment of Marks for Practical				
		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE801T	Irrigation Engineering	3	2		5	5	20	80	100	40					3
BECVE802T	Elective - II	3	1		4	4	20	80	100	40					3
BECVE803T	Elective - III	4			4	4	20	80	100	40					3
BECVE803P	Elective - III			2	2	1					25	25	50	25	
BECVE804T	Construction Economics and Finance	3	1		4	4	20	80	100	40					3
BECVE805P	Project			6	6	6					75	75	150	75	
Total		**13**	**4**	**8**	**25**	**24**	**80**	**320**	**400**		**100**	**100**	**200**		

Note: Internal Evaluation of Project shall be based on the academic contribution of a student and delivery of minimum one seminar on the project work.

BECVE804T - Construction Economics and Finance subject shall be dealt by Board of Basic Science and Humanities.

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
CIVIL ENGINEERING

Absorption Scheme for Students of Semester Pattern to Credit Based Semester Pattern

VII Semester					
Code No.	Name of Subject in **Semester Pattern**		**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
7CE01	Structural Analysis – III (T)		BECVE501T		Structural Analysis – II
7CE02	Advanced Concrete Structures (T)		BECVE701T		Advanced Concrete Structures
7CE02	Advanced Concrete Structures (P)			BECVE701P	Advanced Concrete Structures
7CE03	Irrigation Engineering (T)		BECVE801T		Irrigation Engineering
7CE03	Irrigation Engineering (P)			BECVE801T	Irrigation Engineering
7CE04	Maintenance and Rehabilitations of Civil Engineering Structures (T)		BECVE802T		Elective – II (Maintenance and Rehabilitations of Civil Engineering Structures)
7CE05	Elective – I (T)		BECVE703T		Elective – I
7CE06	Industrial Case Study (P)			BECVE706P	Industrial Case Study & Project Seminar
7CE07	Project and Seminar (P)			BECVE706P	Industrial Case Study & Project Seminar

VIII Semester

Code No.	Name of Subject in **Semester Pattern**		**Code No.**		Name of Equivalent Subject in **Credit Based Semester Pattern**
8CE01	Estimating and Costing (T)		BECVE702T		Estimating and Costing
8CE01	Estimating and Costing (P)			BECVE702P	Estimating and Costing
8CE02	Transportation Engineering – II (T)		BECVE705T		Transportation Engineering – II
8CE03	Elective – II (T)		BECVE802T		Elective – II
8CE04	Elective – III (T)		BECVE803T		Elective – III
8CE04	Elective – III (P)			BECVE803P	Elective – III
8CE05	Project (P)			BECVE805P	Project

Note: Any student willing to opt for CBS Semester pattern shall be absorbed as per the RTMNU’s relevant ordinance.

SEVENTH SEMESTER B.E. CIVIL

ADVANCED CONCRETE STRUCTURES

BECVE701T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 4 hrs**

COURSE OUTCOME: The Students will be able to

1. Understand the behavior and failure modes different concrete members
2. Analyze and apply the results in designing various concrete member of structure.
3. Apply the knowledge & skills in practical problems
4. Understand the relevant software and use the same in analysis & design of concrete members.

Unit – I

Design of circular water tank with roof slab/dome resting on ground by approximate methods/IS code method (by Working Stress Method).

Design of rectangular water tank with one-way roof slab resting on ground by approximate methods/ IS code method (by Working Stress Method).

Unit – II

Analysis and design of columns subjected to biaxial moments. Design of long columns.

Design of Isolated footing, for uniaxialmoment , For Square Rectangular & Circular.

Unit – III

Moment redistribution: Analysis and Design of fixed beam, propped cantilever, two-span symmetric continuous beam.

Unit – IV (with LSM)

Design of RCC Cantilever and Counter-fort Retaining wall.

Unit - V

Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of hinge (design of Dog-legged and Open Well Staircase).

Unit – VI : Design of combined footing.

i) Rectangular footing ii)Strap beam footing iii)Trapezoidal footing iv)Raft footing

ADVANCED CONCRETE STRUCTURE

BECVE701P Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-1

PRACTICAL

1) Minimum 5 Design of Structure based on above Syllabus.
2) One problem of design of structure based on analysis and design software.
3) Minimum One Site visit pertaining to above design.

ESTIMATING AND COSTING

BECVE702T Evaluation Scheme: (80/20)
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 Exam Duration: 4 hrs

COURSE OUTCOMES: The Students will be able to

1. Prepare the preliminary estimate for administrative approval & technical sanction for a civil engineering project.
2. Write the specification of the works to be undertaken, prepare the tender documents, fill the contracts and make use of knowledge of different contract submission & opening in awarding the work to the contractor.
3. Use the concept of SD, EMD, MAS, Running Bill, Final Bill during the entire project
4. Schedule the project for its timely completion.
5. Use the technique of Rate analysis in estimating the exact cost of material & manpower and hence the entire project.
6. Estimate the bill of quantities using different techniques of preliminary & detailed estimation of buildings & roads
7. Arrive the exact value of the asset (movable & immovable) using different Valuation techniques.

Unit I

Introduction: Importance and purpose of the subject, Units of measurement as per I.S.1200. Items of work and Description of items of work, administrative approvals, technical sanction, preliminary estimates. objectives, and its methods

Earthwork estimates in road, hill roads and canals, mass haul curves, methods of consumptions of earthwork.

Unit II

Detailed estimates, objects, importance, accuracy. Methods of detailed estimates,

Detailed estimates of load bearing and framed structures. Calculation of reinforcing steel with Bar bending Schedule.

Unit III

Tenders and Contracts: Method of carrying out works, tender notice, acceptance of tender, essentials of contract, type of contracts, contract documents, land acquisition act, Legal aspects of various contract provisions, Arbitration.

Unit IV

Specifications: IS 1200 Introduction, Purpose and principles of specifications writing, Types of specifications, writing and developing detailed specifications of Important items of building and road work.

Cost Accounting : Various methods, classification of cost, direct and indirect charges, distribution of overheads, M.A.S. Account, issue rates and stores Account.

Unit V

Rate Analysis: Introduction, Purpose and principles of CSR, Factors affecting analysis of rates, labour guidelines from National Building Organization, market rates of materials and labour, Rate analysis of major items of work

Unit VI

Valuation :- Purpose of valuation, Factors affecting property price and cost, Types of Value. Real Estate, Tenure of land, Free hold and lease hold, sinking fund, Depreciation, and its methods, Capitalised value, Methods of valuation, Net & Gross income, Rent fixation.

REFERENCE BOOKS

1. Estimating and Costing by Dutta
2. Estimating & Costing by Chakraborty
3. Valuation by Roshan Namavati
4. Philosophy of Valuation. – S. S. Rathore.

ESTIMATING AND COSTING

BECVE702P **Evaluation Scheme: (50-Internal/50-External)**
(P-2 Hrs/Week); Total Credits-1

PRACTICAL – Minimum 8 practical assignment based on

1. Preliminary estimate using Plinth area method.
2. Detailed estimate of Load bearing structure
3. Detailed estimate of Frame structure.
4. Calculation of steel with Bar bending Schedule.
5. Detailed estimate of earthwork of road for Approximate 1km length.
6. Draft Detailed specification for 8 major items.
7. Analysis the unit rate of 8 major items of work contained.
8. Draft a short tender notice for proposed work.
9. Calculation of annual and total Depreciation and book value of the end of each year.
10. Fixation of standard rent of property.
11. Market survey for material and labour rates for various items.
12. Detailed planning and estimate of plumbing work.
13. Detailed estimate of building using estimate software.

EARTHQUAKE RESISTANT DESIGN OF STRUCTURE (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand the different aspects related to seismology and terms related to it
2. Analyze earthquake loading effect on structures.
3. Perform the analysis and design of structures against earthquake loading.
4. Analyze multi-storey structure using different methods like Equivalent Static Lateral Load Method and Response Spectrum Method
5. Understand the different seismic retrofitting techniques and its implementation.
6. Use the knowledge in practical situation.

Unit I :

Engineering seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale, Introduction on to tsunami. Seismic zoning maps of India. Response spectra. Strong motion characteristics.

Unit II :

Earthquake effects on the structures, classification of loads,. Seismic damages during past earthquakes, effect of irregularities and building architecture on the performance of RC structures

Unit III :

Seismic methods of analysis, seismic design methods, Mathematical modeling of multistoried RC buildings with modeling of floor diaphragms and soil foundation, (Winkler model.)

Unit IV :

Design of multi – story RC structure foundation as per latest IS 1893 by Equivalent static lateral load method and Response spectrum Method. Introduction to Time history method. Concept of Capacity based design of soft story RC building.concept of shear walls. Ductile detailing as per latest IS :13920

Unit V :

Seismic retrofitting, Source of weakness in RC framed building, Various retrofitting techniques, Conventional and non- conventional methods, Comparative study of various methods and case studies.

Unit VI :

Introduction to Base Isolation system. IS code provision for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques.

REFERENCE BOOKS:

1. Seismology Committee (1999). *Recommended Lateral Force Requirements and Commentary*. Structural Engineers Association of California.
2. Design of Seismic Isolated Structures- FarzadNaeim, James M. Kelly, Published 2 DEC 2007
3. A K. Chopra, Dynamics of Structures: Theory and Applications to Earthquake Engineering (3rd Edition), Prentice-Hall of India.
4. IS 13920, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice, 1993.
5. A.K. Chopra, Dynamics of Structures, 3rd Edition, Pearson, 2007.
6. PankajAgarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India, 2006.

ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1 Use the knowledge to carry out traffic studies and give solutions to planning of transportation system.
2 Apply basic principles for the geometric design of roads and other traffic controlling devices
3 To understand the parking systems, riding quality standards, traffic safety and accident study and suggest the solutions to the practical problems.

Unit – I

Elements of Traffic Engineering : Road, Road user & Road Vehicle Characteristics, problems related to heterogeneous traffic.

Traffic Surveys and Data collection :—Speed, journey time and delay studies, methods of measurement of spot speed, headway, gaps, volume / capacity surveys, speed, volume-density interrelations, measurements of running and journey speeds, origin-Destination surveys, necessity, survey methods, sample size, data analysis & Presentation. Highway capacity, level of service concepts.

Unit – II

Statistical methods : Binomial, Normal Poisson, Probability. distributions, Discrete and continuous, variable application to traffic flow, Test of significance – Chi-square & ‘T’ test, (Regression analysis)

Unit – III

Traffic Design : Hierarchy of urban roads and their standards, Diverging, merging crossing weaving maneuver’s conflict points, types of road junctions ,channelization of traffic flow, traffic rotary design, Grade separated inter-sections, Drive ways, design of pedestrian facilities, Design criteria for separate cycle track, Exclusive Bus lane, (Bus stop locations and facilities.) introduction to Intelligent Transport system

Unit – IV

Traffic Control Devices : Traffic signs, road markings, traffic signals, design of signalized intersections & signaling systems~~,~~(Queuing)Theory, Traffic control aids, and street furniture. Introduction to transport systems, Traffic controls for Expressway. -

Unit – V

Traffic Safety, **Enforcement and Education :**

Elements responsible for accidents, situations in India, Collection and interpretation of accident data and recording in Standard form, Analysis of Accidents. Traffic regulation and E`s of traffic management, (vulnerable road user safety, Introduction to Regulation Act.)

Motor Vehicle Acts and Rules, traffic Education, traffic Controls on National Highways

Unit – VI

Urban Traffic: Present traffic scenario. Urban transportation problems, mixed traffic flow, head and administrative set up of traffic cells at various levels, co-ordination with other transport modes.

Parking : Parking surveys, on and off street parking, parking systems, parking demand, design of off-street parking lot, underground & multistoried parking.(Truck lay bye, bus lay bye, facilities to parking and way side amenities.

Students should complete the assignment based on

1. ***Accident data collection***
2. ***Speed, Volume and Parking studies.***
3. ***Data collection for Rotary design and traffic signal.***

Reference Book:

1. Traffic Flow fundamentals: Adolf D.MayVIII
2. Traffic Engineering :Mcshane and Roess
3. Traffic Engineering and Transport Planning : L.R. KadyaliI
4. Principles of Transportation Engineering :PathaChakraborty and Animesh Das III
5. Traffic Flow Theory *by* Drew, D.R., McGraw- Hill Book Co., New York.VII
6. Highway Engg*by*S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.IV
7. Traffic Engg. *by* Matson, T.M., Smith, W.S. and Hurd, F.W., McGraw- Hill Book Co., New York.VI
8. principles of traffic engg. Garber &Hoel. II

AIR POLLUTION AND SOLID WASTE MANAGEMENT (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students will be able to

1. Understand different aspects of air pollutants, its sources and effects on man and material etc.
2. Design controls methods and equipments for air pollution to reduce its impact on environment.
3. Understand problems arriving in handling large amount of solid waste generated ,its collection and transportation, processing and will bw able to design safe collection and disposal methods.

Unit - I

Introduction to air pollution : Definition, air pollution episodes, atmosphere & its zones.

Classification and sources of air pollutants, Standards for air pollution (as per Indian Standards and CPHEEO). Effects of air pollutants on man, and materials.

Unit - II

Meteorological parameters and Air sampling: Primary and secondary parameters, atmospheric stability, plume behavior. Wind rose diagram, wind data analysis & wind impact area diagram, Stack height determination.

Air sampling and measurement : ambient air sampling and stack sampling, collection of particulate and gaseous pollutants, site selection criteria methods of estimation.

Unit – III pollution control

Air pollution controls methods and equipments ; Principles of control methods for particulates and gaseous pollutants, gravity settlers, electrostatic precipitators, bag filters, cyclones and wet scrubbers, (adsorption, absorption, incineration, condensation)

Automobile exhaust :Introduction to Pollution due to diesel & petrol engines,

Noise Pollution : Sources, ill effects, control measures.

Unit - IV

Introduction to solid waste management.(SWM) : Structure , necessity and responsibility,

Sources, Quantity and quality, Sources of solid waste, classification and components, physical and chemical characteristics, per capita contribution, sampling and analysis.

Unit – V : Collection and Transportation methods:

Collection and transportation of solid waste: Method of collection, equipment used for collection and transportation, transfer stations, optimization of transport route.

Solid waste processing : Methods of processing, choice of methods, merits and demerits of various methods, gas control measures.3R concept

Unit – VI : Disposal methods:

Composting of waste, methods of composting, factors affecting composting

Sanitary land filling : Site requirements, methods, leachate management., control of gases.

Incineration: Principles of incineration, types of incinerators, advantages and disadvantages.,3T Diagrams

REFERENCE BOOKS

1. M.N. Rao & H.V.N.Rao, " Air Pollution", Tata McGraw Hill Publishing Co. Ltd.
2. C.S.Rao, "Environmental Pollution Control Engineering", Wiley Estern Ltd. New Delhi.
3. Stern A.C., "Air Pollution" Vol I to X.
4. A. D. Bhide, & Sunderesan B.B., "Solid Waste Management in developing countries, INSDOC, N. Delhi.
5. Tchobanoglous, "Integrated Solid Waste Management in Engineering principles and management isssues,
6. K.V.S.G. Murlikrishna" Air Pollution" JTNU, Kakinada.

ADVANCED HYDRAULICS (ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students shall be able to

1. Apply the concept of uniform flow and critical flow in open channels.
2. Analyze and identify GVF profiles and its importance in practical aspects.
3. Understand the concept of rigid water column theory and elastic water column theory and apply it to the hydraulic projects.
4. Understand water hammer theories and problems encountered in practical situations.

Unit-I : GENERAL:

Computation of uniform flow, computation of critical flow, conveyance of channel section factor, hydraulic exponent for uniform & critical flow.

Theory of gradually varied flow, dynamic~~s~~ equation~~s~~ for GVFin various forms, Analysis of gradually varied flow profiles.

Unit-II : GVF (GRADUALLY VARIED FLOW):

Computation of gradually varied flow, Bresse’s method, Chow’s method, Direct step method, Standard step method

Unit- III : HYDRAULIC JUMP:

Theory of Hydraulic jump, Location of hydraulic jump, application of hydraulic jump types of hydraulic jump, stilling basin with horizontal apron. Numerical on hydraulic jump.

Unit- IV : UNSTEADY FLOW IN PIPE :

Equation of unsteady flow in a pipe line for incompressible fluid, time of flow establishment, rigid water column theory of water hammer and computation of water hammer pressures.

Unit-V : WATER HAMMER :

Equation describing water hammer phenomena when compressibility of fluid and elasticity of pipe is considered, computation of water hammer pressure of frictionless flow in horizontal pipe, for sudden and slow closure of valve, Application of Allievi’s method and charts, approximate pressures, water hammer pressures in pumping systems, method characteristics.

REFERENCE BOOKS

1. Fluid flow in pipe & channel by G.L.Asawa, CBS publication.
2. Open Channel Flow – K. Subramanya
3. Open Channel Flow – V.T. Chow
4. Open Channel Flow – Ranga Raju

SUSTAINABLE RESOURCE MANAGEMENT IN CIVIL ENGINEERING
(ELECTIVE-I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : The students shall be able to

1. Understand the concept of sustainability, sustainable resources management and make use of understanding in planning the civil engineering project.
2. Understand the need of environment protection and energy saving through the use of alternative green construction materials.

Unit – I

Sustainability & Resource Management- Definition of Sustainability & Background. Need ,

Gap between need and practice, Current Global and local scenario, Resources in Construction, current status.

Unit – II

Sustainable Construction Materials ~~&~~ Management- concept of zero waste production in construction engineering, classification of Solid waste (Industrial, agricultural, municipal) utilization in various construction materials (Masonry, concrete, interior, timber, rerolled steel, etc. Alternative building materials e.g. CMB.AAC blocks etc

Unit – III

Sustainable Water Management- 3Rof water **conservation**, reduce, reuse, and recycle (grey water treatment)

Unit – IV

Sustainable Energy Management- Non-renewable energy sources & potential in India (Solar, wind, geothermal, hydro, etc.), energy conservation , introduction to ECBC

Unit – V

Public Health Engineering & Management- Health issues during construction, occupants comfort & indoor air quality, basic design principles (SP41), effects of light , heat, humidity etc.

Unit – VI : Life Cycle Costing of Sustainable Technologies & Management

Recommended Standards- National Building Code, concept and need of life cycle costing, advantages, Introduction to techniques of life cycle costing. Provision of national building code.

R**eference :**

1. Green Rating for Integrated Habitat Assessment, TERI, New Delhi;
2. Indian Green Building Council, Hyderabad
3. Energy conservation building code -2011
4. SP 41 -1987
5. SP 7-2005 (NBC)

BUILDING SERVICES (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

1. To design a building with all essential facilities for better life style.
2. To create a sustainable structure.
3. To design a green building

Unit-I:

Plumbing work :- water supply and sanitary provisions, Accessories of sanitary provision, methods of plumbing, problems associated with plumbing work.

Unit-II:

Acoustics, Sound Insulation and Noise Control: Basic terminology and definitions, Physics of sound. Behaviour of sound in an enclosed space. Requisites for acoustic environment , Acoustic design approaches for different building types, with reference to applicable standards. Selection of acoustic materials.Noise and its control, control of structure borne sound and noise from different mechanical equipment.

Unit-III

Electrical and Allied Installations: day lighting , basic design, artificial lighting . Different types of wiring, need of earthing, comparison between fuse and MCB, substation, types of lightening fixtures, electricity distribution in multi-storeyed building. Building protection against lightening, Planning and layout of electrical installations within a building complex.

Unit-IV:

Ventilation: Functions of ventilation, supply of fresh air, convective cooling, Stack effect, physiological cooling, provision for air movement; wind effect, Air flow through buildings, cross-ventilation, position and size of openings, air flow around buildings, humidity control.

Air Conditioning, Heating and Mechanical (Thermodynamics of human body.) Ventilation: Requirement of air conditioning, air conditioning system, elements of air conditioning, Working and p-H diagram of vapour compression cycle, refrigeration effect,

Unit-V

Mechanical Equipment & Installation: Installation of lifts and escalators, different types of Security and alarm systems. Hot Water Provision (Solar and Electrical), Special features required for physically handicapped and elderly, -

Unit-VI:

Firefighting and safety measures : Planning considerations in buildings using non-combustible materials, escapes, Fire detection and fire fighting systems. Heat and smoke detectors, Fire alarm system, Automatic sprinklers.

Assignment:

Case Study of any Building & its services

Reference Books:

1 Building Services Engineering by David V Chadderton
2 General Specification for Electrical Work – Part – I, II & III, Government of India Publication, Jain Book Depot.
3 General Specification of Heating & Ventilation - 2004, Government of India Publication, Jain Book Depot.
4 Handbook on Functional Requirement of Buildings.
5 Building Services Environmental & Electro – Mechanical Services, by S M Patil, Jain Book Depot.

ADVANCED CONSTRUCTION MATERIALS (ELECTIVE I)

BECVE703T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand properties and utilities of cement, mortar, concrete ceramic materials.
2. Understand properties and its utilities of metals and various composites
3. Study the importance of Construction chemicals
4. Study shoring and formwork materials
5. Understand the elementary concepts of smart materials

UNIT I: CEMENT, MORTAR AND CONCRETE CERAMIC MATERIALS

Study of Special Purpose Cement, Mortar, Concrete • High Strength And High Performance Concrete, Self Compacting Concrete, supplementary cementitious material - Fly Ash, Red Mud, Gypsum, Various Types of Finishes & Treatments, Engineering Grouts, Mortar plaster, Gypsum, Glass. GGBS, micro silica etc. Replacement of aggregates; stone dust, light weight aggregates, recycled aggregate.

UNIT II: METALS

Steels • HYSD, TMT, Tendons, Light Gauge Steel, Steel Fastenings, New Alloy Steels – Aluminum and Its Products, Protective Coatings to Reinforcement.

UNIT III: COMPOSITES

A) Polymer and its composites
B) Ceramic and its composite, FRC, Ferro cement etc.
C) Timber, bamboo, veneer, Laminates, Particle boards.
D) Thermal and Sound insulating materials.

UNIT IV: CONSTRUCTION CHEMICALS AND WASTE

Chemical Admixtures and Adhesives, Water Proofing Compounds – Non Weathering Materials, Geo-Synthetics, Geo-Membranes,, Asphalt, Tar & Bituminous Materials, Agro Waste Materials, Industrial Waste Materials, Disposable Materials.

UNIT V: SHORING & FORMWORK MATERIALS

Materials, Accessories and Proprietary Products - Lumber - Types - Finish - Plywood -Types and grades, Reconstituted wood -Steel -Aluminum Form lining materials, Design Considerations, Building and Erecting the formwork, Causes of Failure of Formwork.

UNIT VI: ELEMENTARY CONCEPT OF SMART MATERIAL

Smart and Intelligent Materials-Piezoelectric Materials, Shape Memory Alloys & Polymers, Magnetostrictive Materials, Temperature Responsive Polymer, Halo chromic Materials, Smart Hydro-gels, Chromomeric Systems, Photomechanical Materials, Self Healing Materials, Dielectric Elastomers.Bio cement, Phase change material.

CONSTRUCTION MANAGEMENT & LAW

BECVE704T **Evaluation Scheme: (80/20)**
(L-4, T-0, P-0) Total Credits-4 **Exam Duration: 3 hrs**

OUTCOMES :

On completion of this syllabus, the students should be able to:

1. *Demonstrate the understanding of various types of projects, modern construction techniques and will exhibit the mastery in construction planning, scheduling and various controls.*
2. *Achieve the knowledge of various types' of equipments to be used in the construction and its operational cost estimates, understand manpower requirement, planning, resources utilization and management.*
3. *To know the quality control aspects in planning & management, modern trends project management, application of information system in management of construction projects, safety provisions and equipments.*
4. *Analyze the legal aspects in construction projects through the understanding of various laws pertaining to civil engineering and architectural planning & sanctioning, labor & organizational welfare measure, provisions of arbitration and litigations.*

UNIT - I :

BASIC STUDIES IN CONSTRUCTION PROJECT

Type of Project & its Financing, Detailed Project Report Analysis and Feasibility, Time of Completion, Provisions of Escalation in Time and Cost, Choice of Technology and Construction Tecniques, Site Planning.

UNIT- II :

CONSTRUCTION SCHEDULING

Network Analysis : The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT), Bar Chart, Resource Oriented Scheduling, Allocation, Leveling, Crashing and Time/Cost Tradeoffs, Line of Balance.

UNIT III - :

MANPOWER, MATERIAL AND MACHINERY (3M) MANAGEMENT

Manpower – Requirement and methods of calculating Productivity, Staffing, planning, directing & controlling. Organisational Charts, Duties and Responsibility of Personal Manager

Material – Requirement, Procuring, Storing & Delivery. Quality Checks, Inventory Control techniques, construction Waste generation and Management .

Machinery – different type of construction equipments and their applications- Excavators, Dozer,Rollers, Hoisting and Hauling equipments, Cost & Working Hour analysis, Depreciation analysis,

UNIT- IV:

QUALITY AND SAFETY MANAGEMENT

Concept of Total Quality Management, Safety Provisions as per National Building Code of India, Safety Equipments, MIS in Construction Project, Project Management System-MS Project.

UNIT –V :

LEGAL ASPECTS IN CONSTRUCTION PROJECTS

Town Planning Requirements, Acts and codes related to planning, Regional Town Planning, Housing Development act, Highway Act, Irrigation act, Local Rules (Gunthewari),

UNIT –VI :

INTRODUCTION TO DIFFERENT LAWS

Environmental (Protection) act, Forest Conservation - Water Pollution and air pollution, Transfer of property act – sale, purchase, lease. Land Acquisition and Rehabilitation act, Indian Contract act.

Reference Books :

1. Construction Planning and Management – Purifoy
2. Construction Planning and Management – Dr U K Shrivastava, Galgotia Publ.
3. Project Planning & Management – B C Punmia
4. Laws related to buildings and engineering contracts in India- Gajaria G T, LexisNexis Butterworths India Publisher, 2000
5. Construction Contracts- Jimmie Hinze McGraw Hill,
6. Contracts and the legal Environment for Engineers and Architects- Joseph T Bockrath, McGraw Hill,

TRANSPORTATION ENGINEERING-II

BECVE705T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students are able to

1. Understand the functions of various elements of railways, airports, tunnels and docks and harbor.
2. Plan and design various elements of railways, airports, tunnels and docks and harbor.
3. Understand the various principles traffic control in railways, airports, tunnels and docks and harbor.
4. Understand layout, design and construction permanent way, runway, taxiways, tunnels, births and jetty.
5. Understand the maintenance of various elements of railways, airports, tunnels and docks and harbor.

Unit – I : RAILWAYS

Classification of Rail way~~:~~ lines and their track standards.

Traction and Tractive Resistance, Hauling capacity and Tractive effort of locomotives, Different Types of tractions

Permanent Way: (Ideal permanent way), gauges, track section. Coning of wheels, Stresses in railway track, High speed track.

Unit – II

Rail types and functions, selection for rails, wear & defects, creeps of rails, long welded rails., sleepers -function, types, merits and demerits, sleeper density. Ballast cushion. Ballast section, Spikes, fishplates, hook bolts, Dog bolt, pondrot clip .

Geometric design of railway track, Gauge, Gradient~~s~~ speed, super elevation, cant deficiency, Negative super elevation, objectives of transition curves, grade compensations.

Unit - III

Points & crossings: Left and right hand turnouts, design calculations for turnouts ~~,~~ Station and Yards: Types, functions,

Railway signaling and interlocking: Objects of signaling, principles of signaling. Classification and types of signals. Necessity of interlocking methods and mechanical devices Railway track construction, inspection & modern techniques of maintenance. Modern technology related to track, signaling & controlling.

Unit – IV : AIRPORTS

Aircraft components and characteristics, Airport site election. modern aircrafts.

Airport obstructions: Zoning Laws, Approach and turning Zone, clear zone, . (vertical) Clearance for Highway & Railway.

Runway and taxiway design: Wind rose, cross wind component, Runway Orientation and configuration. Basic runway length and correction, runway geometric design standards. Taxiway Layout and geometric design standards, Exit Taxiway.-

Unit – V

Airport layout and classification: Terminal Area, Aircraft parking, configuration and system. Aprons, Hangers, Helipads and Heliports,

Visual Aids: AirPort marking and Lighting for runway, Taxiway and other areas.

Air traffic control: Need, network, control aids, instrumental landing systems, Microwave loading system

Unit – VI (Tunnel Engineering and Docks and Harbors)

16. Tunnel (Engineering) – surveys, Drainage, Ventilation, Lighting (and Lining)-

Text Books and Reference Book:

1 A text book of Railway Engineering *by*S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi.
2 Railway Track Engg. *by* J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
3 Airport Planning and Design *by*S.K. Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
4 Planning and Design of Airports *by*RobertHornjeff, McGraw Hill Book Co.
5 Air Transportation Planning and Design *by* Virender Kumar &Satish Chandra, Galgotia Publications, N.Delhi.
6 Mundary, J.S. Railway Track Engineering, Tat McGraw Hill, New Delhi.
OZA, Docks and Harbours, Charotar Publisher)
7 Air Planning and Design by G.V. Rao

INDUSTRIAL CASE STUDY & PROJECT SEMINAR

BECVE706P **Evaluation Scheme: (50-Internal/50-External) (P-3 Hrs /Week); Total Credits-3**

Industrial Case Study

The student is expected to prepare Mini project report on the basis of data collected in Summer Training (ST-2) of 3 / 4 Weeks and submit detailed report .

Project & Seminar

This includes preparation of preliminaries for the project work to be under taken in 8th Semester.

1. Finalizing the title of the Project .
2. Literature Survey
3. Collection of Data
4. Scope of the project

Each group shall deliver seminar on the work done during the semester. In addition student will deliver one more seminar on the topic finalized by him with the consent of his guide.

EIGHTH SEM. B.E CIVIL

IRRIGATION ENGINEERING

BECVE801T **Evaluation Scheme: (80/20)**

(L-3 Hrs/Week, T-2 Hrs/Week); Total Credits - 5 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1. Understand the importance and scope of irrigation engineering
2. Understand fully the methods and efficiencies of irrigation, crop water requirement.
3. Understand the planning, design and operation of storage reservoir and make use of it in the practical situation.
4. Understand the basic profile of dams and use the knowledge in checking stability of Gravity dams and Earth dams.
5. Understand the theories of Canal design and apply the concept to design lined and unlined canals and detail out the cross sections.
6. Understand water logging and provide the solution to such problem.

Unit – I

General : Necessity and importance of Irrigation Engineering; Benefits & ill effects of Irrigation; Classification of Irrigation; General principles of flow, lift, perennial, inundation Irrigation systems; Comparative study of sprinkler and drip Irrigation systems.

Water Requirement Of Crops : Suitability of soils for Irrigation, Standards of Irrigation water; (Modified Penman Method), Depth and frequency of Irrigation; Definitions of field capacity, wilting point, available moisture, duty, delta, GCA, CCA, or depth, base period, outlet factor, capacity factor, time factor, root zone depth; Relation between duty and delta; Factors affecting duty; Principal crops in India; Crop rotation; Methods of assessment of Irrigation water.

Unit – II

Reservoir Planning : Selection of site for Reservoirs; Engineering surveys, Geological and Hydrological Investigations; Fixing of LWL, FTL, TBL, HFL; Different storage zones in reservoir; Determination of storage capacity by mass curve method; (Reservoir operation scheduling,) Reservoir sedimentation; Life estimation of reservoir by Brune’s method; Organizational setup & Administration of Irrigation projects.

Dams: General Classification of dams as per use, hydraulic design and materials; Factors governing selection of dams. Instrumentation in dam.

Unit – III

Gravity Dam : Forces acting on gravity dam; stability requirements; Theoretical & practical profile of gravity dam; Low & High dam; Galleries.

Earthen Dams: Types of earthen dam; Description of component parts of earthen dams-foundation, cut off trench, rock toe, hearting, central impervious core, pitching and chipping, turfing; seepage through body of earthen dam and drainage arrangements; Failure of earthen dams; Plotting of phreatic line for earthen dams with horizontal filters; Stability of foundation against shear. (OMC and ODD tests for hearting and casing zones)

Unit – IV

Spillways: Types of spillway, General principle of design of ogee spillway; Spillway gates – vertical lift, radial, rolling and drum; Gate O.S. Energy dissipation methods.

Diversion Head Works: Component parts of diversion headworks – Fish ladder, guide wall, divide wall, silt excluder and silt ejector; Causes of failure of weirs on permeable foundation; Bligh's Creep theory; Dr. Khosla's theory for design of weirs on permeable foundations.

Unit – V

Canals : General : Types of canal; Alignments of canal; Cross section of Irrigation canals; Balancing depth; Schedule of area statistics; Losses in canals,

Canals In Alluvial Soils : Kennedy's silt theory – Design procedure, drawbacks; Lacey's silt theory - Definition of initial, final and permanent regime channels, Lacey's Regime equation, channel design procedure, drawbacks; Garret's diagram for channel design.

Lined Canals: Design procedure, Types of lining; relative merits and demerits of canal lining; Economics of canal lining.

Unit – VI

Canal Structures: Canal Regulation Works : Purpose, components of Head Regulator, Cross regulators, canal escapes, Canal falls and canal outlets.

Cross Drainage Works : Purpose aqueducts, siphon aqueducts, super passage, canal siphon, inlets and level crossings.

Water Logging And Land Drainage : Causes, effects, preventive measures of water logging, types of drains, layout of tile drains system, flow of ground water to drains.
(Components of lift irrigation scheme)

RECOMMENDED BOOKS

1. Irrigation Engineering and Hydraulic Structures- Santosh Kumar Garg
2. Irrigation Engineering and Hydraulic Structures- S.R. Sahastrabudhe
3. Irrigation Engineering and Water Power Engineering- B.C. Punmia
4. Irrigation Engineering and Hydraulic Structures- K.R.Arora
5. Irrigation Engineering- N.N. Basak
6. Irrigation Engineering and Hydraulic Structures-R.K.Sharma
7. Irrigation Engineering- G.L. Asawa
8. Water Resource Engineering Principles and Practice-C.S. Murty

ADVANCED STRUCTURAL ANALYSIS (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1 Analysis of Symmetrical & Unsymmetrical plane frames, plane Grids, space trusses.
2 Analysis for Free & Forced Damped/ un-damped vibrations for SDOF
3 Perform the earthquake Analysis of structures using IS:1893.

Unit – I

1. Beams On Elastic Foundation: Introduction, Case studies, infinite beams on elastic foundation, Development of computer program.
2. Beam Curved in Plan (Statically Determine Beams Only)
   Introduction, circular beam loaded uniformly and supported on symmetrically placed columns, semicircular Beams, Varandah circular beams.

Unit – II

3. Advanced MATRIX METHOD OF ANALYSIS FOR PLANE Frames, Analysis of Symmetrical & Unsymmetrical plane frames Effects of Shear deformation. Symmetry, Anti-symmetry conditions for solving symmetric frames.

Unit – III

4. MATRIX METHOD OF ANALYSIS FOR PLANE GRIDs Analysis of Symmetrical & Unsymmetrical plane Grids, space trusses using stiffness approach subjected to member loading (UDL, Conc. Load, Temperature etc.) and joint loads. Introduction to computer program development. Introduction to MATARIX METHOD OF ANALYSIS FOR Space Structures frames.

Unit – IV

5. INTRODUCTION TO STURCTURAL DYNAMICS : Basis concepts, D'Alemberts Principle, equation of Motion of the Basis Dynamic System, Effect of Gravitation force, Influence of Support Excitation, Analysis for Free & Forced Damped/ undamped vibrations for SDOF only, Transmissibility ratio, Response to Harmonic Loading.

Unit – V

6. Response to Periodic loading, Response ti Impulse loading, Numerical methods. Approximate methods for analysis of impulsive loading, Response to ground dynamic Loading. MDOF (3DOF), mode shape and frequency

Unit – VI

7. Earthquake Analysis of structures using IS:1893 : Introduction to Earthquake code, Calculation of earthquake forces on building using codal coefficient method.

Note: Solution is restricted upto three DOF problems and assembly restricted upto 8 DOF problem.

RECOMMENDED BOOKS:

1. Matrix Method of Structural Analysis - Gere and Weaver
2. Computer Analysis of Structures - Beaufait, Rowen, Headly et al
3. Structural Dynamics- Clough &Penzin
4. Computational Structural Mechanics, S Rajasekaran& G Sankarasubramanian
5. Computer Analysis of Structures – Flemmings

PRE-STRESS CONCRETE (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1) Gaining the thorough knowledge of the basic theories and the fundamental behavior of pre-stressed concrete
2) Perform the analysis and design of pre-stress elements.
3) Apply the fundamental knowledge to the solution of practical problems.

Unit – I

1. Losses in prestress.
2. Partial prestressing
3. Analysis and design of End Blocks as per IS 1343 Method. (Only comparative study with the other methods is expected)
4. Use of untensioned reinforcement.
5. Types of pre-stressed concrete structures - Type – I, II, and III

Unit - II

6. Structural design of pre-stressed concrete beams, including I Section by Limit state method, including Limit state design criteria for pre-stressed concrete members.

7. Deflection of pre-stressed concrete beams.
8. Behaviour of unbounded and bonded pre-stressed concrete beams.

Unit - III

9. Shear and Torsional resistance of the pre-stressed concrete members.

   Composite construction of pre-stressed concrete structures and in-situ concrete, Differential shrinkage, deflection, flexural strength, serviceability (Limit state) of the composite sections.

Unit - IV

10. Statically Indeterminate structures, Continuous beams, primary and secondary moment, transformation profile, concordant profile.
11. Flexibility Influence coefficient, Analysis of single-storey, single-bay fixed portal frame.

Unit - V

12. Analysis and design of circular water tank, fixed, hinged and sliding base at the bottom, use of IS-3370.
13. Design of pre-stressed concrete poles.

Unit - VI

14. Special problems in pre-stressed concrete structures like corrosion, fatigue, dynamic behavior of pre-stressed concrete beams, behavior of pre-stressed concrete structures under fire.

    Introduction to pre-stressed concrete bridges, pavements, one way, two way and grid floor.

RECOMMENDED BOOKS:

1 Pre-stressed Concrete by Dr, N. Krishna Raju
2 Pre-stressed Concrete by Dr. TY Lin
3 Pre-stressed Concrete by N. Rajgopalan, Narosa Publishing House, Mumbai, Ed. II- 2007.
4 Pre-stressed Concrete Design & Construction- Leonhardt F. Ernst Wilhelm and Sohen, Publ .

PAVEMENT ANALYSIS AND DESIGN (ELECTIVE-II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-The students shall be able to

1 Analyze and Design pavement and under different loading conditions for highways and airfields taking into consideration different characteristics.
2 Propose a pavement management system framework.
3 Design highway appurtenance and highway drainage.
4 Perform different tests considering field conditions and using the knowledge to increase the strength of pavements along with its economy point of view.

UNIT - I

1) General: Structural action of flexible and rigid pavements. Characteristics of high way and airfield pavement.
2) Design parameters: Standard axle load and wheel assemblies for road vehicles. Under carriage system for aircraft, type and contact pressure, contact area, imprints, computation of ESWL for flexible and rigid pavements. Load repetitions and distributions of traffic for highway and airfield, pavement, airport traffic area.

UNIT - II

3) Material characteristics: AASHO subgrade soil classification. Group index, CBR, North Dakota cone bearing value, plate load test for K, Marshal’s method of Bituminous mix design, modulus of rupture, elasticity, poisons’s ratio and coefficient of thermal expansion of concrete. Layer equivalent concepts.
4) Analysis of flexible and right pavements: stress, strain, deflection analysis for single, two three and multi layered flexible pavement system. Stress and deflections for rigid pavements due to load and temperature, influence charts, ultimate load analysis, joints.

UNIT - III

5) Highway pavement design:

   Flexible: North Dakota cone, CBR, IRC-37, Burmister, Traiaxial (Kansas), AASHTO method of design

6) Airfield pavement design

UNIT - IV

7) RIGID IRC58, PCA, AASHTO method of design, design of joints and reinforcements.

   Flexible: US Corps of engineering, CBR, FAA, McLeod (Canadian)

   Rigid PCA, FAA & LCN, Ultimate load analysis yield lines patterns method

UNIT –V

8) Pavement testing and evaluation: field density, CBR, plate load test, condition surveys and surface evaluation for unevenness, rut depth, profilometers, bump integrators, Benkalman beam deflection study. Introduction to high way Design method(HDM)

UNIT VI

9) Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.
10) Specification and cost estimate: Review of IRC/MOST/ICAO/IAAI specifications and standards for highway and airfield construction. Cost evaluation and comparative study.
11) case studies of highway and airfield pavement projects.

Reference Book:

1) Highway Engg *by* S.K.Khanna& C.E.G. Justo, Nem Chand Bros., Roorkee.
2) Relevant IRC Code: 37 , 58, (latest) and BIS standards.
3) Principles and Practice of Highway Engg. *by*L.R.Kadiyali, Khanna Publishers, Delhi.
4) Principles of Pavement Design *by*Yoder,E.J&Witczak,M.W., John Wiley and Sons, USA.
5) Pavement analysis and Design by Huang, Y. H. (1993), Prentice Hall, Englewood Cliffs, New Jersey.

WATERSHED MANAGEMENT (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students ~~will~~shallbe able to

1 Understand the Watershed and its characteristics
2 Understand the importance of watershed in terms of drinking water, irrigation water, increases in ground water.
3 Plan and design of Watershed protection, conservation elements
4 Envisage the management plan of Watershed.

Unit – I

Soil and Water – Issues related to plant life like composition of soil, water requirement of crops, necessary conditions for plant growth etc. Soils, their origin and classification. Land classification for WM, Land capability rating, determination of land capability class, land capability and suitability surveys, (Desalination of water logging and its remedial measures).

Unit – II

Watershed Behavior – Physical elements of a watershed, effects of land use changes on hydrological cycle component Concept of vegetative management of water yield and quality. Watershed Experiments, extrapolation of results from representative and experimental basins, Regional studies.(Water auditing and Bench marking).

Soil erosion – problem, types, conservation, and control measures in agricultural and non-agricultural land.

Unit – III

Water conservation and Harvesting – Agronomical measures in soil and water conservation. Examples and critical reviews. Inventory techniques for precipitation runoff, soil, timber, range-land and wild life

Water harvesting techniques – Elements, Development of modern harvesting Techniques Estimation of peak runoff rate Land capability classification

Unit IV

Erosion process – Factors affecting erosion, Types of erosion, Assessment of erosion, Control measures for erosion
Conservative practices – Objective and general practices, land and soil classification, identification of critical areas, (Catchment area treatment).

Unit V

Watershed Management – Objectives of Planning Watershed Projects, Guidelines for Project Preparation. Approach in Govt. programmes, people's participation, conservation farming, watershed-management planning, identification of problems, objectives and priorities, socioeconomic survey, use of tools like GIS.

Unit VI

Watershed Modelling: Runoff components –Simple parametric models – Curve Number Method, variable source area models; quasi- physically based models; a simple physically based model. Rainfall, Runoff modeling, USLE model for soil erosion.

RECOMMENDED BOOKS

1. J. V. S Murthy, Watershed Management, New Age International Publishers, 1998.
2. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers, 2003.
3. V.V. N. Murthy, Land and Water Management, Kalyani Publishers, 1994.

4. Ghanshyam Das, Hydrology &soil Conservation Engineering ,PHI Publication.

ENVIRONMENTAL MANAGEMENT SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand the Environmental issues such as pollution, degradation and its impact.
2. Understand the environment management system and certification
3. Understand and carry out Environment Impact Analysis of a civil engineering project
4. Learn to Perform the risk analysis.

Unit – I : Environmental Management

Environmental management- issues and strategies, Environmental reporting and certification, Development and implementation of international environmental management system, Introduction to ISO 1400 series , International voluntary standards,

Unit – II : Environmental legislation

Pollution control acts, rules & notifications, Environmental audit, EMS certification , Post Project Monitoring

Unit – III : Environmental impact Assessment :

Environmental impact analysis-Concept-methodology, Identification, Prediction and evaluation, checklist material, network and overly methodology. Environmental clearance Procedures in India EIA Case studies

Unit – IV

Methods of Impact Analysis :- –**Environmental clearance procedure in India ,**Cost benefit analysis & its dimensions, Role of GIS in EIA-base line study , risk assessment & management,

Unit – V : Risk Analysis

- Environmental Risk Analysis, Fundamentals of hazards, exposure & risk assessment, management Basic Steps in risk management- hazard identification, exposure assessment & risk characterization, Quantified risk assessment for industrial accidents , Design of risk management program , Risk assessment application to environment management problems.

Unit – VI

Energy Impact Analysis

Energy sources, Importance of energy impact analysis, Energy inventory, Supply demand scenario, Energy conservation, Energy alternatives , Energy Inventory data, energy conservation.

Recommended Books:

1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.
3. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment Earthscan, London, 1992.
4. A.Gilpin, Environmental Impact Assessment-Cutting edge for the 21st century, CUP, London, 1994.
5. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press, 1994**.**
6. Suresh, K.D., Environmental Engineering and Management, SK Kataria Publishers, New Delhi, 2002.
7. Gupta, K.R., Environmental Legislation of India, Atlantic Publishers, 2006.
8. Chandrasekhar M., Environmental Science, Hi-Tech Publications, Hyderabad, 2004.

WATER TRANSMISSION AND DISTRIBUTION SYSTEM (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:- The students shall be able to

1. Understand concepts of pipes, reservoir, pumps and valves.
2. Analyze water distribution networks and its designing process.
3. Carry out optimal design of water distribution network
4. Carryout the reliability analysis of water distribution network

Unit-I

General Hydraulic Principles: Frictional head loss in pipes, different formulae, minor head loss in pipes, equivalent pipe.

Reservoir Pumps and Valves: Impounding reservoir, Service and balancing reservoir, Three reservoir system, Multi reservoir system, pumps and pump co-ordinations, Valves- their types, analysis of reservoir system with checks valves and pressure reducing valves.

Unit- II

Analysis of Water Distribution Networks: Types and parameters, Parameter relationship, Formulation of equations, Analysis of network using Hardy Cross method, Newton Raphson method and linear theory method, Introduction of gradient method, Introduction of Dynamic analysis.

Unit-III

Node Flow Analysis (NFA): Difference between Node Head and Node Flow Analysis, Necessity of NFA, Bhave’s approach- Node classification, node category compatibility, NFA theory. Introduction to other NFA methods- Germanopolus approach, Wagner ethal approach, Gupta and Bhave’s approach.

Unit-IV

Reservoir capacity: Estimation of minimum required reservoir capacity using graphical and analytical method. Design of pumping main: Optimal design of pumping main considering pipe diameter as continuous and discrete variable.

Unit-V

Design of Water Distribution Networks: Design of single source branching networks using critical path method, number of branching, configuration of looped networks using Graph Theory principles, selection of branching configuration using path concept and minimum spanning tree concept. Design of single source looped networks using critical path method

Unit-VI

Optimal Design of Water Distribution Networks: Cost Head Loss Ratio(CHR) method- CHR criterion, Problem formulation, CHE methodology for single source branching networks. Linear programming formulation and solution using simplex method.Introducton of Non- Linear Programming based approaches.

Reference Books:

1 Jeppaon R.W.(1977), “Analysis of Flow in Pipe Networks’’ Ann Arbor Science. Ann Arbor Michigan, USA
2 Walski. T.M.(1984),’’ Analysis of flow in water distribution networks’’
3 Technomic Publishing CO.Lancaster, Pennsylvnia,USA
4 Analysis of water distribution networks by P.R. Bhave, R.Gupta.

GEOTECHNICAL INVESTIGATION & GROUND IMPROVEMENT TECHNIQUE (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
((L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Understand methods of soil exploration and analysis of the results
2. Understand the methods ground improvement and material used.
3. Understand the use of geosynthetic materials.

Unit I - Importance and objects of Geotechnical exploration:

Planning of geotechnical exploration program: Methods of boring, location, number of bore, depth of boring.
Sub-surface Investigation Report: Salient features and boring logs; Types of soil samples & their suitability, precautions in sampling, parameter for sampler design, preservation & shipment of samples.
Seismic refraction method, electrical resistivity method, qualitative and quantitative interpretation of test results, limitations.

Unit II - Field investigation:

Standard Penetration test, static cone and dynamic cone penetration tests, interpretation of test results for obtaining design soil parameters for cohesive and cohesion less soil,
Plate load test– purpose, procedure, interpretation for bearing capacity and settlement of foundation.
Field vane shear test, design value of un-drained shear strength of clays, correction factor;

Unit III - Introduction to ground improvement techniques:

Need for ground improvement and ground improvement techniques, economic considerations and suitability.
Grouting: Materials and methods of grouting grout volume and grouting pressure, grout requirements and tests.
Stone Column: Application, layout feature, procedures of installation, rammed & floated column, quality control in construction, methods of improving the effectiveness of stone column, skirted and cemented stone column technique, geosynthetic encased stone column.

Unit IV - Reinforced soil and Geo-synthetics:

Basic theory of reinforced soil, concept of reinforced soil wall and slope geo-synthetics types, application and function in civil engineering,. Application of Geofoam & Geocell.

Unit 5 : Ground Anchor and Soil Nailing

Concept , Design features , types, construction procedure, Functions, Application, Advantages. Limitations of soil nailing system and ground anchor.

Unit 6 : Diaphragm wall

Construction sequence, cement slurry wall, Design features, Functions, applications, Case study on Diaphragm wall.

Deep soil mixing – Concept, procedure, Advantages and limitations.

Reference Book:

1. Geotechnical Engineering, Principles & Practices of Soil Mechanics and Foundation Engineering: VNS Murthy
2. Soil Mechanics and Foundation Engineering: K.R. Arora, Standard Publisher and Distributor, 1989 and later
3. Soil Mechanics and Foundation Engineering: B.C. Punmia, Laxmi Publications Pvt. Ltd.
4. Basic and Applied soil mechanics: Gopal Ranjan & A.S. Rao, New Edge International Ltd., (2004)
5. Ground Improvement Techniques: Dr. P. Purushothama Raj, Laxmi Publications Pvt. Ltd., 1999 and later
6. Engineering Principles of Ground Modification: M.R. Housmann, McGraw Hill (1990)
7. Geotechnical engineering – Braja M.Das, N.Sivakugan, Cengage, learning.

ADVANCE ENGINEERING GEOLOGY (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The Students will be able to

1. Acquire sufficient knowledge of existing rocks , its failure and its remedial methods.
2. Understand the application of Geological fundamentals in various fields of Civil Engineering.
3. Understand different Geological Hazards on earth and plan for the mitigation of such hazards..

Rock Mechanics

Unit-I

Foundation Geology : Methods of rock investigation for major Civil engineering projects, Geological Drilling Method, borehole logs, Correlation, percent recovery and Rock quality designation, Engineering classification of Rock based on RMR, RQD, Strength and Weathering resistance.

Unit-II

Rock Strengthening : Defects in rock masses, Grouting method and material, Design of Rock bolts and anchors. Water percolation tests at foundation site. Case studies of Civil Engineering projects in India.

Unit-III

Groundwater Hydrology: Groundwater and well Hydraulics, Determination of permeability, storage capacity, transmissivity, specific capacity, safe yield. Groundwater trends and fluctuations. Construction of Wells.

Unit-IV

Groundwater Exploration : Surface and sub-surface investigations of Groundwater. Geological, Geophysical methods and remote sensing; Water balance technique, Artificial recharge of ground-water.

Unit-V

Environmental Geology: - Land use/cover planning; pollution of surface and groundwater; waste disposal site selection for solid and liquid wastes.

Unit-VI

Geological Hazards: Natural Disaster Management with emphasis on Earthquakes, Stability of slopes and landslides. Prediction, Prevention and Rehabilitation.

RECOMMENDED BOOKS

1. Fundamentals of Engineering Geology- F.G.Bell Publisher BS Publications Edition 2005.
2. Engineering Geology- Parbin Singh, S K Katariya& Sons Edition Sixth Edition.
3. Principles of Physical Geology- Homes Arthur and Homles Doris, ElBS Publications Edition 1987.

WATER POWER ENGINEERING (ELECTIVE- II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOME:-

At the end of syllabus, students shall be able to

1. Understand the significance of water power and hydraulic structures related to water power engineering
2. Apply the knowledge of mathematics, statistics, fluid mechanics, in design of penstocks, surge tanks and intakes
3. Understand concepts of turbines and pumped storage tanks.
4. Design complete unit of hydro electric power station & its components.

Unit 1:

Introduction: Sources of energy, types of power station, choice of type of generation, component of water power project, types of hydro power schemes, general layouts of various hydropower schemes General arrangements of a power station, power house, sub-structure and super structure, underground power station – necessity principal, types, development and economics.

Unit 2:

Estimation of hydro power potential, basic water power equation, gross head, net head nature of supply, storage and pondage. Method of computing hydrographs, mass curves, flow duration curves.

Nature of demand: Load curve, load duration curves, load factor, plant factor, plant use factor, firm power secondary power

Unit 3:

Intake structures - Types, level of intake, hydraulics of intake structures, trash rack, transition, intake gates.

Conduits: Types, economic section, power canals, pen-stock types hydraulic design and economic diameter pipe supports, anchor blocks, tunnels – classification, location and hydraulic design, tunnel linings

Unit 4:

Surge Tank: Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, fore-bay

Unit 5:

Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitations

Tail race: Functions, types, channel and tunnel draft tubes, function and principal types

Unit 6:

Pumped storage plants, purpose and general layout of pumped storage schemes, main types, typical arrangements of the upper reservoirs, economics of pumped storage plants. Introduction to Tidal power stations

Assignment:

1. Feasibility Study of Hydro Power Station in Vidarbha Region
2. Complete Design of Components of Hydro Power Station .

Recommended books:

1. Dandekar M. M. & Sharma K. N, Water Power Engineering, Vikas Publishing House Pvt. Ltd. , New Delhi.
2. Sharma R.K. & Sharma T.K., Water Power Engineering, S. Chand Publication.
3. Streeter V. L. & Wylie E. B, Hydraulic Transient , McGraw Hill Book Company, New York.
4. ChaudharyHanif, Applied Hydraulic Transients, Van Nostrand Rein Hold Company, New York.
5. Warshne, Water power engineering ,Nemchand Publication.

FORENSIC CIVIL ENGINEERING (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1 Understand various testing methods of Failed Structures.
2 Understand the aspects of failures connected with various structural systems and materials.
3 Plan the strategic measures against failures.
4 Can write the legal and technical report of the failure in lucid manner.

Unit – 1

Introduction to forensic engineering, Forensic investigations-tools and techniques. Scope and extent of application of Forensic Engineering techniques in various fields of Civil Engineering.

Unit - 2

Structural Failures: Failure of construction materials steel, concrete - Joints by Bolt and weld. Failure of compression members and tension members by reversal of loads – Failure aspects of post tensioned concrete systems, space frame, plane frame, precast buildings, failure of bridges.

Geo-Technical Failures: Soil liquefaction, failure of foundation systems – Causes and prevention.

Unit - 3

Testing of failures: Various methods of testing of failed structures & instrumentation- Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology.

Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring. Development of the most probable failure hypothesis - cross-check with original design.

Unit - 4

Designing Against Failure: Quality control – Material selection, workmanship, design and detailing.

Performing reliability checks, Legal issues involving jurisprudence system, insurance, reducing potential liability, responsibility of engineers and contractors. Professional practice and ethics.

Reporting – Oral & Written

Assignment:

One Case Study of complete forensic study of civil engineering structure and reporting.

Recommended Books:

1. Guidelines for Forensic Engineering Practice by Gary L Lewis, ASCE Publication
2. Introduction ot Forensic Engineering by Randall K Noon, CRC Press
3. Forensic Engineering Investigations by Randall K Noon, CRC Press
4. Forensic Engineering by Sam Brown, ISI Publication
5. Forensic Structural Engineering by Robert T Ratay, Mc-Graw Hill Professional
6. Construction Failures by Jacob Feld & Kenneth L Carper, John Wiley & Sons

DISASTER RESPONSE AND MANAGEMENT TECHNIQUES (ELECTIVE II)

BECVE802T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:

After studying the subject, student should be able to understand the nature & types of disaster, its preparedness, Role of different government & private agencies, Act & other Statute Provisions, Management of Disaster, Post disaster condition & its management.

Unit - 1

Disasters:

Natures and extent of disasters, natural calamities such as floods, earthquake, drought, forest fire, etc.

Manmade disasters such as Chemical and Industrial hazards, Epidemic, etc.

Disaster Response Plan:

Long term & Shot term planning for disaster. Preparation of vulnerable locations map, data assimilation of past recurrence of similar disasters, socio-economic parameters of the area, Resources availability, Training Emergency Response Mechanism, Medical Aid.

Role of Local, State & Central administration, Role of NDRF, NCDC, NGOs, Media, and SHG. Forecasting and Warning Communication aid.

Unit - 2

Risk & Cost Assessment:

Geographical conditions, Population, Living habits, Threats, Extent of damages to the lives, agricultural area, industrial units, Awareness & Safety Program.

Relief arrangement & essential components, Shelters, Rescue & search tools &equipments, transport facilities. Cost assessment of each unit and funding.

Unit - 3

Disaster Management:

Principles/Components of Disaster Management, Organizational Structure for Disaster Management, Disaster Management Schemes/SOPs, Important Statutes, Provisions of DDM Act – 2005.

Natural Disasters and Mitigation Efforts, Flood Control, Drought Management, Cyclones, Epidemic Management, IEDs /Bomb Threat Planning and Safety & Rescue Measures, Forest Fires Management, Oil Fires, Crisis in Power Sector, Accidents in Coal Mines, Terrorism and Emergency Management, Rumors & Panic Control.

Unit - 4

Post Disaster Management:

Rehabilitation: Physical, Psychological & Medical Rehabilitation, Epidemic management through medical camping, Trauma and Stress Management, Rumor and Panic Management, Medical facilitation and Health management post Disasters. Insurance & Claim management.

Assignment:

One Case Study on any one Disaster in India.

Recommended Books:

1. Forest Fire Disaster Management by Satendra Ashutosh & D Kaushik
2. Environmental Extremes – Disaster Risk Management by Anil K Gupta & Sreeja Nair
3. Disaster Management in India – Ministry of Home Affair, Govt of India
4. Risk to Resilience: Strategic Tools for Disaster Risk Management by A K Gupta, S Nair, S Chopde & P Singh
5. Disaster Management by Mukesh Kapoor
6. Management of Manmade Disaster by S L Goel
7. Earthquake & Natural Disaster by Manik Kar
8. A Practical Guide to Disaster Management by A K Jain
9. A manual on Disaster Management by Parag Diwan

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week) Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-At the end of the course teaching, the student shall be able to

1. Understand the properties of clay
2. Know the swelling and shrinkage characteristics of soil.
3. Understand the basics of pile foundation

Unit-I :

EXPANSIVE SOILS:

Origin and classification of clay minerals, Mechanism of swelling recognition & identification of expansive soil. Free swell indices, ground heave, swelling pressure & swelling potential, factors affecting expansivity and swelling pressure of soil, properties and uses of benotonite slurry, design approaches for foundations in swelling soil, introduction to CNS technique, Swelling shrinking of clays identification of clay minerals by x-ray diffraction and DTA methods.

Unit-II:

GRAIN MORPHOLOGY

Effect of size, shape of sand an engineering properties. Effects of grain morphology, stress- strain behavior of soil.

Unit-III:

DRAINAGE &DEWATERING :

Purpose, various methods, well point systems, their suitability, flow towards slots from line source, concept of electro osmosis.

UNIT-IV

CONSOLIDATION:

consolidation theory, application to consolidation due to sand drains, constructional features and design of sand drain installation. Secondary consolidation phenomenon & estimation of secondary consolidation settlement. Over consolidated soil, over consolidation ratio, Schmertmann’s method for determination of Preconsolidation pressure field consolidation curve

Unit –V : DYNAMIC SOIL PROPERTIES

-Introduction, Representation of stress condition by Mohrs circle.Measurements of Dynamic soil properties, stress-strain behavior of cyclically loaded soil.Strength of cyclically loaded soil.

Unit-VI : LIQUEFACTION

Introduction, phenomenon, evaluation, effects of Liquefaction.

Reference Book:

1. Arora K.R. : Soil Mechanics & Foundation Engineering
2. Punmia B. C. : Soil Mechanics & Foundation
3. Gopal Ranjan & Rao: Basic &Applied Soil Mechanics, New Age international Publisher, 2005
4. P Raj : Geotechnical Engineer, McGraw Hill Education,2000
5. VNS Murthy: Soil Mechanics & Foundation Engineering,Vol.-1, Saikripa Tech Consultant, Bangalore 1991
6. Purushottam Raj: Geotechnical Engg.
7. B. M. Das: Principle of Geotechnical Engg.
8. Winterkom H.F &Farg H.: Foundation Engineering Handbook
9. Geotechnical engineering , A practical problem solving Approch- Braja M.Das, N. Sivakugan, Cengage learning.
10. Principles of geotechnical Engineering- Braja M.Das, Cengage learning

ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week); Total Credits-2**

PRACTICALS:

A. Any three of the following laboratory practicals :

1. Determination of swelling pressure of soil.
2. Determination of swelling, potential of soil
3. Determination of tensile strength of rock by Brazilian test.
4. Determination of stress -strain nature, compressive strength and elastic modulus of rock from uniaxial Compression test.
5. Determination of consolidation property parameters.

B. Any two design assignments:

1. Design of sand drain installation.
2. Design of under reamed pile foundation
3. Stability analysis of well foundation.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE803T	**Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4	**Exam Duration: 3 hrs**

UNIT I: INTRODUCTION TO CONCRETE

Constituentsof Concrete, Special Purpose Cements Binary cement , ternary cement, Hydration Process and Hydrated Cement Pasteof blended cement,Aggregate cement paste interface. Transition Zone in Concrete, Standards, Specifications and Code of Practice.

UNIT II: SPECIAL CONCRETE AND CONCRETING TECHNIQUES

a) Concrete with difference cementatious materials: fly ash, GGBS, Silica fume.
b) Concrete with different Aggregates: No fines, high weight, gap graded, Recycled Aggregate, Auto clave aerated concrete.
c) Modified property: high density, high performance, ultra rapid hardening concrete, transportation concrete, Fiber reinforcement concrete.
d) Techniques: RMC, Underwater concrete , Shot crete, nano concrete.

UNIT III: DESIGN OF CONCRETE

Concept of Design of concrete, Quality control (field and statistical) Indian Standard Method, Comparison with British and.American Method of Mix Design. Acceptance criteria.

Design of High Strength Concrete Mixes, Design of Light Weight Aggregate Concrete Mixes, Design of Fly Ash Cement Concrete Mixes, Design of High Density Concrete Mixes, Standards, Specifications and Code of Practice

UNIT IV: BEHAVIOR AND STRENGTH OF CONCRETE

a) Failure modes inconcrete, type deformation stress strain relation and modulus of elasticity, Shrinkage cause, Factors Affecting and control, creep, causes, Factores influencing and effects. Effects of temperature.
b) Compressive strength, Tensile strength, Fatigue strength, and impact strength, Factors influencing strength of concrete.

UNIT V: DURABILITY OF CONCRETE

Water As An Agent Of Deterioration, Permeability Of Concrete, Classification of Causes of Concrete Deterioration, Deterioration By Surface Wear/Abrasion, Freezing And Thawing of Concrete, Alkali-Aggregate Reaction (Alkali-Silica Reaction / Alkali-Carbonate Reaction), Deterioration By Chemical Reactions, Sulfate

Attack, Concrete In Seawater, Carbonation, Corrosion of Embedded Steel In Concrete, Deterioration By Fire, Guide To Durable Concrete

UNIT VI: TESTING OF CONCRETE

Advanced Non-Destructive Testing Methods: Ground Penetration Radar, Probe Penetration, Pull Out Test, Break off Maturity Method, Stress Wave Prorogation Method, Electrical/Magnetic Methods, Nuclear Methods And Infrared Thermograph, Core Test.

ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

BECVE 803P **Evaluation Scheme: (25-Internal/25-External)**
(P - 2 Hrs/Week); Total Credits-2

1. Minimum 3 Mix Design
2. Minimum 5 Practical on Testing of Concrete with NDT Equipments.

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803T	**Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4	**Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand the principles of analysis and design of special RC structures viz bridge, deck, ESR, shell etc.
2. Understand the behavior of special RC structure under different loading conditions such as IRC, dynamic etc. as per the code provision.
3. Analysis and design of multistoried frame structure incorporating seismic forces.
4. Analysis and design of cylindrical shells.

Unit – I

Design of overhead circular, and Intze service reservoirs (by using Working Stress Method)._Analysis of staging by cantilever method. Analysis and design for earthquake as per relevant IS codes. including ductile detailing. Design of foundation- Annular raft, Full raft.

Unit – II

Design of highway bridges with IRC loading and equivalent UDL. Slab type, Two/Three girder type.

Unit – III

Analysis & Design (Using Limit state Method) of building frames upto two bay/two storey, including design of foundation, ductile detailing, and introduction to Seismic Coefficient Method.

Unit – IV

Design of cylindrical shells by beam theory, advantages, assumption, ranges of validity and beam analysis. Design of shells with or without edge beams.

RECOMMENDED BOOKS:

1 Advanced Reinforced Concrete Design - Varghese P.C, Publisher Prentice Hall of India Edition 2001.
2 Advanced reinforced Concrete - N. Krishna Raju, Publisher CBS Publishers & Distributers Edition 2002.
3 Reliability Analysis & Design of Structures- Ranganathan R Publisher Tata McGrawHill Edition 1990.
4 Reinforced Design- Pillai ,S.U.,D. Menon, Publisher T M H Publication Edition (Second Edition)2003

ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External) (P-2 Hrs/Week) Total Credits-2**

PRACTICALS : (Minimum 3 designs)

1) Design of up to two bay two storey by using Analysis/Design Software.
2) Design and analysis using above syllabus.
3) Minimum One site visit pertaining to above design.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES:-

At the end of this course, students will be able to

1. Understand the analysis and design of tension members, bolted connections, welded connections, compression members and beams.
2. Understand the basic concepts and to incorporate the same in the analysis and design of special structures such as gantry girders, foot bridges, railway bridges, storage vessels etc.

Unit – I

1. Gantry Girders: Cranes, Electrically operated overhead, Design consideration, Crane girder and Gantry girder design.
2. Industrial building frames
   i. Upto two bay single storeyed, foundations, connections, detailing of steel connections.
   ii. North light trussed and lattice girders for industrial buildings.

Unit - II

3. Bridges : Types of bridges foot bridge, road bridge, railway bridge.

   Rolled beam bridges, plate girder bridges, trussed bridge, through type, deck type bridges.

   Loading on foot ways, IRC loading, loading on railway bridges.

   Design of a foot bridge, design of components of railway and road bridges
4. Bearings : Types of bearings, bearing pads, design of rocker and roller bearings

Unit - III

5. Storage Vessels : General concepts, design of bunkers, silo,
6. Open web sections : Introduction, design of open web sections.

Unit - IV

7. Composite construction. General concepts.

   Properties, Steel – concrete composite design of encased beams, columns, shear connectors.

ADVANCED STEEL DESIGN (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/ 25-External)**
(P-2 Hrs/Week) Total Credits-2

PRACTICLAS:

Minimum 3 designs based on above syllabus

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES: The students will be able to

1. Understand composition of typical municipal solid wastes, their sources, collection, treatment and disposal methods.
2. attain an ability to use the techniques, skills, and modern engineering tools necessary for environmental engineering practices.
3. designing of different units of water &waste water treatment plant.
4. Give the knowledge about recent development in water &waste water treatment .

Unit – I - Introduction to WTP & Aeration:

1. Objective of water treatment, unit operation and unit processes, treatment flow sheet, site selection for water treatment plant.
2. Aeration: objective of aeration, types or aerators, design of cascade aerator, gas transfer, two film theory.

Unit – II - Coagulation, Flocculation & Sedimentation

3. Coagulation- Flocculation: Theory of coagulation objectives, types& Design of rapid and slow mixing devices(hydraulic and mechanical), factors affecting coagulation and flocculation, nature and types of chemical coagulants used in water treatment, coagulant and flocculent aids
4. Sedimentation: Theory of sedimentation, factors affecting, types of settling, analysis of discrete and flocculent settling, design of sedimentation tank and clariflocculators.

Unit – III - Filtration, Disinfection &Minor methods

5. Filtration: mechanism of filtration, types of filters, design of rapid sand filters, filter media specifications, preparation of filter sand from stock sand, problems in filtration.
6. Disinfection: Method of disinfection, kinetics of disinfection, types of disinfectants, chlorination, method of chlorination (breakpoint chlorination), factors affecting efficiency of chlorination.
7. Iron and manganese removal, deflourination.
8. Recent development in water treatment.

Unit – IV - Characteristics & Disposal of Waste water

9. physical and chemical characteristics of waste water, DO, BOD, COD, determination of BOD rate constant
10. Disposal of sewage by dilution and by land disposal, Streater-Phelps's equation. Numerical

Unit – V - Preliminary & Primary Treatment

11. Treatment Methods: Waste water treatment flow sheet, preliminary & primary and secondary methods of treatment, design of screen. Girt chamber and primary settling tank.

Unit – VI- Secondary Treatments

12. Biological unit processes: principle of biological treatment processes, design parameters of activated sludge process, aerated lagoons and stabilization ponds. Design of ASP
13. Sludge treatment, aerobic and anaerobic digestion, reactor types (such as UASB, AFFB, Hybrid reactor) & factors affecting anaerobic digestion and sludge drying beds (excluding design)
14. Recent development in waste water treatment.

REFERENCE BOOKS:

1 Sali J. Arcelvala, Tata Mcgraw "Waste Water Treatment for Pollution Control and Reuse".
2 Dr. P.N. ModiVol I – Environmental Engineering I – Standard Publication.
3 Dr. P.N. ModiVol I – Environmental Engineering II – Standard Publication.
4 Dr. A.G. Bhole – Design of Water Treatment Plant, IWWA, Nagpur centre.
5 Dr. B.C. PunmiaVol I &Vol II – Laxmi Publication.
6 CPHEEO Manual.
7 V.N.S. Raju" Water and Waste Water Treatment"- Tata McGraw Hill.
8 Matcalf and Eddy - Water and Waste Water Treatment, Disposal And reuse - Tata McGraw Hill.

WATER AND WASTE WATER TREATMENT (ELECTIVE III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

A) Minimum 6 experiments
   1. Determination of Sulphates
   2. Determination of Chlorides.
   3. Residual, Available Chlorine and Chlorine demand.
   4. Determination of BOD
   5. Determination of COD.
   6. Jar test.
   7. Determination of filter sand from available stack sand.
   8. Balferiology test on water.

B) Design of individual unit of water and waste water treatment.

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803T **Evaluation Scheme: (80/20)**
(L-4 Hrs/Week); Total Credits-4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Develop skills and knowledge regarding basic principles of GIS
- Apply knowledge of remote sensing and GIS in various fields of civil engineering
- Understand fundamental knowledge of principles of ariel photography and remote sensing.
- Remote Sensing and GIS for mapping and monitoring land cover and land use changes
- Remote Sensing and GIS approach in the monitoring and evaluation of rapid urban growth for sustainable development.
-

UNIT-I: Basics of Remote Sensing:

Introduction. history & development, Definition and Scope of Remote Sensing, Advantages and disadvantages of remote sensing techniques, Type of Remote Sensing, Basic principle of remote sensing, Electromagnetic energy and its wavelength, Wavelength regions and their applications in remote sensing, Interaction of EMR with atmosphere, Atmospheric windows Ideal Remote sensing system. Radiometers. Spectral signature and Spectral response curves.

UNIT-II: Remote Sensing Platforms and Sensors:

Introduction, Terrestrial, Airborne and Space borne platforms-classification of satellites, Sun-synchronous and geostationary satellites, Type of Orbit. Satellite launch vehicles GSLV and PSLV, Sensors and Scanners, sensor material, sensor systems, Resolution of sensors, Swath, Image referencing system- Path and Row, Multispectral, Thermal and Radar Scanners,, Remote sensing data products, and their types: Analogue and Digital data formats, Thermal and Radar imageries, FCC, Indian remote sensing program. Various Earth resources satellites and their characteristics,

UNIT-Ill: Aerial Photography:

Introduction, Terminology. Geometry of vertical aerial photograph. Elements of photo and image interpretation, Interpretation key, Interpretation Instruments, Orientation of aerial photographs, Aerial mosaics, Flight planning, Types of aerial photographs. Scale of Aerial photographs, Number of photographs to cover a given area, Relief displacement of vertical objects, Image Parallax and vertical exaggeration.

UNIT-IV: Digital Image Processing:

Introduction, Image reduction, Image magnification, Image rectification and restoration, Image Enhancement contrast manipulation, spatial feature manipulation multi image manipulation. Image classification: supervised and unsupervised classifications, accuracy assessments and data merging

UNIT-V: Geographical Information System

Introduction, Components of GIS- Hardware and Software components. data input and editing, spatial and non spatial data, raster and vector data, database management, data manipulation and analysis, data output.

Global Positioning System: Introduction to Global Positioning System (GPS) Fundamental concepts. GPS system elements and signals, Classification of GPS receivers.

UNIT-VI : Applications: Integrated Approach of RS and GIS Application:

Application in Geological Investigations, Water Resources Management. Environmental studies, Land cover and Land use, Transportation planning, Application in Civil Engineering Projects — Dams and Bridges site investigations, Land slide studies. Flood studies.

RECOMMENDED BOOKS

1. Remote Sensing and Geographical Informatiotn Systems - M. Anji Reddy.
2. Concepts and techniqes of Geographic Information Systems- C.P LO Albert KW Yeung, Pritince Hall of India Edition 2002 .
3. Remote Sensing of the Environment ..an Earth Resource Perspective - John R Jensen, Pearson Education Edition 2006 .

APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)

BECVE803P **Evaluation Scheme: (25-Internal/25-External)**
(P-2 Hrs/Week); Total Credits-2

PRACTICALS:

RS Data Formats and their study : Analogue and Digital Data Products

1. Digital Image Processing : Registration, Enhancements and digital Classifications
2. Case Studies in water Resources (Surface, Ground water) Environmental geology, engineering projects
3. Calculations on RS Data : Elevation, spatial attributes
4. GIS : Vector data generation, data attachments and data analysis.

Construction Economics and Finance

BECVE804T **Evaluation Scheme: (80/20)**
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4 **Exam Duration: 3 hrs**

COURSE OUTCOMES : - The students shall be able **to**

- Acquaint with various economic and financial aspects of construction industry
- Understand the tools and techniques of economic analysis for improving their decision making skills
- Understand the knowledge of economics and finance with special reference to construction industry
- Understand the concept of IRR, turnkey construction projects
- Apply knowledge of inflation, recession, financial ratios

Unit I:

Importance of construction and infrastructure in economic development and growth. Construction – a key industry of India, Concepts of Time value of money, discounted cash flow, internal rate of return, numerical problem based on calculation of IRR.

Unit II:

Factors of production with special reference to construction industry, definition and nature of turnkey construction projects, numerical problem based on calculation of Rate of Return and Net Present Value

Unit III:

Types of market structure in construction industry of India-monopoly, oligopoly and monopolistic competition, definition of recession, inflation, stagflation and its impact on construction industry.

Unit IV :

The sources of finance for construction industry, types of foreign direct investment in infrastructure development of India, project cash flow and numerical problem based on calculation of project cash flow.

Unit V:

Elements of Balance sheet and income statement in construction industry, affordable housing scheme by government of India. numerical problem based on calculation of financial ratios – liquidity ratio, debt/equity ratio, operating profit ratio, return on investment ratio.

Unit VI :

Relevance of capital structure, cost of capital, working capital management in construction projects, factors influencing working capital, the concept and practice of CIBIL in finance, numerical problem based on calculation of working capital for construction project.

Note *: Numerical problem shall be of 4 to 6 marks .*

References :

1. Tarquin, A.J and Blank L.T, (1976) Engineering economy and behavioral approach. Mc Graw Hill Company.
2. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
3. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
4. Van Horne, J.C. (1990). Fundamentals of Financial Management, Prentice-Hall of India Ltd.
5. Brigham, E.F. (1978). Fundamentals of Financial Management, The Dryden Press, Hinsdale, Illinois.
6. Kolb, R.W. and Rodriguez, R.J. (1992). Financial Management. D.C. Heath & Co.
7. Walker, E.W. (1974). Essentials of Financial Management, Prentice Hall of India Private Limited, New Delhi.
8. Wilfred, N. (1971). Accounting for the Building Trade, Hutchinson Educational, London.
9. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd.
10. Lifson, N.W. and Shalfer, E.F. (1982). Decision and Risk Analysis for Construction Management, John Wiley & Sons.
11. Degoff, R.A. and Friedman, H.A. (1985). Construction Management, John Wiley & Sons.
12. Van Horne, J.C. (1990). Management and Policy, Prentice-Hall of India Ltd.
13. Harris, F. and McCaffer, R. (1989). Modern Construction Management. BSP Professional Books.

BECVE805P Project

BECVE805P **Evaluation Scheme: (75-Internal/75-External)**

(P-2 Hrs/Week); Total Credits-6

Minimum two presentations on the work done, Dissertation copy shall be approved by respective guides.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(under Maharashtra Act No. XXIX of 2014)
P.O. Lonere, Dist. Raigad, Pin 402 103, Maharashtra
Telephone and Fax. : 02140 - 275142
www.dbatu.ac.in

Detailed Syllabus
for
Second Year
B. Tech program in Computer Engineering/ Computer Science/ Computer Science & Engineering

With effective from
Academic year July 2018-19
Approved in the 11th meeting of Academic Council 8th June 2018

Teaching and Evaluation Scheme Second Year B. Tech. (Computer Engineering)

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit
			L	T	P	MSE	CA	ESE	
		Semester III							
1	BTBSC301	Engineering Mathematics -III	3	1	-	20	20	60	4
2	BTCOC302	Discrete Mathematics	2	1	-	20	20	60	3
3	BTCOC303	Data Structures	2	1	-	20	20	60	3
4	BTCOC304	Computer Architecture & Organization	2	1	-	20	20	60	3
5	BTCOC305	Digital Electronics & Microprocessors	2	1	-	20	20	60	3
6	BTHMC306	Basic Human Rights	2	-	-	-	50	-	Audit
7	BTCOL307	Python Programming	1	-	2	-	60	40	2
8	BTCOL308	HTML and Javascript	1		2		60	40	2
8	BTCOL309	Data Structures Lab	-	-	2	-	60	40	1
9	BTCOL310	Digital Electronics & Microprocessor Lab	-	-	2	-	60	40	1
10	BTCOF311	Field Training / Internship/Industrial Training Evaluations	-	-	-	-	-	100	1
		Total	**15**	**5**	**8**	**100**	**390**	**560**	**23**
		Semester IV							
1	BTCOC401	Design & Analysis of Algorithms	2	1	-	20	20	60	3
2	BTCOC402	Probability & Statistics	2	1	-	20	20	60	3
3	BTCOC403	Operating System	2	1	-	20	20	60	3
4	BTCOE404	**Elective-I** A) Object Oriented Programming in C++ B) Object Oriented Programming in Java	2	1	-	20	20	60	3
5	BTCOE405	**Elective-II** A) Numerical Methods B) Physics of Engineering Materials C) Soft Skills and Personality Development	2	1	-	20	20	60	3
6	BTXXC406	Product Design Engineering	2	-	-	20	20	60	2
7	BTCOL407	Design & Analysis of Algorithms Lab	-	-	2	-	60	40	1
8	BTCOL408	Introduction to Data Science with R	1	-	2	-	60	40	2
9	BTCOL409	Object Oriented Programming Lab	-	-	2	-	60	40	1
10	BTCOL410	Operating System Lab	-	-	2		60	40	1
11	BTCOF411	Field Training / Internship/Industrial Training (minimum 4 weeks which can be completed partially in first semester and second Semester or in at one time.)						100	Credits to be evaluated at in V Sem.
		Total	**13**	**5**	**8**	**120**	**360**	**620**	**22**

(BTBSC301) Engineering Mathematics III

Unit 1: Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function. **[07 Hours]**

Unit 2: Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients. **[07 Hours]**

Unit 3: Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms. **[07 Hours]**

Unit 4: Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}\right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$). **[07 Hours]**

Unit 5: Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping. **[07 Hours]**

Unit 6: Functions of Complex Variables (Integral calculus)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs). **[07 Hours]**

Text Books

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

BTCOC302 Discrete Mathematics

Unit 1 **6 hrs**

Fundamental Structures and Basic Logic: Sets, Venn diagram, Cartesian product, Power sets, Cardinality and countability, Propositional logic, Logical connectives, Truth tables, Normal forms, Validity, Predicate logic, Limitations of predicate logic, Universal and existential quantification, First order logic.

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Unit 2 **6 hrs**

Functions and Relations: Subjective, Injective, Bijective and inverse functions, Composition of function, Reflexivity, Symmetry, Transitivity and equivalence relations.

Unit 3 **6 hrs**

Combinatorics: Counting, Recurrence relations, generating functions.

Unit 4 **6 hrs**

Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path problems, Euler and Hamiltonian paths, Representation of graph, Isomorphic graphs, Planar graphs, Connectivity, Matching Coloring.

Unit 5 **6 hrs**

Trees: Rooted trees, Path length in rooted tree, Binary search trees, Spanning trees and cut set, Minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree.

Unit 6 **6 hrs**

Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient79 Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

Reference Books:

1. Lipschutz, Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2009.
2. V. K. Balakrishnan, Schaum's Outline of Graph Theory, McGraw-Hill Publication, 1st Edition, 1997.
3. Eric Gossett, Discrete Mathematics with Proof, Wiley Publication, 2nd Edition, 2009.

Text Books:

1. C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2008.
2. Kenneth H. Rosen, Discrete Mathematics and its Applications, McGraw-Hill Publication, 6th Edition, 2010.
3. Y. N. Singh, Discrete Mathematical Structures, Wiley Publication, 1st Edition, 2010.
4. Dr. Sukhendu Dey, Graph Theory with Applications, SPD Publication, 1st Edition, 2012.

BTCOC303 Data Structures

Unit 1 **6 hrs**

Introduction: Data, Data types, Data structure, Abstract Data Type (ADT), representation of Information, characteristics of algorithm, program, analyzing programs.

Unit 2 **6 hrs**

Arrays and Hash Tables: Concept of sequential organization, linear and non-linear data structure, storage representation, array processing sparse matrices, transpose of sparse matrices. Hash Tables, Direct address tables, Hash tables, Hash functions, Open addressing, Perfect hashing.

Unit 3 **6 hrs**

Searching and Sorting: Sequential, binary searching, skip lists – dictionaries, linear list representation, skip list representation, operations – insertion, deletion and searching. Insertion sort, selection sort, radix sort, File handling.

Unit 4 **6 hrs**

Linked Lists: Concept of linked organization, singly and doubly linked list and dynamic storage management, circular linked list, operations such as insertion, deletion, concatenation, traversal of linked list, dynamic memory management, garbage collection.

Unit 5 **6 hrs**

Stacks and Queues: Introduction, stack and queue as ADT, representation and implementation of stack and queue using sequential and linked allocation, Circular queue and its implementation, Application of stack for expression evaluation and expression conversion, recursion, priority queue.

Unit 6 **6 hrs**

Trees and Graphs: Basic terminology, binary trees and its representation, insertion and deletion of nodes in binary tree, binary search tree and its traversal, threaded binary tree, Heap, Balanced Trees. Terminology and representation of graphs using adjacency matrix, Warshall’s algorithm.

Reference Books:

1. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition, 1983.
2. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
3. Venkatesan & Rose, Data Structures, Wiley Publication, 1st Edition, 2015.
4. Goodrich & Tamassia, Data Structure & Algorithm in C++, Wiley Publication, 2nd Edition, 2011.
5. R. G. Dromey, “How to Solve it by Computer”, 2nd Impression, Pearson Education.
6. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1st Edition, 1999.

Text Books:

1. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4th Edition, 2013.
2. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised 1st Edition, 2014.
3. Y. Langsm, M. Augenstin, A. Tanenbaum, Data Structure using C and C++, Prentice Hall India Learning Private Limited, 2nd Edition, 1998.
4. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2nd Revised Edition, 1983.
5. Vishal Goyal, Lalit Goyal, A Simplified Approach To Data Structure, SPD Publication, 1st Edition, 2014.

BTCOC304 Computer Architecture and Organization

Unit 1 **6 hrs**

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

Unit 2 **6 hrs**

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

Unit 3 **6 hrs**

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

Unit 4 **6 hrs**

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

Unit 5 **6 hrs**

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

Unit 6 **6 hrs**

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface.
Instruction pipe-lining: Concepts. Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Reference Books:

- Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and Kaufman Publication, 4th Edition, 2007.
- Morris Mano, Computer System Architecture, Pearson Education India, 3rd Edition, 2007.
- Mostafa Abd-El-Barr, Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, Wiley Publication, 1st Edition, 2004.
- Miles J. Murdocca, Vincent P. Heuring, Computer Architecture and Organization: An Integrated Approach, Wiley Publication, 1st Edition, 2007.
- Sajjan G. Shiva, Computer Organization, Design, and Architecture, CRC Press, 5th Edition, 2013.

Text Books:

- William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8th Edition, 2009.
- Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3rd Edition, 2012.
- Zaky, Computer Organization, McGraw-Hill Publication, 5th Edition, 2011.

BTCOC305 Digital Electronics & Microprocessor

Unit 1 **6 hrs**

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples ofICgates, **Number Systems:** binary, signed binary, octal hexadecimal number, binary arithmetic, one’s and two’s complements arithmetic, codes, error detecting and correcting codes.

Unit 2 **6 hrs**

Combinational Digital Circuits:

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don’t care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, parity checker / generator.

Unit 3 **6 hrs**

Sequential circuits and systems:

A 1-bit memory, the circuit properties of Bistable latch, the clocked SR flip flop, J- K - T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC’s, asynchronous sequential counters, applications of counters.

Unit 4 **6 hrs**

Fundamentals of Microprocessors:

Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bit microprocessors (80386).

The 8086 Architecture: Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles.

Unit 5 **6 hrs**

Memory Interfacing. I/O Interfacing. Direct Memory Access. (DMA). Interrupts in 8086.

Unit 6 **6 hrs**

8086 Instruction Set and Programming:

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C language programs. Assemblers and compilers. Programming and debugging tools.

Text Books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
4. Douglas Hall, Microprocessors and Interfacing, McGraw-Hill Publication, Revised 2nd Edition, 2006.

BTHMC306-Basic Human Rights

Unit 1 6 hrs

The Basic Concepts:

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

Unit 2 6 hrs

Human Rights and Human Duties:

Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India's Charter of freedom.

Unit 3 6 hrs

Society, Religion, Culture, and their Inter-Relationship:

Impact of Social Structure on Human behaviour, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

Unit 4 6 hrs

Social Structure and Social Problems:

Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.

Unit 5 6 hrs

State, Individual Liberty, Freedom and Democracy:

The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

Unit 6 6 hrs

Human Rights in Indian Constitution and Law:

The constitution of India:
(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission.

Text / Reference Books:

- Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005.
- Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

BTCOL307 Python Programming

One hour per week is for program demonstration and instruction which can be conducted as a classroom session or lab session.

Module 1: **2 Hrs.**

Informal introduction to programming, algorithms and data structures, Downloading and installing Python, run a simple program on Python interpreter.

Module 2: **2 Hrs.**

Variables, operations, control flow – assignments, conditionals, loops, functions: optional arguments, default values, Passing functions as arguments.

Module 3: **2 Hrs.**

Statements, Expressions, Strings: String processing. Exception handling, Basic input/output, Handling files.

Module 4: **2 Hrs.**

Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries.

Module 5: **4 Hrs.**

Using Database and Structured Query Languages (SQL): SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.

***Programming assignments are mandatory.**

Reference Books:

1. Mark Lutz, Learning Python, O'Reilly Media, 5th Edition, 2013.
2. Mark Pilgrim, Dive into Python 3, Apress Publication, 2nd Edition, 2009.
3. Allen B. Downey, Think Python, O'Reilly Media, 2nd Edition, 2012.
4. Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 1st Edition, 2006.

Text Books:

1. Michael Urban and Joel Murach, Murach's Python Programming, Murach's Publication, 2016.
2. Charles Severance, Python for Informatics: Exploring Information, University of Michigan, Version 2.7.0, 2014.
3. Dr. R. Nageswara Rao, Core Python Programming, Dreamtech Press, 1st Edition, 2016.

BTCOL308 HTML and JavaScript

Unit 1 **2 hrs**

Web Site development Essentials: Overview of Web Design Concepts, Web Development Teams, Web Project Management Fundamentals, Web Site Development Process, Web Page Layout and Elements, Web Site Usability and Accessibility, Configure Browsers Setting, Navigation Concepts, Web Graphics, Multimedia and the Web.

Unit 2 **2 hrs**

Hyper Text Markup Language (HTML): HTML and the Evolution of Markup languages, Create Hyperlinks, Create Tables, Create Web Forms, Image Inserting Techniques, Create Frames, GUI HTML Editors, Site Content and Metadata.

Unit 3 **2 hrs**

Introduction to Client-Server Model: Features of Dreamweaver Interface, Setting Up a Site with Dreamweaver, FTP -Site Upload Feature of Dreamweaver, Create various types of Links, Insert multimedia including text, image, animation & video, Finding a Home for your WordPress Site, Installing WordPress on Your Site, Content Management using WordPress, Selecting the Right Tools, Image Formats, Fonts and Colors, Designing Your WordPress Site, The WordPress Default Layout, Creating a Custom Site.

Unit 4 **2 hrs**

Cascading Style Sheets: Cascading Style Sheets for Web page design, Creating CSS rules in Dreamweaver, Format Text with CSS, Use of CSS Selectors, Embed Style Sheets, and Attach External Style Sheets.

Using CSS with Tables: Insert and Styling Tables, Import Table Data, Style Tables with CSS, Sort Data in Table.

Unit 5 **4 hrs**

JavaScript first steps; JavaScript first steps overview; What is JavaScript?; A first splash into JavaScript; What went wrong? Troubleshooting JavaScript; Storing the information you need — Variables; Basic in JavaScript — Numbers and operators; Handling text — Strings in JavaScript; Useful string methods; Arrays; Making decisions in your code — Conditionals; Looping code; Functions — Reusable blocks of code; Build your own function; Function return values; Introduction to events

***Programming assignments are mandatory.**

Reference Books:

J. N. Robbins, Learning Web Design, O'Reilly Media, 4th Edition, 2012.

Steven M. Schafer, HTML, XHTML, and CSS Bible, Wiley India, 5th Edition, 2010.

John Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wiley India, 3rd Edition, 2009.

Hal Stern, David Damstra, Brad Williams, Professional WordPress: Design and Development, Wrox Publication, 3rd Edition, 2015.

E. Robson, E. Freeman, Head First HTML & CSS, O’Reilly Media, 2nd Edition, 2012.

BTCOL309 Data Structure Laboratory

List of Experiments:

1. Write a program to implement stack using arrays.
2. Write a program to evaluate a given postfix expression using stacks.
3. Write a program to convert a given infix expression to postfix form using stacks.
4. Write a program to implement circular queue using arrays.
5. Write a program to implement double ended queue (dequeue) using arrays.
6. Write a program to implement a stack using two queues such that the push operation runs in constant time and the pop operation runs in linear time.
7. Write a program to implement a stack using two queues such that the push operation runs in linear time and the pop operation runs in constant time.
8. Write a program to implement a queue using two stacks such that the enqueue operation runs in constant time and dequeue operation runs in linear time.
9. Write programs to implement the following data structures: (a) Single linked list (b) Double linked list.
10. Write a program to implement a stack using a linked list such that the push and pop operations of stack still take O(1) time.
11. Write a program to create a binary search tree (BST) by considering the keys in given order and perform the following operations on it. (a) Minimum key (b) Maximum key (c) Search for a given key (d) Find predecessor of a node (e) Find successor of a node (f) delete a node with given key.
12. Write a program to construct an AVL tree for the given set of keys. Also write function for deleting a key from the given AVL tree.
13. Write a program to implement hashing with (a) Separate Chaining and (b) Open addressing methods.
14. Implement the following sorting algorithms: (a) Insertion sort (b) Merge sort (c) Quick sort (d) Heap sort.
15. Write programs for implementation of graph traversals by applying: (a) BFS (b) DFS

BTCOL310 Digital Electronics and Microprocessor Laboratory

List of Experiments:

1. Simplification, realization of Boolean expressions using logic gates/universal gates.
2. Realization of half/full adder & half/full subtractors using logic gates.
3. Realization of parallel adder/subtractors using 7483 chip, BCD to Excess-3code conversion & vice versa.
4. Realization of binary to gray code conversion & vice versa.
5. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits & code converter.
6. Realization of one/two bit comparator and study of 7485 magnitude comparator.
7. Use of a) Decoder chip to drive LED display & b) Priority encoder.
8. Truth table verification of flip-flops: i) JK Master Slave ii) T type iii) D type.
9. Realization of 3-bit counters as a sequential circuit & MOD-N counter design (7476, 7490, 74192, 74193).
10. Writing & testing of sequence generator.
11. Design of FSM: Moore machine, Mealy machine.

BTCOC401 Design and Analysis of Algorithms

Unit 1 **6 hrs**

Introduction to Algorithms: Definition of Algorithms, Properties of Algorithms, Expressing Algorithm, Flowchart, Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithm's Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem, Changing Variable, Heap Sort.

Unit 2 **6 hrs**

Divide and Conquer: Introduction to Divide and Conquer Technique, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication.

Unit 3 **6 hrs**

Greedy Algorithms: Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithm.

Unit 4 **6 hrs**

Dynamic Programming: Introduction, Characteristics of Dynamic Programming, Component of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming Techniques, Longest Common Sub-sequence, matrix multiplication, shortest paths: Bellman Ford, Floyd Warshall, Application of Dynamic Programming.

Unit 5 **6 hrs**

Backtracking: Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem.

Branch and Bound: Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.

Unit 6 **6 hrs**

Tree: Introduction, B-tree, Red-Black Tree (RBT): Insertion, Deletion.
NP Completeness: Introduction, The Complexity Class P, The Complexity Class NP, Polynomial-Time Reduction, The Complexity Class NP-Complete.

Reference Books:

1. Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1st Edition, 1983.
2. Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2nd Edition, 2006.
3. George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2nd Edition, 2016.

Text Books:

1. Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
2. Ellise Horowitz, Sartaj Sahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2nd Edition, 2008.
3. Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2nd Edition, 1988.

BTCOC402 Probability and Statistics

Unit 1 **6 hrs**

Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities with proofs, Examples.

Unit 2 **6 hrs**

Random Variable and Mathematical Expectation: Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.

Unit 3 **6 hrs**

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.

Unit 4 **6 hrs**

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors.

Unit 5 **6 hrs**

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient.

Unit 6 **6 hrs**

Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Reference Books:

1. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001.
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction To Probability And Statistics, Wiley Publication, 2nd Edition, 2001.

Text Books:

1. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016.
2. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
5. G. Haribaskaran, Probability, Queuing Theory and Reliability Engineering, Laxmi Publications, 2nd Edition, 2009.
6. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability And Statistics, Schaum's Outlines, 4th Edition, 2013.

BTCOC403 Operating System

Unit 1 **6 hrs**

Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components- System Services, Systems Calls, System Programs, System structure. Virtual Machines, System Design and Implementation, System Generations.

Unit 2 **6 hrs**

Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Cooperating processes. Threads, Inter-process Communication, Scheduling criteria, scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Scheduling Algorithms and performance evaluation.

Unit 3 **6 hrs**

Process Synchronization The critical-section problem, Critical regions, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Synchronizations in Solaris.

Unit 4 **6 hrs**

Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.

Unit 5 **6 hrs.**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

Unit 6 **6 hrs.**

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, sDevice independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms.

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Reference Books:

1. D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.
2. Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.
3. Harvey M. Deitel, An Introduction to Operating Systems, Addison-Wesley Publication, 2nd Edition, 1990.
4. Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley Publication, 2011.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
2. Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.

BTCOE404(A) Object-Oriented Programming using C++ (Elective I)

Unit 1 **6 hrs**

Introduction to Object Oriented Programming and Objects and Classes: Need of object oriented programming, The object oriented approach, Characteristics of object oriented languages. A class, Objects as data types, Constructors, Objects as function arguments, Returning objects.

Unit 2 **6 hrs**

Operator Overloading and Inheritance: Overloading unary and binary operators, Data conversion. Derived and base class, Public and private inheritance, Levels of inheritance, Multiple inheritance Examples.

Unit 3 **6 hrs**

Polymorphism: Virtual functions, Dynamic binding, Abstract classes and pure virtual functions, Friend functions, this pointer.

Unit 4 **6 hrs**

Streams and Files: Streams, Stream output and input, Stream manipulators, Files and streams, Creating, Reading, Updating sequential and random files.

Unit 5 **6 hrs**

Templates and Exception Handling: Function templates, Overloading function templates, Class templates, Exception handling overview, Need of exceptions, An exception example, Multiple exceptions, Exception specifications.

Unit 6 **6 hrs**

Standard Template Library (STL): Introduction to STL-Containers, Iterators, Algorithms, Sequence containers, Associative containers, Container adapters.

Reference Books:

1. Bjarne Stroustrup, The C++ Programming Language, Addison-Wesley Publication, 4th Edition, 2013.
2. P. J. Deitel, H. M. Deitel, C++ How to Program, PHI Publication, 9th Edition, 2012.
3. John Hubbard, Programming with C++, Schaum's Outlines, McGraw-Hill Publication, 2nd Edition, 2000.
4. Nicolai M. Josuttis, Object-Oriented Programming in C++, Wiley Publication, 1st Edition, 2002.

Text Books:

1. E. Balagurusamy, Object Oriented Programming with C++, McGraw-Hill Publication, 6th Edition, 2013.
2. Robert Lafore, Object Oriented Programming in C++, Sams Publishing, 4th Edition, 2001.
3. Dr. B. B. Meshram, Object Oriented Paradigms with C++ Beginners Guide for C and C++, SPD Publication, 1st Edition, 2016.
4. Rajesh R. Shukla, Object-Oriented Programming in C++, Wiley India Publication, 1st Edition, 2008.

BTCOE404(B) Object-Oriented Programming using Java (Elective I)

Unit 1 **6 hrs**

Introduction to Computers and Java: Computers: Hardware and Software, Data Hierarchy, Computer Organization, Machine Languages, Assembly Languages and High-Level Languages, Introduction to Object Technology, Operating Systems, Programming Languages, Java and a Typical Java Development Environment, Your First Program in Java: Printing a Line of Text, Modifying Your First Java Program, Displaying Text with printf, Another Application: Adding Integers, Memory Concepts, Arithmetic, Decision Making: Equality and Relational Operators.

Unit 2 **6 hrs**

Introduction to Classes, Objects, Methods and Strings: Introduction, Declaring a Class with a Method and Instantiating an Object of a Class, Declaring a Method with a Parameter, Instance Variables, set Methods and get Methods, Primitive Types vs. Reference Types, Initializing Objects with Constructors Floating-Point Numbers and Type double.

Unit 3 **6 hrs**

Control Statements: Algorithms, Pseudocode, Control Structures, if Single-Selection Statement, if...else Double-Selection Statement, while Repetition Statement, Formulating Algorithms: Counter-Controlled Repetition, Formulating Algorithms: Sentinel-Controlled Repetition, Formulating Algorithms: Nested Control Statements, Compound Assignment Operators, Increment and Decrement Operators, Primitive Types, Essentials of Counter-Controlled Repetition, for Repetition Statement, Examples Using for Statement, do...while Repetition Statement, switch Multiple-Selection Statement, break and continue Statements, Logical Operators.

Unit 4 **6 hrs**

Array: Introduction, Declaring and Creating Arrays, Examples Using Arrays, Case Study: Card Shuffling and Dealing Simulation, Enhanced for Statement, Passing Arrays to Methods, Case Study: Class GradeBook Using an Array to Store Grades, Multidimensional Arrays, ase Study: Class GradeBook Using a Two-Dimensional Array, Variable-Length Argument Lists, Using Command-Line Arguments, Class Arrays.

Unit 5 **6 hrs**

Classes and Objects: Introduction, Controlling Access to Members, Referring to the Current Object's Members with the this Reference, Time Class Case Study: Overloaded Constructors, Time, Default and No-Argument Constructors, Notes on Set and Get Methods, Composition, Enumerations, Garbage Collection and Method finalize, static Class Members, static Import, final Instance Variables, Time Class Case Study: Creating Packages, Package Access.

Unit 6 **6 hrs**

Inheritance: Introduction, Superclasses and Subclasses, protected Members, Relationship between Superclasses and Subclasses, Hierarchy Using private Instance Variables, Constructors in Subclasses Software Engineering with Inheritance, Class Object.
Polymorphism: Introduction, Polymorphism Examples, Demonstrating Polymorphic Behavior, Abstract Classes and Methods, Case Study: Payroll System Using Polymorphism, final Methods and Classes, Case Study: Creating and Using Interfaces.

Reference Book:

1. Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9th Edition,
2. Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016.
3. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition, 2014.
4. Herbert Schildt, Java The Complete Reference, McGraw-Hill Publication, 9th Edition,
5. Patrick Niemeyer, Daniel Leuck, Learning Java, O'Reilly Media, 4th Edition, 2013.

BTCOE405(A) Numerical Methods (Elective-II)

This course preferably offered as a SWAYAM course

Unit 1 [5 Hrs.]

Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method.

Unit 2 [5 Hrs.]

Solution of Linear Simultaneous Equation: Gauss elimination method, Gauss-Jordan method, Iterative method of solution- Jacobi iteration method, Gauss-Seidal iteration method, Relaxation method.

Unit 3 [5 Hrs.]

Finite Differences: Forward difference operator, Backward difference operator, Central difference operator, Newton's interpolation formulae, Newton's forward–backward-central interpolation formulae.

Unit 4 [5 Hrs.]

Differentiation and Integration: Newton-Cortes formula, Trapezoidal rule, Simpson one–third rule, Simpson three- eighth rule.

Unit 5 Numerical Solution of ODE: Picard's methods, Taylor series method, Euler's method, Modified Euler's method, Runge - Kutta method. [5 Hrs.]

Text Books:

1. B.S Grewal, Higher Engineering Mathematics, 40 th edition, Khanna publication.
2. S. S. Shastri, Introduction to Numerical Methods, PHI publication.
3. V. Rajaraman, Computer Oriented Methods, 3 rd edition, PHI publication.

Reference Books:

1. Conte and De boor, Elementary Numerical Analysis, BPB publication.
2. E. Kreyszig, Advanced Engineering Mathematics, BPB publication.
3. Steven C Chapra, Numerical Methods for Engineers, 5 th edition, McGraw Hill publication.

Equivalent SWAYAM/NPTEL Course

BTCOE405(B) Physics of Engineering Material (Elective-II)

Unit I Magnetic Materials: **5hrs**

Magnetic Materials: Origin of magnetization using atomic theory, classification of magnetic materials and properties, Langevin's theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Ant ferromagnetic and Ferromagnetic materials, Ferrites and Garnets, magnetic bubbles, magnetic recording.

Unit II Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation) **5hrs**

Unit III Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell **5hrs**

Unit IV Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials **5hrs**

Unit V Nano Materials: Nanomaterials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials. **5hrs**

Text Books:

1. C. Kittle ,"***Introduction to Solid state Physics***".
2. C. M. Srivastava , C. Srinivasan , "***Science of Engineering Materials and Carbon Nanotubes***".
3. A. J. Dekker, "***Solid State Physics***".

Reference Books:

1. V. Raghavan, "***Material Science and Engineering***".
2. A. J. Dekker, "***Electrical Engineering Materials***".

BTCOE405(C) Soft Skills and Persnolity Development (Elective-II)

This course preferably offered as a SWAYAM course

UNIT I

Self Management:

Self Management, Self Evaluation, Self discipline, Self criticism, Recognition of one's own limits and deficiencies, dependency, etc.

Self Awareness, Self Management, Identifying one's strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride,- Leadership & Team Dynamics

UNIT II

Time Management Techniques

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time.

UNIT III

Motivation/ Inspiration

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation,

Motivation techniques : Motivation techniques based on needs and field situations

Unit IV

Interpersonal Skills Development

Positive Relationship, Positive Attitudes, Empathies: comprehending others' opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

Unit V

Effective Computing Skills

Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference books:

1. Mitra, Barun, "***Personality Development and Soft Skills***", Oxford University Press, 2016.
2. Ramesh, Gopalswamy, "***The Ace of Soft Skills: Attitude, Communication and Etiquette for Success***", Pearson Education, 2013.
3. Covey, Stephen R., "***Seven Habits of Highly Effective People: Powerful Lessons in Personal Change***"
4. Rosenberg Marshall B., "***Nonviolent Communication: A Language of Life***".

BTXXC406 Product Design Engineering

Unit 1 **6 hrs**

Creating Simple Products and Modules.

Unit 2 **6 hrs**

Document Creation and Knowledge Sharing.

Unit 3 **6 hrs**

Self and Work Management.

Unit 4 **6 hrs**

Team Work and Communication.

Unit 5 **6 hrs**

Managing Health and Safety.

Unit 6 **6 hrs**

Data and Information Management.

Text / Reference Books:

1. Model Curriculum for “Product Design Engineer – Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
2. Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw - Hill Higher Education.
3. Green, W., & Jordan, P. W. (Eds.). (1999).Human factors in product design: current practice and future trends. CRC Press.
4. Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design Mc-GRAW- HILL book company.
5. Roozenburg, N. F., &Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc.
6. Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of designs, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design. Rockport Pub.

BTCOL407 Design and Analysis of Algorithm Laboratory

List of Experiments:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication).
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling sales person problem).
4. Obtain the Topological ordering of vertices in a given digraph.
5. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
6. Selection: Minimum/ Maximum, K^{th} smallest element.
7. Find optimal ordering of matrix multiplication. (Use Dynamic programming method).
8. Use dynamic programming algorithm to solve optimal binary search tree problem.
9. Compute the transitive closure of a given directed graph using Warshall's algorithm.
10. Write programs to find out a minimum spanning tree of a simple connected undirected graph by applying: (a) Prim’s algorithm (b) Kruskal’s algorithm.
11. Write a program to implement Dijkstra’s algorithm for solving single source shortest path problem using priority queue.
12. Write a program to implement Floyd-Warshall algorithm for solving all pairs shortest path problem.

BTCOL408 Introduction to data science with R

Unit 1: Introduction to Basics **2 hrs**

The basic data types in R. Variables.

Module 2 Vectors and Matrices **4hrs**

Vectors. Create, name and select elements from vectors. Learn how to work with matrices in R. Do basic computations with them and demonstrate your knowledge by analyzing the Star Wars box office figures.

Module 3: Factors & Data Frames **2 hrs**

Storeing Categorical data in factors. Learn how to create, subset and compare categorical data. When working R, you'll probably deal with Data Frames all the time. Therefore, you need to know how to create one, select the most interesting parts of it, and order them.

Module 4: Lists **2 hrs**

Create, name and select elements from Lists

Module 5: Basic Graphics **2 hrs**

Discover R's packages to do graphics and create your own data visualizations.

***Programming assignments are mandatory.**

Reference Books:

1. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media, 1st Edition, 2015.
2. Hadley Wickham, Garrett Grolemund, R for Data Science Import, Tidy, Transform, Visualize, and Model Data, O'Reilly Media, 1st Edition, 2017.
3. Nina Zumel, John Mount,"Practical Data Science with R", Manning, 2014.

Text Books:

1. Rajendra Patil, Hiren dand, Rupali Dahake, A practical approach to R Tool, SPD Publication, 1st Edition, 2017.

BTCOL409 Object Oriented Programming Laboratory

List of Experiments:

1. Programs on Operators, Arithmetic Promotion, Method Calling.
2. Programs on dealing with Arrays.
3. Programs on Classes: String and Math.
4. Programs on Inheritance and Polymorphism.
5. Programs on Garbage collection, packaging, access Modifiers, as well as static and abstract modifiers.
6. Programs on Interfaces, block initializers, final Modifier, as well as static and dynamic binding.
7. Programs on file handling and stream manipulation.
8. Programs on Dynamic Polymorphism.
9. Programs on Dynamic Memory Management.
10. Programs on Exception Handling.
11. Programs on generic programming using templates.
12. Programs on STL-containers and iterators.

BTCOL410 Operating Systems Laboratory

1. Hands on Unix Commands
2. Shell programming for file handling.
3. Shell Script programming using the commands grep, awk, and sed.
4. Implementation of various CPU scheduling algorithms (FCFS, SJF, Priority).
5. Implementation of various page replacement algorithms (FIFO, Optimal, LRU).
6. Concurrent programming; use of threads and processes, system calls (fork and v-fork).
7. Study pthreads and implement the following: Write a program which shows the performance
8. Improvement in using threads as compared with process.(Examples like Matrix Multiplication,
9. Hyper Quick Sort, Merge sort, Traveling Sales Person problem).
10. Implementation of Synchronization primitives – Semaphore, Locks and Conditional Variables.
11. Implementation of Producer-Consumer problem, Bankers algorithm.
12. Implementation of various memory allocation algorithms, (First fit, Best fit and Worst fit), Disk
13. Scheduling algorithms (FCFS, SCAN, SSTF, C-SCAN).
14. Kernel reconfiguration, device drivers and systems administration of different operating systems.
15. Writing utilities and OS performance tuning.

DR.BABASAHEBAMBEDKARTECHNOLOGICALUNIVERSITYLONERE.

ELECTRICALENGINEERINGDEPARTMENT

Second Year B. Tech. Electrical Engineering / Electrical Engineering (Electronics and Power)/ Electrical & Electronics Engg / Electrical& Power Engineering

WitheffectfromNovember 2018

Teaching&EvaluationschemeofsecondyearB.Tech. ElectricalEngineering/ElectricalEngineering(Electronicsand Power)/ Electrical & Electronics Engg / Electrical & Power Engg .

IIISEMESTER.

S.No	CourseCode	CourseTitle	Teaching Scheme			EvaluationScheme			Credits
			L	T	P	MSE	CA	ESE	
1	BTBSC301	EngineeringMathematics-III	3	1	0	20	20	60	4
2	BTEEC302	NetworkAnalysisandSynthesis	2	1	0	20	20	60	3
3	BTEEC303	FluidMechanicsandThermal Engineering	2	1	0	20	20	60	3
4	BTEEC304	MeasurementandInstrumentation	2	1	0	20	20	60	3
5	BTEEE305A BTEEE305B BTEEE305C	Elective–I (A) ElectricalEngineeringMaterials (B) AppliedPhysics (C) SignalsandSystems	3	0	0	20	20	60	3
6	BTHM3401	BasicHumanRights	2	0	0	-	20	-	Audit
7	BTHM306	EngineeringEconomics	2	0	0	20	20	60	2
8	BTEEL307	NetworkAnalysisandSynthesisLab	0	0	2	-	60	40	1
9	BTEEL308	MeasurementandInstrumentationLab	-	0	4	-	60	40	2
10	BTEEM309	Electricalworkshop/Miniproject	-	-	2	-	60	40	1
11	BTEEF310	FieldTraining/Internship/Industrial TrainingEvaluation						50	1
		TOTAL	16	04	08	120	320	530	23
IVSEMESTER.									
1	BTEEC401	ElectricalMachine-I	3	1	0	20	20	60	4
2	BTEEC402	PowerSystem-I	2	1	0	20	20	60	3
3	BTEEC403	Electrical InstallationandEstimation	2	1	0	20	20	60	3
4	BTEEC404	NumericalMethodsandProgramming	2	1	0	20	20	60	3
5	BTID405	ProductDesignEngineering	1	0	2	30	30	40	2
6	BTEEE-406A BTEEE-406B BTEEE-406C	Elective–II (A) SolidStateDevices (B) AnalogandDigitalelectronics (C) ElectromagneticTheory	2	0	0	20	20	60	2
7	BTEEOE407-A BTEEOE407-B BTEEOE407-C	Elective–III (A) Industrialsafety (B) IntroductiontoNon-Conventionalenergy sources (C) SoftwareTechniques.	2	0	0	20	20	60	2
8	BTEEL408	ElectricalMachine-ILab	0	0	2	-	60	40	1
9	BTEEL409	PowerSystemlab-I	0	0	2	-	60	40	1
10	BTEEL410	NumericalMethodsandProgramming Lab	-	0	2	-	60	40	1
11	BTEEEL411	Elective-IILab	0	0	2	-	60	40	1
12		Field Training / Internship/ IndustrialTraining(minimum4 weeks whichcan becompletedpartiallyinThirdsemester and Fourth Semester or in at one time.)							Credits to be evaluated in VSem
	TOTAL		15	04	10	140	380	580	23

SemesterIII

BTBSC301.EngineeringMathematicsIII

TeachingScheme	**ExaminationScheme**
Theory:03Hrs/Week	Mid-termTest:20Marks
Tutorial : 01 Hr/Week	InternalAssessment:20Marks
	EndSemesterExam:60Marks
	Duration: 03 Hrs.

CourseContents:

Unit1:LaplaceTransform

Definition – conditions for existence; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided byt, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

[07Hours]

Unit2: InverseLaplaceTransform

Introductory remarks;Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplacetransforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

[07Hours]

Unit3: FourierTransform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; ComplexformofFourierintegrals;Fouriersineandcosinetransforms;PropertiesofFouriertransforms;Parseval’s identityfor Fourier Transforms.

[07Hours]

Unit4: PartialDifferentialEquationsandTheirApplications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable bydirectintegration;Linearequationsoffirstorder(Lagrange’slinearequations);Methodofseparationofvariables–applicationstofindsolutionsofonedimensionalheatflowequation $\left(\frac{\partial u}{\partial t} = {}^2\frac{\partial^2 u}{\partial x^2}\right)$,andtwodimensionalheatflow equation(i.e.Laplaceequation: $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$).

[07Hours]

Unit5:FunctionsofComplexVariables(Differentialcalculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

[07Hours]

Unit6:FunctionsofComplexVariables(Integralcalculus)

Cauchy’s integral theorem; Cauchy’s integral formula; Residues; Cauchy’s residue theorem (All theorems withoutroofs).

[07Hours]

TextBooks

1. HigherEngineeringMathematicsbyB.S.Grewal,KhannaPublishers,NewDelhi.
2. AdvancedEngineeringMathematicsbyErwinKreyszig,JohnWiley&Sons,NewYork.
3. ACourseinEngineeringMathematics(VolIII)byDr.B.B.Singh,SynergyKnowledgeware,Mumbai.
4. A TextBook of Applied Mathematics (VolI &II)by P.N. Wartikar andJ. N. Wartikar, Pune VidyarthiGriha Prakashan, Pune.
5. HigherEngineeringMathematicsbyH.K.DasandEr.RajnishVerma,S.Chand&CO.Pvt.Ltd.,NewDelhi.

ReferenceBooks

1. HigherEngineeringMathematicsbyB.V.Ramana,TataMcGraw-HillPublications,NewDelhi.
2. ATextBookofEngineeringMathematicsbyPeterO’Neil,ThomsonAsiaPteLtd.,Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett,Tata Mcgraw-HillPublishing CompanyLtd., New Delhi.
4. IntegralTransformsandTheirEngineeringApplicationsbyDr.B.B.Singh,Synergy.Knowledgeware,Mumbai.

5. IntegralTransformsbyI.N.Sneddon,TataMcGraw-Hill,NewYork.

GeneralInstructions:

1. ThetutorialclassesinEngineeringMathematics-IIIaretobeconductedbatchwise.Eachclassshouldbedivided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. Theminimumnumberofassignmentsshouldbeeightcoveringalltopics.

BTEEC302.NETWORKANALYSISANDSYNTHESIS.

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Toreviewbasiccomponentsofelectricnetwork. Todesignanddevelopnetworkequationsandtheirsolutions. To apply Laplace theorem for electric network analyses ToanalyzeACcircuit.	
Unit	Contents	Contact Hrs
1	Active&PassiveCircuitElement:Independent& dependentvoltage& currentsources,R,L,C&mutual inductance circuit parameters, Their mathematical modes, Voltage current power relations. Classificationofelement:Lumpeddistributed,Linear&non-linear,Unilateral,Bilateral,Timeinvariant& variant,Paceinvariant&variant,Superposition,Thevenin's,Norton'sReciprocity,Maximumpowertransfer, Substitution, Tellegen's theorem.	6
2	NetworkEquations:Network topology, Graph, Tree,Branches, Chords, Equilibriumequationonloop basis& node basis Number of network equation required, Choice between nodal & loop analysis, Source transformation,Networkmutualinductance, Dotconventions, Conceptofsuper mesh,Supernode Concept of duality&dual networks.	6
3	SolutionofNetworkEquations: Classificationsolutionoffirst, Second orderdifferentialequationsofseries& parallel R-L, R-C, R-L-C circuits, General & particular solutions, Particular integral & complimentary functions, Time constant, Mathematical analysis of circuit transients, initial conditions in network, Procedure ofevaluality,Conditionsinnetworkproblems,SolutionofD.C.resistivenetwork&A.C.sinusoidalsteady statenetworks,Writingloopequations,Nodeequationsdirectlyinmatricesform.Numericals	6
4	Application of Laplace's Transform: Solution of differential equation using Laplace transform, Unit step, Impulse&rampfunctions,Laplacetransformofsingular&shiftedfunction,Convolutionintegral,Conceptof complexfrequency,Transformimpedance&transformadmittance,Series&parallelcombinationofthese transformnetworks.	6
5	Twoportnetwork:Terminals&terminalpairs,Drivingpoints&transferadmittance,Transferfunctions, Conceptofpoles&zeroes,Twoportnetworks,Z,Y&thetransmissionparametersrelationshipbetween parametersets.	6
6	SinusoidalSteadyStateA.C.Circuit:R-L-Cseriescircuits,SeriesresonanceVariationofZwithfrequency, maximum value of VC & VL, Magnification, Bandwidth, Q factor. ParallelResonance:Resonancefrequencyfortankcircuitfrequency,LocusdiagramofseriesR-L,R-Cwith variable R & X. Filter:Introductionclassification,Lowpass,Highpass,Bandpass&bandrejectfilter,active&passive filters.ApplicationofFourierseries,Expansionforperiodic&non-sinusoidalwaveforms.	6
	RefBooks: 1. Mac.EVanValkenburg,"NetworkAnalysis", 2. FranklinFa-Kun.Kuo,"NetworkAnalysis&Synthesis",JohnWiley&Sons. 3. M.L.Soni,J.C.Gupta,"ACourseinElectricalCircuitsand Analysis", 4. Mac.EVanValkenburg,"NetworkSynthesiss", 5. JosephA.Edminister,MahmoodMaqvi,"TheoryandProblemsofElectricCircuits",Schaum'sOutline Series,	

BTEEC303.FLUIDMECHANICSANDTHERMALENGINEERING.

Teachingscheme:
Theory: 2 hrs
Tutorial: 1hr
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	BasicMechanicalengineering	
Course Outcome	TointroducepropertiesoffluidandhydraulicmeasurementTounderstanddynamicsoffluidflowTo understandbasicconceptsofICenginesTounderstandconceptofrefrigerationandairconditioning	
Unit	Contents	Contact Hrs
1	Introductiontopropertiesoffluids&hydraulicmeasurements(pressureatplane&curvedsurfaces,criteriaof pressure),Fluidkinematicsanddynamics&simplenumerical.	6
2	FlowthroughpipeLaminarflow,HaugenPoisellie'sequationTurbulentflow,DarcyWeisbachformula, Frictionfactor,useofModdysDiagramonly,Pipesinseries&parallel,minorlosses.Introductionto reciprocatingandcentrifugalpumps,theircharacteristicsandapplications	6
3	Internal Combustion Engines: Introduction to First Law & second Law of Thermodynamics, Concept of Entropy & Enthalpy Classification Otto, Diesel & air-fuel cycles, Constructional details of two stroke, four stroke engines, studyof various systems suchasfuel supply, ignitioncycle, over heating, cooling, lubrication, calculationofIP,BP,MEP,efficiencies,heatbalance,enginetrial,performance,gasturbine,classification, cycles,performanceimprovement.	6
4	Aircompressors:Classification,principleofoperationofreciprocating&rotarycompressors,Constructional detailsofsingle&multistagecompressor,workinput,P-Vdiagram,efficiencies,improvingcompressor performance, reciprocating type only, use of compressed air	6
5	Refrigeration&Airconditioning:Refrigeration:Differentsystems,principleofcyclesofoperationsofvapour compression&vapourabsorptionsystems,COPcalculationsofvapourcompressionrefrigerationsystem, refrigerants,desirable&undesirableproperties,applicationofrefrigeration.	6
6	Airconditioning:Psychrometry,DBT,WBT,RH,Psychometricchart,airconditioningprocessessuchas heating,cooling,humidification,dehumidification,studyofcentralairconditioningplant&itscontrol, application of air conditioning.	6
	RefBooks: 1. JoelReyner,"EngineeringThermodynamics",(LongmanPublications) 2. NagP.K.,"EngineeringThermodynamics",(TataMcGrawHillPublications) 3. AroraC.P,"Refrigeration&AirConditioning",(TataMcGrawHillPublications) 4. EastopT.D.&McconkeyA.,"AppliedThermodynamicsForEngineeringTechnologists"(Longman Publications) 5. ModiP.N&SethS.M,"HydraulicFluidMechanics",(StandardBookHousePublications) 6. LewittW.,"Hydraulic&FluidMechanics",(SirIssacPitmanPublications),10thEdition	

BTEEC304MEASUREMENTANDINSTRUMENTATION

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Tounderstandphilosophyofmeasurement. Tounderstanddifferentmethodsanaloganddigitalmeasurement. Tostudyprincipleofconstructionandoperationofdifferenttransduceranddismaymethods.	
Unit	Contents	Contact Hrs
1	PhilosophyOfMeasurement-MethodsofMeasurement,MeasurementSystem,Classificationofinstrument system,Characteristicsofinstruments&measurementsystem,Errorsinmeasurement&itsanalysis,Standards.	6
2	Analog Measurement of Electrical Quantities – Electro dynamic, Thermocouple, Electrostatic & Rectifier type Ammeters & Voltmeters, Electro dynamic Wattmeter, Three Phase Wattmeter, Power in three phase system, errors&remediesinwattmeterandenergymeter.InstrumentTransformerandtheirapplicationsintheextension ofinstrumentrange,Introductiontomeasurementofspeed,frequencyandpowerfactor	6
3	MeasurementofParameters -Differentmethodsofmeasuringlow,mediumandhighresistances,measurement ofinductance&capacitancewiththehelpofACBridges,QMeter	6
4	DigitalMeasurementofElectricalQuantities-Conceptofdigitalmeasurement,blockdiagramStudyofdigital voltmeter,frequencymeterPowerAnalyzerandHarmonicsAnalyzer;ElectronicMultimeter.	6
5	Transducers: Definition-different typesoftransducers– criteria for selection–generalcharacteristics–dynamic characteristics–transducersformeasurementofdisplacement(RVDT&LVDT),speed,angularrotation,altitude, force, torque, humidity and moisture, pressure, strain and temperature (Thermocouple and RTD method), Hall Effect transducer and applications Instrumentation amplifiers – differential amplifiers)Data transmission and telemetry–methodsofdatatransmission,Generaltelemetrysystems–Digitalmethodsoffrequency,phase,time andperiod measurements.	6
6	Displaymethods,recorders:Displaymethodsanddevices–differenttypesofrecorders–galvanometric recorders–pendrivingsystem–magneticrecorders–digitalrecorders,digitalstorageoscilloscope(Block Diagram, theory and applications only)	6
	ReferenceBooks: 1. A.K.Sawhney,AcourseinElect.&ElectronicMeasurementandInstrumentation,DhapatRai&Co. 2. Golding&Widis,ElectricalMeasurementandMeasurementinstrument,WheelarBooks H.S.Kalsi,ElectronicInstruments,TataMc-Grawhill 3. Carr,ElementsofElectronicInstrumentationandMeasurement,PearsonEducation. 4. D.Patranabis,Sensors&Transducers,PHI. 5. A.J.Bouwens,DigitalInstrumentation,TataMc-Grawhill. 6. A.D.Heltric&W.C.Copper,ModernElectronicinstrumentation&Measuringinstruments,Wheeler Publication. 7. H.K.P.Neubert,Instrumenttransducers,OxfordUniversitypress.	

BTHM3401-BasicHumanRights

Teachingscheme: ExaminationScheme:
Theory: 2hrs
Totalcredit:Audit ContinuousAssessment:50Marks

Pre requisite		
Course Objective		
Course Outcome	Tostudyconceptoftimevalueofmoney To study about demand in detail TounderstandMeaningofProductionandfactorsofproduction, To understand dif. Concept about market	
Unit	Contents	ContactHrs
1	TheBasic Concepts: Individual,Group,CivilSociety,State,Equality,Justice,HumanValues:-Humanity,Virtues, Compassion.	6
2	HumanRightsandHumanDuties: Origin,CivilandPoliticalRights,ContributionofAmericanBillofRights,FrenchRevolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India's Charter of freedom	6
3	Society,Religion,Culture,andtheirInter-Relationship: ImpactofSocialStructureonHumanbehaviour,RollofSocializationinHumanValues, Science and Technology, Modernization, Globalization, and Dehumanization.	6
4	SocialStructureandSocialProblems: Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.	6
5	State,IndividualLiberty,FreedomandDemocracy: The changing of state with special reference to developing countries, Concept ofdevelopment under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.	6
6	HumanRightsinIndianConstitutionandLaw: TheconstitutionofIndia: (i) Preamble (ii) FundamentalRights (iii) Directiveprinciplesofstatepolicy (iv) FundamentalDuties (v) Someotherprovisions UniversaldeclarationofHumanRightsandProvisionsofIndia,ConstitutionandLaw,National Human Rights Commission and State Human Rights Commission	6
	ReferenceBooks: 1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005. 2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.	

BTHM306.ENGINEERINGECONOMICS

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite		
Course Outcome	Tostudyconceptoftimevalueofmoney To study about demand in detail TounderstandMeaningofProductionandfactorsofproduction, Tounderstanddif.Conceptaboutmarket	
Unit	Contents	Contact Hrs
1	Introductiontothesubject:MicroandMacroEconomics,RelationshipbetweenScience,Engineering, TechnologyandEconomicDevelopment.ProductionPossibilityCurve,NatureofEconomicLaws.	4
2	TimeValueofMoney:conceptsandapplication.Capitalbudgeting;Traditionalandmodernmethods,Payback periodmethod,IRR,ARR,NPV,PI(withthehelpofcasestudies)	4
3	MeaningofDemand,LawofDemand,ElasticityofDemand;meaning,factorseffectingitanditspractical applicationandimportance.Demandforecasting(abriefexplanation)	4
4	MeaningofProductionandfactorsofproduction,Lawofvariableproportionsandreturnstoscale.Internaland external economies and diseconomies of scale. Concepts of cost of production, different types of costs; accountingcost,sunk cost,marginalcost,Opportunitycost.Breakeven analysis,MakeorBuydecision(case study).RelevanceofDepreciationtowardsindustry.	5
5	Meaningofmarket,typesofmarket,perfectcompetition,Monopoly,Monopolistic,Oligopoly.(Mainfeatures). Supplyandlawofsupply,Roleofdemandandsupplyinprice determination.	4
6	IndianEconomy,nature andcharacteristics.Basicconcepts;fiscal andmonetarypolicy,LPG,Inflation,Sensex, GATT,WTOandIMF.DifferencebetweenCentralbankandCommercialbanks	2
	ReferenceBooks: 1. ChopraP.N.,PrincipleofEconomics,KalyaniPublishers 2. DewettK.K.,Moderneconomictheory,S.Chand 3. H.L.Ahuja.,Moderneconomictheory,S.Chand 4. DuttRudar&SundhramK. P.M.,IndianEconomy 5. MishraS.K.,ModernMicroEconomics,PragatiPublications	

BTEEE305A.ELECTRICALENGINEERINGMATERIALS.

Teachingscheme:
Theory:3hrs
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,Physics,Chemistry	
Course Outcome	Tostudyaboutcrystalstructure Tounderstandmagneticmaterialstructure Tostudyaboutconductingandsuperconductingmaterials To study dielectric and nano materials.	
Unit	Contents	Contact Hrs
1	Crystallography Crystaldirectionsandplanes,DiatomicCrystal(CsCl,NaCl,Diamond,BaTiO3)Crystalimperfection,Point defects,Linedefects,SurfaceandVolumedefects,Structurepropertiesrelationship,structuredetermination by X-ray diffraction.	6
2	MagneticMaterials Originofmagnetizationusingatomictheory,classificationofmagneticmaterialsandproperties,Langevin's theoryofDia,Paraandferromagnetism,SoftandHardmagneticmaterialsandtheiruses,Domaintheoryof ferromagnetism,Hysteresisloss,AntiferromagneticandFerrimagneticmaterials,FerritesandGarnets, magneticbubbles,magneticrecording.	7
3	ConductingandSuperconductingMaterials Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors,BCStheory,Josephsoneffect,Hightemperaturesuperconductors,Applicationof superconductors(Cryotron,magneticlevitation)	7
4	SemiconductingMaterials Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell	6
5	DielectricMaterials Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials	7
6	NanoMaterials Nanomaterials : Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.	7
	ReferenceBooks: 1. MaterialScienceandEngineering–V.Raghavan 2. ElectricalEngineeringMaterials–A.J.Dekker 3. SolidStatePhysics–A.J.Dekker 4. ScienceofEngineeringMaterialsandCarbonNanotubes-C.M.SrivastavaandC.Srinivasan	

BTEEE305B.APPLIEDPHYSICS

Teachingscheme:	**ExaminationScheme:**
Theory: 3hrs	Mid-term test: 20 Marks
Totalcredit:3	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	Physics-II	
Course Outcome	1. UnderstandconceptofElectromagnetictheoryandMagnetism 2. UnderstandconceptodDielectricandSuperconductivity 3. Understandconceptofnanomaterial	
Unit	Contents	Contact Hrs
1	Electromagnetic Theory covering, Coulomb‟s law for distribution of charges, Polarization Gauss‟s law, Electric current and equation of continuity, Magnetic induction and Lorentz force, Steady current and Biot-Savertlaw,Ampere‟slaw,Magnetizationandmagneticintensity,Faradayslawofinduction,Generalization ofAmpere‟slaw,Maxwell‟sequations	4
2	Dielectrics:Introductiontodielectrics,ConceptofPolarization;Dipoleanddipolemoment,Electricfielddue to dipole (without derivation); Depolarization field, depolarization factors,Local electric field at an atom, Lorentz field, Lorentz relation; Dielectric constant and polarizability – ClausiusMossotti equation (with derivation); Types of polarization – electronic, ionic, dipolar, space charge; Temperature and frequency dependenceofdielectricconstant	5
3	Magnetism:MagneticfieldandMagnetization;Magneticsusceptibility,Paramagnetism-Paramagnetismdue to partially filled shells, transition elements (3d), rare earths (4f) and actinides, Magnetization and total angular momentum (definition and relationship); Concept of magnetic moment, gyromagnetic ratio, Lande‟s g-factor, Bohr Magneton, Curie‟s Law – derivation for „spin only‟ system (L = 0), expression for non-zero orbital angular momentum system (J = L + S); Ferromagnetism, antiferromagnetism, and ferrimagnetism; Exchangeinteractionbetween magneticicions;Molecular field, Expressionfor Curie-Weiss law,conceptofθP ;FerromagnetismandFerrimagnetism–Curietemperature,hysteresis,Hardferromagnets,permanentmagnets – SmCo5, Nd2Fe14B, Sintered Alnico, Sintered Ferrite – 3 etc. – Comparison and applications; Soft ferromagnets –Permalloys, Ferrites etc. – Comparison and applications; Neel temperature, Curie-Weiss law; Magneticresonance,NMRandMRI,MASER;	5
4	Superconductivity :Zero resistance, Critical temperature Tc ,Perfect diamagnetism, Meissner effect, Critical field Hc, Type I and Type II superconductors, Cooper pairs and formation of superconducting gap at Fermi level,Electron-PhononinteractionandBCStheory,Isotopeeffect,Applications–Superconductingmagnets, Transmissionlines,Josephsoneffect(DC&AC,qualitative),SQUID;(7Lectures)	4
5	Physics of Nanomaterials : Nanoscale; Properties of nanomaterials- Optical (SPR, luminescence, tuning band gapofsemiconductornanoparticles),Electrical(SET),Magnetic,Structural,Mechanical;Briefdescriptionof different methods of synthesis of nanomaterials (physical - laser ablation, ball milling; chemical - vapor deposition, sol gel); Reduction of dimensionality, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Density of states and energy spectrum for Zero dimensional solid, One dimensional quantum wire, Two dimensional potential well, Particle in a three dimensional box; Some special nanomaterials like, Aerogels – properties and applications, Carbon nanotubes - properties and applications,Core shell nanoparticles - properties and applications; Applications of nanomaterials: Electronics,Energy,Automobiles,Space,Medical,Textile,Cosmetics;NanotechnologyandEnvironment;	7
6	Quantum Computationand Communication covering, the idea of „qubit‟ and examples of single qubit logic gates- Classical bits, Qubit as a two level system; Bloch vector representation of state of qubit; Polarization statesofphotonandmeasurements;Pauligates,Hadamardgate,Phaseshiftgate,Quantumgatesasrotations in Bloch sphere; EPR paradox, concept of entanglement and Bell‟s inequality- The paradox, joint state of entangled particles; Proof of Bell‟s inequality; Two-qubit controlled gates; entanglement generation and the Bell basis- Generic twoqubit state, Controlled-NOT gate;Quantum circuit for transforming computational basis to Bell basis; Qualitative discussion on the „circuit‟ model of „quantum computation; An overview of classical cryptography: Vernam cypher; Public keycryptosystem; The „Rivest-Shamir-Adleman‟ or „RSA‟ protocol;CommentsonNo-cloningtheoremandimpossibilityoffaster-than-lighttransferofinformation;The	8

	BB84protocolinquantumcryptography-Theprotocol;itsvalidityonthebasisofHeisenberg‟suncertainty principle; Quantum Teleportation-Basic idea; measurement using Bell operator, need for classical communicationchannel;quantumcircuitdescribingteleportationprotocol;	

	RefBooks: 1. KittelC.,IntroductiontoSolidStatePhysics,WileyEastern 2. CallisterW.C.Jr.,MaterialScienceandEngineering:AnIntroduction,6thEdn.,JohnWiley&Sons 3. KulkarniSulabhaK.,Nanotechnology:Principles&Practices,CapitolPublishingCo. **4.** CharlesP.Poole,Jr.,FrankJ.Owens,IntroductiontoNanotechnology,WileyEastern **5.** NielsenM.A.,I.L.Chuang,QuantumComputation&QuantumInformation,CambridgeUniv.Press

BTEEE305C.SIGNALSANDSYSTEMS

Teachingscheme:
Theory:3hrs
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	Tostudyclassificationofsignalsandsystem Toanalyzediff.typesoftime signal	
Unit	Contents	Contact Hrs
1	CLASSIFICATIONOFSIGNALS Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse,Impulse,Exponential,ClassificationofCTandDTsignals-periodicandperiodic, random singals,	5
	CLASSIFICATIONOFSYSTEMS CTsystemsandDTsystems,Basicpropertiesofsystems-LinearTime invariant Systems and properties.	5
2	ANALYSISOFCONTINUOUSTIMESIGNALS Fourierseriesanalysis,SpectrumofC.T.singals,FourierTransformandLaplace Transform in Signal Analysi	7
3	LINEARTIMEINVARIANT–CONTINUOUSTIMESYSTEMS Differential equation, Block diagram representation, Impulse response, Convolution integral,frequencyresponse,FourierandLaplacetransformsinanalysis,Statevariable equations and matrix representation of systems	7
4	ANALYSISOFDISCRETETIMESIGNALS SamplingofCTsignalsandaliasing,DTFT andproperties,Z-transformandpropertiesofZ-transform.	7
5	LINEARTIMEINVARIANT-DISCRETETIMESYSTEMS Difference equations, Block diagram representation, Impulse response, Convolution sum,LTIsystemsanalysisusingDTFTandZ-transforms,Statevariableequationsand matrixrepresentationofsystems.	7
	REFERENCES: 1. AllanV.Oppenheim,S.WilskyandS.H.Nawab,SignalsandSystems,Pearson Education, 2007. 2. EdwardWKamen&Bonnie'sHeck,"FundamentalsofSignalsandSystems", Pearson Education, 2007 3. HPHsu,RakeshRanjan"SignalsandSystems",Schaum'sOutlines,TataMcGraw Hill, Indian Reprint, 2007 4. S.Salivahanan,A.Vallavaraj,C.Gnanapriya,DigitalSignalProcessing,McGrawHill International/TMH, 2007. 5. SimonHaykinsandBarryVanVeen,SignalsandSystemsJohnWiley&sons,Inc, 2004. 6. RobertA.GabelandRichardA.Roberts,Signals&LinearSystems,JohnWiley	

BTEEL307.NETWORKANALYSISANDSYNTHESISLABORATORY

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):30 Marks
Pr/oral:20Marks

Pre requisite	Basicelectricalengineering	
Course Objective	Tounderstandprinciplesofvariousnetworktheoremsandnetworkprinciples	
Course Outcome	Verifiesprinciplesofnetwork	
Expt No	TitleofExpt	
1	VerificationofSuperpostiontheorem	
2	VerificationofThevinion’stheorem	
3	VerificationofNorton’stheorem	
4	Verificationofmaximumpowertransfertheorem	
5	Verificationofreciprocating theorem	
6	DeterminationoftransientresponseofcurrentinRL&RCcircuitswithstepvoltageinput	
7	AnalysisofRL/RCandRLCcircuits	
8	DeterminationoftransientresponseofcurrentinRLCcircuitwithstepvoltageinputforunder damped,criticallydampedandoverdamped cases	
9	DeterminationoffrequencyresponseofcurrentinRLCcircuitwithsinusoidalacinput	
10	Determinationofdrivingpointandtransferfunctionsofatwoport laddernetwork andverify withtheoreticalvalues	
11	Determinecharactersticsoffilter	

BTEEL308.MEASUREMENTSANDINSTRUMENTATIONLABORATORY

Teachingscheme:
Labwork:4hrs
Total credit: 2

ExaminationScheme:
ContinuousAssessment(T/W):60 Marks
Pr/oral:40Marks

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	StudyofReyleigh'scurrentbalancemethod	
2	TostudyACbridges	
3	Studyofdifferenttypesofohm meter	
4	Studyofmegger	
5	StudyofinstrumentT/Fandit'stypes	
6	Studyofwattmeter	
7	Constructionofammeterandvoltmeter	
8	Tostudydifferenttypesoftransdusers	
9	Studydigitalfrequencymeteranddigitalvoltmeter	
10	Tostudylinearvariabledifferentialtransformer	
11	Studyofdigitaltorque measurement	

BTEEM309.ELECTRICALWORKSHOP/MINIPROJECT

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):30 Marks
Pr/oral:20Marks

Pre requisite	Basicelectricalengineering	
Course Objective	Toprovidehandsonexperiencetowardsbuildingofprototype	
Course Outcome	Buildandverifiesbasicscientificprinciples.	
Expt No	TitleofExpt	
1	Studyvariousresourcesandcomponentsinelectricalengineeringprojects	
2	Studydatasheetofbasiccircuitcomponentsofaproject	
3-5	Studyvarioussoftware inbuildingofprojectlike:ElectricCircuit,X-Circuit, Electrician app,ElectronicTutorials,Logisim,Circuitsimulator,FreePCBKiCADEDAsoftwersuit, SYC labs, Tina-TI etc	
6	PreparationofPCBforagivenproject	
7	Verificationandanalysisofproject	
8	Reportwriting	

SemesterIV

BTEEC401.ELECTRICALMACHINES–I

Teachingscheme:	**ExaminationScheme:**
Theory:3hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:4	End semester exam: 60 Marks

Pre requisite	Basicelectricaltechnology,	
Course Outcome	Tostudydiff.types,constructionandoperatingprincipleofdiff.typesofelectrical machines	
Unit	Contents	Contact Hrs
1	Single Phase Transformer:Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams,power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, Per Unit system, excitation phenomenon in transformers,switchingtransients,Autotransformers,Variablefrequencytransformer,voltageandcurrent transformers,weldingtransformers,Pulsetransformerandapplications.	7
2	ThreePhaseTransformers:Constructionalfeaturesofthreephasetransformers,Coolingmethodology,Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three windingtransformersanditsequivalentcircuit,Onloadtapchangingoftransformers,Moderntrendsin transformers,Typeandroutinetests,Standards.	8
3	ElectromechanicalEnergyConversionPrinciples:Energyinamagneticsystems,fieldenergyandmechanical force,energyinsinglyand multiplyexcited magnetic systems,determinationofmagnetic forceand torquefrom energyandcoenergy,Forcesandtorquesinmagneticfieldsystems,dynamicequationsofelectromechanical systemsandanalyticaltechniques	6
4	DCGenerators: Constructionofarmature and field systems, Working,types, emfequation, Armature windings, Characteristics and applications, Building of emf, Armature reaction - Demagnetizing and Cross magnetizing mmfsandtheirestimation;Remediestoovercomethearmaturereaction;Commutationprocess,Causesofbad commutationandremedies	9
5	D.C. Motors: Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and SelectionofDCMotors,StartingofDCMotors,SpeedControl,LossesandEfficiency,ConditionforMaximum Efficiency,BrakingofDCMotors,Effectofsaturationandarmaturereactiononlosses;Applications,Permanent MagnetDCMotors,Typeand Routinetests.	9
6	SpecialMachines:Constructionaldetailsofreluctancemachine,variable-reluctancemachines,basicVRM analysis,practicalVRManalysis,steppermotorsandtheiranalysis,BrushlessDCmotors.	6
	REFERENCES: 1. BhattacharyaS.K,“ElectricalMachines”,(TataMcGrawHillPublications) 2. KothariNagrath,“ElectricalMachines”,(TataMcGrawHillPublications) 3. M.N.Bandopadhyay,“ElectricalMachines”,(TataMcGrawHillPublications) 4. Fitzaralda,“ElectricalMachines”,(TataMcGrawHillPublications)	

BTEEC402:POWERSYSTEM-I:

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Tutorial:1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering	
Course Outcome	ToUnderstandbasicoperationofpowersystem,powersystemcomponentsandtheircharacteristics.	
Unit	Contents	Contact Hrs
1	**Load and Energy survey**: load duration curve, plant factor and plant economics. Introduction to different sources of energy. Construction, principle and working of different thermal power plants with neat block diagram of main parts, fuel economisation, for thermal power plants based on Coal, Oil and nuclear energy. HydroelectricPowerPlant:Advantagesandlimitations,selectionofsite,hydrologicalcyclesandhydrographs, storage and pondage, essential elements of hydroelectric plant, classification, different types of turbines and their selection, layout of hydro-station, simple numerical.	7
2	**Major Electric Equipments**: Descriptive treatment of alternator exciter & excitation systems, Transformers, Control panels, Metering & other control room equipments. Inductance:Definition,Inductanceduetointernalfluxoftwowiresinglephaselineofcompositeconductor line,ConceptofGMD,Inductanceofthreephaselinewithequal&unequalspacing,verticalspacing.	5
3	**Capacitance**:Conceptofelectricfield,Potentialdifferencebetweentwopointsinspace,Effectofearth's surfaceonelectricfield,Computationofcapacitance ofsinglephase,threephasetransmissionlineswith&with outsymmetricalspacingforsolid&compositeconductors.	6
4	**Transmission:**Typesofconductors,Choiceofconductormaterials,Strandedcopper&ACSRconductor, Insulationconsideration,Different types ofinsulator,supports,distributionofvoltage across theinsulatorstring, Stringefficiency,skineffect,Ferrantyeffect,proximityeffect	6
5	**Current and Voltage relation:** Representation of short, medium & long transmission lines, P. U. quantities, evaluation of ABCD parameters and surge impedance loading, power flow through transmission line, circle diagram, evaluation of relation between sending and receiving end current & voltage, Interpretation of transmissionlineequation,Numericals,Linecurrent,%regulation,Transmissionefficiency,numericalsbased on above	7
6	**MechanicalDesignofTransmissionLine**:Effectofwind&icecoatingontransmissionline,sagduetoequal & unequalsupports,with their derivation, Numericals. Corona:Phenomenonofcorona,factorsaffectingthecorona,Powerloss&disadvantagesofcorona.	5
	REFERENCES: 1. GuptaB.R.”PowerPlantEngineering”.(Eurasiapublications) 2. NagP.K.“PowerPlantEngineering”,(TataMcGrawHillPublications) 3. KothariNagrath,“ElectricPowerSystem”,(TataMcGrawHillPublications) 4. WadhvaS.L.,“ElectricPowerSystem”,(TataMcGrawHillPublications) 5. StevensionW.B.,“PowerSystem”,(EnglishLanguageBookSocietypublications)	

BTEEC403ELECTRICALINSTALLATIONANDESTIMATION

Teachingscheme:
Theory: 2 hrs
Tutorial-1hr
Totalcredit:3

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,electricalmeasurementandinstrumentation.	
Course Outcome	Topreparestimatesandcostingofelectricalinstallationsofpowersystem,Tounderstand procedures of contractingandpurchase.	
Unit	Contents	Contact Hrs
1	Estimating and Determination of conductor size for internal wiring, HT and LT Overhead Lines and UndergroundCables:Variousstepsto formanestimate,Pricecatalogue,Scheduleoflabourrates,Scheduleof ratesand estimatingdata, Conductor size, calculations for internal domestic wiring, Permissible voltage drops forlightingandindustrialload,simplenumericals,Conductorsizecalculationforundergroundcables:General considerations,Simplenumericals,ConductorsizecalculationsforoverheadlineswithA.C.S.R.conductors, simplenumericals.	7
2	Preparation of estimate of quantity of material required for wiring of a house (typical plan of house including electriclayoutistobegiven).Drawingofelectricalcircuitforsuchelectrification.Specificationforaccessories likeACenergymeter, mainswitch,Tumblerswitch,Electricheater,Fluorescenttube,Chokesfortubes,starters, bulbs,andInsulationtapes.	5
3	**PrinciplesofContracting**:Purchasingtechniques,Spotquotations,Floatinglimitedenquiry,Typicalexample of quotation form, preparation of comparative statement, Analysis of comparative statement, Tenders types (Single tender, Open tender), Earnest money, Security deposit, Various steps involved in complete purchase, Typical order formats, various criteria for selecting the supplier, General considerations in order form, Procedures to be followed for submitting the tenders & quotations. PurchaseDepartment,Objective,activities,dutiesandfunctions,purchaseorganization,Centralizedand decentralizedpurchasing,relativeadvantagesanddisadvantages,Applications	6
4	**Studyofdifferenttypesofcomponentsinelectricaldistributionsystem:** Cables: Classification, general construction, types of cables, jointing of cables, measurement of insulation resistance,Insulators:Requirements,materialsused,types(Pin,Suspension,Strain,Stay)Substation:Different types, classification, design consideration, various symbols, complete arrangement of substation (Single and double bus bar), key diagrams for typical substations. ReviewofInsulatedWires:Types:RubbercoveredtapedandcompoundedorVIR,Leadalloysheathed,Tough rubber sheathed, Weather proof, Flexible wire splicing, Termination (Twist splicing, Married joint, Tap joint, Pigtailjoint) DifferentTypesofSwitches:Tumbler,flush,pull,grid,architrave,rotarysnap,Pushbutton,Iron cladwaterproof,Quickbreakknifeswitch.Ceilingroses,Mountingblocks,Socketoutletsplugs,Main switches,Distributionfuseboards,MCB(MiniatureCircuitBreakers)	7
5	**DifferentToolsUsed**:Screwdriver,Pliersofvarioustypes, wrench,andblowlamp,Precautionforusingtools	4
6	**WiringSystem**:Selectionoftypesofwiring.Methodsofwiring(Cleat,Casingcapping,Metalsheathedand Conduit)CalculationandEstimationofpowerratingofdifferentACandDCmachines,schematicandwiring diagrams for motor control and protection circuit	6
	REFERENCES: 1. Uppal.S.L–ElectricalWiring,Estimation&Costing(KhannaPublication). 2. Raina&Bhattacharaya–ElectricalDesignEstimating&Costing(WillyEstern).	

BTEEC404.NUMERICALMETHODSANDPROGRAMMING.

Teachingscheme:	**ExaminationScheme:**
Theory: 2 hrs	Mid-term test: 20 Marks
Tutorial-1hr	InternalAssessment:20Marks
Totalcredit:3	End semester exam: 60 Marks

Pre requisite	Mathematics1,mathematics2,mathematics3,Cprogramming	
Course Outcome	TostudyandunderstandMATLABprogramming. To review mathematical concepts . Todevelopcomputerprogramforlinearandnonlinearequations.	
Unit	Contents	Contact Hrs
1	IntroductiontoMATLABProgramming:Arrayoperations,LoopsandexecutioncontrolLecture.Working withfiles:ScriptsandFunctions,Plottingandprogramoutput	5
2	ApproximationsandErrors:DefiningerrorsandprecisioninnumericalmethodsTaylor's/Maclaurinseries, Truncationandround-offerrors,Errorpropagation,Globalandlocaltruncationerrors.	6
3	NumericalDifferentiationandIntegration:Methodsofnumericaldifferentiationandintegration,trade-off betweentruncationandround-offerrors,errorpropagationandMATLABfunctionsforintegration	6
4	Linear and Nonlinear Equations: numerical methods in linear algebra, and use of MATLAB to solve practical problems. Gauss Elimination ,LU decomposition and partial pivoting,Iterative methods: Gauss Siedel and Special Matrices: Tri-diagonal matrix algorithm, Nonlinearequations:NewtonRaphsonmethodandMATLABroutinesfzeroandfsolve.,Nonlinearequationsin singlevariable,MATLABfunctionfzeroinsinglevariable,Fixed-pointiterationinsinglevariable,Newton-Raphsoninsinglevariable,MATLABfunctionfsolveinsingleandmultiplevariables,Newton-Raphsonin multiplevariab	6
5	RegressionandInterpolation:Linearleastsquaresregression(includinglsqcurvefitfunction),Functionaland nonlinearregression(includinglsqnonlinfunction),InterpolationinMATLABusingsplineandp chip	5
6	Ordinary Differential Equations (ODE) – 1 Explicit ODE solving techniques in single variable, Introduction to ODEs; Implicit and explicit Euler's methods, Second-Order Runge-Kutta Methods, Higher order Runge-Kutta methods, Error analysis of Runge-Kutta method. StiffODEsandMATLABode15salgorithm,PracticalexampleforODE-IVP,SolvingtransientPDEusing MethodofLines	7
	ReferenceBooks: 1. FausettL.V.(2007)AppliedNumericalAnalysisUsingMATLAB,2ndEd.,andPearsonEducation. 2. ChapraS.C.andCanaleR.P.(2006)NumericalMethodsforEngineers,5thEd.,andMcGrawHill. 3. NPTELnotes.http://nptel.ac.in/courses/122106033/	

ProductDesignEngineering

Teaching Scheme:	**ExaminationScheme:**
Lecture-cum-demonstration:1hr/week	ContinuousAssessment 1: 30Marks
DesignStudio:2 hr/week	ContinuousAssessment 2: 30Marks
	FinalAssessment: 40Marks

- ➢ Pre-requisites:KnowledgeofBasicSciences,MathematicsandEngineeringDrawing
- ➢ DesignStudio:2hr/weektodevelopdesignsketchingandpracticalskills, learningdigitaltools
- ➢ ContinuousAssessment:Progress throughaproduct designanddocumentationofsteps inthe selected product design
- ➢ FinalAssessment:ProductDesigninStudiowithfinalproductspecifications

CourseOutcomes:Attheendofthecourse,studentswillbeable to

1. Createsimplemechanicalorotherdesigns
2. Createdesigndocumentsfor knowledgesharing
3. Manageownworktomeetdesignrequirements
4. Workeffectivelywithcolleagues

CourseContents:

Unit1.IntroductiontoEngineeringProductDesign:

Trigger for Product/ Process/ System, Problem solving approach for Product Design, DisassemblingexistingProduct(s)andunderstandingrelationship ofcomponents witheachother, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failedproducts, Public/Society’s perception of products, and its input into product design.

Unit2.Ideation:

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or groupofindividuals,Sketchingofproducts, Market researchfor need,competitions,scaleandcost, Initial specifications of products

Unit3.Conceptualisation:

Computer operationprinciplesandimageeditingthroughagraphicalComposition;Computer aided 2D drafting and 3D Modeling through simple exercises.

Designingofcomponents,Drawingsofpartsandsynthesisofaproduct fromitscomponent parts, Rendering the designs for 3-D visualization and to create a photo realistic image, Parametric modelling of product, 3-D Visualization of mechanical products, Detail Engineering drawings of components

BTEEE406A.SOLIDSTATEDEVICES.

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	basicelectricalengineering,	
Course Outcome	1. Tostudyconstructionandcharacteristicsofsolidstatedevices. 2. Toapplyoperationalamplifier modelsincircuitsemployingnegativefeedback. 3. TodesignelectronicscircuitusingTimerICandvoltageregulators. 4. Toperformanalysisofamplifiersusingsmallsignalmodelsforthecircuit elements. 5. TocalculatethefrequencyresponseofcircuitscontainingBJT,Op-Ampetc	
Unit	Contents	Contact Hrs
1	SemiconductorDevicesandtheirapplications:Applicationsofdiodes-clippers,clampers,multipliers,Types of diodes - Zener diode, Tunnel diode, schottky diode, LED, PIN diode, Photodiode etc, BJT- CB, CE, CC configurations,biasing,FETbiasing,MOSFETbiasing,NMOS,PMOS,CMOS,Devicemodeling.	4
2	SignalandPowerAmplifiers:AnalysisofCB,CC,CEandFETamplifiers.Lowand highfrequencyresponse oftransistorandFETamplifier,Feedbackinamplifiers,Oscillators.Transistorpoweramplifiers.	4
3	OperationalAmplifiers:TheidealOp-Amp,equivalentcircuitofOp-Amp,idealvoltagetransfercurve, open loopOp-Ampconfigurations,Op-Ampparameters,blockdiagramrepresentationoffeedbackconfigurations, frequency response, high frequency Op-Amp.	4
4	ActiveFiltersandOscillators:Activefilters:lowpassfilter,highpassfilter,band-passfilters,bandreject filters,allpassfilters,comparatorsandoscillators.	4
5	GeneralizedLinearApplications:DCandACamplifiers,instrumentationamplifier,logarithmicamplifier, voltagetocurrentconverter,currenttovoltageconverter,theintegrator,thedifferentiator.	4
6	Specialized IC Applications: The 555 Timer as monostable, astable multivibrator, phase locked loops operatingprinciples,565PLLapplications,voltageregulators-fixed,adjustable,switching,special.Analog switchandanalogmultiplier.	4
	RefBooks: 1. Millman,HalkiasandSatyabrataJit,”ElectronicDevicesandCircuits”,4thedition,McGrawHill Education (India) Private Limited, 2015. 2. RobertL.BoylestadandLouisNashelsky,”Electronicdevicesandcircuittheory”,11thedition, Prentice Hall India Ltd, 2015. 3. RamakantA.Gayakwad,”Op-AmpsandlinearintegratedCircuits”4thedition,PearsonEducation, 2015.	

BTEEE405B.ANALOGANDDIGITALELECTRONICS

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	basicelectricalengineering,	
Course Outcome	Toreviewbasicnumber system. Tounderstanddeignandcharacteristicsofdigitallogicgates. To studydifferent techniques in use of digital circuits. Todesigndigital systems.	
Unit	Contents	Contact Hrs
1	TransistorasanAmplifier,loadline,Smallsignallowfrequencyanalysisofsinglestageamplifierindifferent configuration, High frequency equivalent circuit of transistor (hybrid pi), Cascade amplifier, High input resistancecircuits-CcoupledamplifierFrequencyresponse,Definitionof3dbbandwidth,Effectofcascading ongain&BW,Classificationofamplifiers	4
2	Block diagram of operational amplifier, Properties of ideal operational amplifier, Explanation of different terms appearing in OP-Amp application (offset, bias, quantities, PSRR, CMRR, Ad, AC, Slew rate etc.), Operation of circuit diagram of OP-Amp using discrete components & I.C.diagram, Different types of current of current sources in I.C. technology, frequency response of OP-Amp, OP-Amp parameters & minimizationtechniqueoftemperatureeffect,Inverting&Non-invertingoperationofOp-Amp&analysisfor AG,RI,RO,Linear&non-linearcircuitapplicationofOP-Amp	4
3	NumberSystems,BasicLogicGates&BooleanAlgebra:BinaryArithmetic&Radixrepresentationof differentnumbers.Sign&magnituderepresentation, fixed pointrepresentation,complementnotation, variouscodes&arithmeticindifferentcodes&theirinter conversion.Featuresoflogic algebra,postulates of Boolean algebra. Theorems of Boolean algebra. Boolean function.Derived logic gates:Exclusive-OR, NAND, NOR gates, their block diagrams and truth tables. Logic diagrams from Boolean expressions and Vica-versa.Converting logic diagrams to universal logic.Positive, negative and mixed logic. Logic gate conversion	4
4	DigitalLogicGateCharacteristics:TTLlogicgatecharacteristics:Theory&operationofTTLNANDgate circuitry. Open collector TTL. Three state output logic. TTL subfamilies. MOS & CMOS logic families. Realization of logic gates in RTL, DTL, ECL, and C-MOS & MOSFET. Interfacing logic families to one another.SequentialSystems:Latches,flip-flops,R-S,D,J-K,MasterSlaveflipflops.Conversionsof flip-flops Counters:Synchronous&asynchronousrippleanddecadecounters,Moduluscounter, skippingstatecounter,counterdesign,statediagramsandstatereduction techniques.Ring counter. Counterapplications.Registers:bufferregister,shiftregister	4
5	MinimizationTechniques:Minterm,Maxterm,KarnaughMap,Kmapupto4variables.Simplificationof logiConversionoftruthtablesinPOSandSOPform.Incompletespecifiedfunctions.Variable mapping.Quinn-McKlusky minimization techniques. c functions with K-map	4
6	CombinationalSystems:Combinationallogiccircuitdesign,halfandfulladder,subtractor.Binaryserialand parallel adders.BCD adder. Binary multiplier.Decoder: Binaryto Graydecoder, BCD to decimal, BCD to 7- segment decoder' Multiplexer, DE multiplexer, encoder. Octal to binary, BCD to excess-3 encoder. Diode Switchingmatrix.Designoflogiccircuitsbymultiplexers,encoders,decodersandDEmultiplexers.	4
	RefBooks: 1. Mandal,DigitalElectronics:PrinciplesandApplications,TMH2009 2. Leach,DigitalPrinciplesandApplications,ed.7,TMH2008 3. M.MorrisMano,DigitalLogicandComputerDesign,PearsonEdu. 2014	

BTEEE405C.ELECTROMAGNETICTHEORY

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,machine1,physics	
Course Outcome	Tounderstandvectorrelationsindiff.forms To analyze diff. laws and their solution Tostudyaboutmagneto static Tounderstandtimevaryingfieldandeffectofmagnetismintransmissionline	
Unit	Contents	Contact Hrs
1	Introduction:VectorRelationinrectangular,cylindrical,sphericalandgeneralcurvilinearcoordinatesystem. Conceptandphysicalinterpretationofgradient,Divergenceandcurl,Green'sStoke'sandHelmholztheorems	4
2	Electrostatics:Electricfieldvectors-electricfieldintensity,fluxdensity&polarization.Electricfielddueto variouschargeconfigurations.Thepotentialfunctionsanddisplacementvector.	4
3	Gauss'slaw,Poisson'sandLaplace'sequationandtheirsolution.Uniquenesstheorem.Continuityequation. Capacitance and electrostatics energy. Field determination by method of images. Boundary conditions. Fieldmappings and concept of field cells	5
4	Magnetostatics:Magneticfieldvector:Magneticfieldintensity,fluxdensity&magnetization,Bio-Savart'slaw, Ampere'slaw,Magneticscalarand vectorpoten Energy stored in magnetic field, Boundary conditions, Analogybetweenelectricandmagneticfield,Fieldmappingandconceptoffieldcellstial,self&mutual inductance.	5
5	TimeVaryingFields:Faraday'slaw,Displacementcurrentsandequationofcontinuity.Maxwell'sequations, Uniformplanewaveinfree space, dielectricsandconductors,skineffect sinusoidaltimevariations, reflections, refraction&polarizationofUPW,standingwaveratio.Pointingvectorandpowerconsiderations.	4
6	TransmissionLines:Thehigh-frequencycircuit.LCRladdermodel.ThetransmissionLineequation.Solution forloss-lesslines.Wavevelocityandwaveimpedance.ReflectionandTransmissioncoefficientsatjunctions. VSWR	4
	RefBooks: 1. G.S.N.Raju:ElectromagneticFieldTheoryandTransmissionLines,Pearson.2006 2. S.BaskaranandK.Malathi:ElectromagneticFieldandWaves,ScitechPub. 2013 3. R.S.Kshetrimayum,ElectromagneticFieldTheory,CengageLearning.2012 4. J.D.Kraus:Electromagnetic.5thedition,MGH.1999	

BTEEOE407A.INDUSTRIALSAFETY.

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	Basicelectricalengineering,electricalmeasurementandinstrumentation,machine1	
Course Outcome	Tounderstandimportanceofsafetyinindustrialenvironment. Tounderstanddifferentsafetyproceduresinanindustrialenvironment.	
Unit	Contents	Contact Hrs
1	SAFETYINMETALWORKINGMACHINERYANDWOODWORKINGMACHINESGeneralsafety rules,principles,maintenance,Inspectionsofturningmachines,boringmachines,millingmachine,planning machineandgrindingmachines,CNCmachines,Woodworkingmachinery,types,safetyprinciples,electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards	4
2	PRINCIPLES OF MACHINE GUARDING Guarding during maintenance, Zero Mechanical State (ZMS), Definition, Policyfor ZMS –guardingofhazards -point ofoperation protective devices, machine guarding, types, fixed guard, interlock guard, automatic guard, trip guard, electron eye, positional control guard, fixed guard fencing- guard construction- guard openin Selection and suitability: lathe-drilling-boring-milling-grinding-shaping-sawingshearingpresses-forgehammer-flywheels-shafts-couplings-gears-sprocketswheels andchains-pulleysandbelts-authorizedentrytohazardousinstallations-benefitsofgoodguardingsystems.	5
3	SAFETY IN WELDING AND GAS CUTTING Gas welding and oxygen cutting, resistances welding, arc weldingandcutting,commonhazards,personalprotectiveequipment,training,safetyprecautionsinbrazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment andinstruments–safetyingeneration,distributionandhandlingofindustrialgases-colourcoding–flashback arrestor–leakdetection-pipelinesafety-storageandhandlingofgascylinders.	4
4	SAFETY IN COLD FORMING AND HOT WORKING OF METALS Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses,powerpresselectriccontrols,powerpresssetupanddieremoval,inspectionandmaintenance-metal sheers-press brakes.	4
5	Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending ofpipes, hazards and control measures. Safetyingasfurnaceoperation,cupola,crucibles,ovens,foundry healthhazards,work environment,material handlinginfoundries,foundryproductioncleaningandfinishingfoundryprocesses.	4
6	SAFETYINFINISHING,INSPECTIONANDTESTINGHeattreatmentoperations,electroplating,paint shops, sand and shot blasting, safety in inspection and testing, dynamic balancing, hydro testing, valves, boiler drums and headers, pressure vessels, air leak test, steam testing, safety in radiography, personal monitoringdevices,radiationhazards,engineeringandadministrativecontrols,IndianBoilersRegulation	4
	References: 1. “AccidentPreventionManual”–NSC,Chicago,1982. 2. “OccupationalsafetyManual”BHEL,Trichy,1988. 3. “SafetyManagementbyJohnV.Grimaldiand RollinH. Simonds,AllIndiaTravelersBookseller,New Delhi, 1989. 4. “SafetyinIndustry”N.V.KrishnanJaicoPublisheryHouse,1996. 5. IndianBoileractsandRegulations,GovernmentofIndia. 6. Safetyintheuseofwoodworkingmachines,HMSO,UK1992. 7. HealthandSafetyinweldingandAlliedprocesses,weldingInstitute,UK,HighTech.PublishingLtd., London, 1989	

BTEEOE407B.INTRODUCTIONTONON-CONVENTIONALENERGYSOURCES,

Teachingscheme:	**ExaminationScheme:**
Theory:2hrs	Mid-term test: 20 Marks
Totalcredit:2	InternalAssessment:20Marks
	End semester exam: 60 Marks

Pre requisite	Energyandenvironmentalengineering,basicelectricalengineering	
Course Outcome	Toreviewenergyscenario. Tounderstandbasicconcepts,constructionandoperationalfeaturesofdifferentnon-conventionalsources.	
Unit	Contents	Contact Hrs
1	Introduction:Worldenergysituation,conventionalandnon-conventionalenergysources,Indianenergy scene.	2
2	SolarEnergy:Solarradiation,solarradiationgeometry,solarradiationontiltedsurface.Solarenergy collector. Flat- plate collector, concentrating collector- parabolidal and heliostat. Solar pond. Basic solarpower plant. Solar cell, solar cell array, basic photo-voltaic power generating system	4
3	Wind Energy: Basic principle of wind energy conversion, efficiency of conversion, site selection. Electric power generation-basic components, horizontal axis and vertical axis wind turbines, towers, generators, control and monitoring components. Basic electric generation schemes- constant speed constant frequency, variablespeedconstantfrequencyandvariablespeedvariablefrequencyschemes.Applicationsofwind energy	6
4	GeothermalEnergy:Geothermalfields,estimatesofgeothermalpower.Basicgeothermalsteampowerplant, binary fluid geothermal power plant and geothermal preheat hybrid power plant. Advantages and disadvantages of geothermal energy. Applications of geothermal energy. Geothermal energy in India. TidalEnergy:Introductiontotidalpower.Componentsoftidalpowerplants,doublebasinarrangement. Powergeneration.Advantagesandlimitationsoftidalpowergeneration.ProspectsoftidalenergyinIndia	5
5	Nuclear Fusion Energy: Introduction, nuclear fission and nuclear fusion. Requirements for nuclear fusion. Plasmaconfinement–magneticconfinementandinertialconfinement.BasicTokamakreactor,laserfusion reactor.Advantagesofnuclearfusion.Fusionhybridandcoldfusion	4
6	BiomassEnergy:Introduction,biomasscategories,bio-fuels.Introductiontobiomassconversion technologies. Biogas generation, basic biogas plants-fixed dome type, floating gasholder type, Deen Bandhu biogas plant, Pragatidesignbiogasplant.Utilizationofbiogas.Energyplantation.Pyrolysisscheme.Alternativeliquid fuels–ethanolandmethanol.Ethanolproduction	4
	RefBooks: 1. A.N.Mathur:Non-ConventionalResourcesofEnergy.2010 2. V.V.N.Kishore:RenewableEnergyEngineeringandTechnology,TERI.2006	

BTEEOE407C.SOFTWARETECHNIQUES.

Teachingscheme:
Theory:2hrs
Totalcredit:2

ExaminationScheme:
Mid-term test: 20 Marks
InternalAssessment:20Marks
End semester exam: 60 Marks

Pre requisite	BasicCprogramming	
Course Outcome	Tounderstanddifferenttechniquesofsoftwaremodels. To understand verification and validation of software. Toanalyzesoftwareprojectmanagement.	
Unit	Contents	Contact Hrs
1	Introduction- Notion of SoftwareasaProduct– characteristicsof agoodSoftwareProduct.Engineering aspects ofSoftwareproduction–necessityofautomation.JobresponsibilitiesofProgrammersandSoftwareEngineers as Software developers	3
2	ProcessModelsandProgramDesignTechniques-SoftwareDevelopmentProcessModels–Code&Fixmodel, Waterfallmodel,Incrementalmodel,RapidPrototypingmodel,Spiral(Evolutionary)model.	3
3	GoodProgramDesignTechniques–StructuredProgramming,CouplingandCohesion,Abstractionand InformationHiding,AutomatedProgramming,DefensiveProgramming,RedundantProgramming,Aesthetics. SoftwareModellingTools–DataflowDiagrams,UMLandXML.JacksonSystemDevelopment	7
4	VerificationandValidation:TestingofSoftwareProducts–Black-BoxTestingandWhite-BoxTesting,Static Analysis, Symbolic Execution and Control Flow Graphs – Cyclomatic Complexity. Introduction to testing of Real-time Software Systems.	5
5	Software Project Management: Management Functions and Processes, Project Planning and Control, Organization and Intra-team Communication, RiskManagement. Software Cost Estimation – underlyingfactors ofcriticalconcern.Metricsforestimatingcostsofsoftwareproducts–FunctionPoints.Techniquesforsoftware costestimation–Expertjudgement,Delphicostestimation,Workbreak-downstructureandProcessbreak-downstructure,COCOMOandCOCOMO-II.	6
6	Advanced Topics: Formal Methods in Software Engineering – Z notation, Hoare‟s notation. Formalization of FunctionalSpecifications–SPEC.SupportenvironmentforDevelopmentofSoftwareProducts.Representative Tools for Editors, Linkers, Interpreters, Code Generators, Debuggers. Tools for Decision Support and Synthesis, ConfigurationcontrolandEngineeringDatabases,ProjectManagement.Petrinets.IntroductiontoDesign Patterns,AspectorientedProgramming.	7
	Referencebooks: 1. FundamentalsofSoftwareEngineering–CarloGhezziet.al.2.SoftwareEngineering–Design, Reliability Management – Pressman. 2. SoftwareEngineering–IanSommerville.2.SoftwareEngineering-Shoeman.3.Software EngineeringwithAbstraction–BerzinsandLuqi	

BTEEL408.ELECTRICALMACHINE-ILABORATORY

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):60 Marks
Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	Toverifyturnratio oftransformer	
2	TodetermineequivalentcircuitdiagramoftransformerthroughOCandSCtest	
3	Todetermineefficiencybydirectloadtestonsinglephasetransformer	
4	ToverifyV-Irelation&todrawphasordiagramofi)star-starii)star-deltaiii)delta-star iv)delta-deltaconnectionof3phasetransformer	
5	Toverifyrelationini)scottconnectionii)opendelta connection	
6	Tostudytheparalleloperationof3phasetransformer	
7	Tostudyconstructionofstatorand rotorofDCmachine	
8	Todeterminemagnetization,internalandexternalcharacteristicsofaseriesgenerator	
9	Todetermineinternalandexternalcharacteristicsofdcmachine	
10	TodetermineST characteristicsofDCmotor	
11	TodetermineefficiencyofDCmotor	
12	TocontroltheSpeedofDCmotor	
13	ToconductbrakingtestonDCmotor	

BTEEL409.POWERSYSTEM-ILABORATORY

Teachingscheme:	**ExaminationScheme:**
Lab work : 2 hrs	ContinuousAssessment(T/W):60 Marks
Total credit: 1	Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	StudyofThermalpowerplantlayoutanditscomponents	
2	StudyofHydropowerplantlayoutanditscomponents	
3	Studyofalternatorexciter systems	
4	Studyofcontrolpanelandmeteringequipment	
5	StudyofdifferentOHTSystemconductors	
6	StudyofdifferentOHTSysteminsulator	
7	Determinationofperformanceparameterofshorttransmissionline	
8	Determinationofperformanceparameterofmediumtransmissionline	
9	Determinationofperformanceparameteroflongtransmissionline	
10	DeterminationofABCDparametersoftransmissionline	
11		
12		

PS:Avisittonearbytypicalpowerplantwhichincludesstudyofexpt1-6isrecommended.

BTEEL410.NUMERICALMETHODSANDPROGRAMMINGLABORATORY

Teachingscheme:	ExaminationScheme:
Labwork:2hrs	ContinuousAssessment(T/W):60 Marks
Total credit: 1	Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	Programforscanconversionofastraightline	
2	Programforscanconversionofacircle	
3	Programforscanconversionofanellipse	
4	Programforscanconversionofarectangle	
5	Programforscanconversionofanarc	
6	Programforscanconversionofasector	
7	Programforfindingrootsoff(x)=0bynewtonraphsonmmethod	
8	Programforfindingrootsoff(x)=0bybisectionmethod	
9	Programforsolvingnumericalintegrationbysimpson’s1/3rule	
10	Programforsolvingordinarydifferentialequationbyrungekuttamethod	

BTEEL411.ELECTIVE-IILABORATORY

Teachingscheme:
Lab work : 2 hrs
Total credit: 1

ExaminationScheme:
ContinuousAssessment(T/W):60 Marks
Pr/oral:40Marks

8-10experimentscoveringfullcontentofthesyllabusandatleastoneexperimentfromeachunit.

AnaloganddigitalElectronicsLab

Pre requisite	Basicelectricalengineering	
Course Objective		
Course Outcome		
Expt No	TitleofExpt	
1	MeasurementofopAmpparameters	
2	Designandimplementationofintegrator,differentiatorandcomparator	
3	Designandimplementationofphasedlockedloopanditsapplications	
4	Designandimplementationofvarioussignalgenerator	
5	Designandimplementationofinstrumentamplifier	
6	Designandimplementationofarithmeticcircuits	
7	Designandimplementationofvariouscodeconvertersanditsapplications.	
8	Designandimplementationofmultiplexeranddemultiplexeranditsapplications.	
9	Designandimplementationofencodersanddecodersanditsapplications	
10	Designandimplementationofsynchronousandasynchronouscountersanditsapplications	
11	Designandimplementationofnon-sequentialcounters.	
12	Designandimplementationofshiftregistersanditsapplications.	
13	ImplementationandverificationsofCombinationalcircuitsonprogrammablelogicdevices	

Dr. Babasaheb Ambedkar Technological University, Lonere.

B. Tech (Electronics & Telecommunication Engineering) / B. Tech (Electronics Engineering)

Curriculum for Semester III [Second Year]

Sr. No.	Course Code	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
			L	T	P	MSE	CA	ESE		
1	BTBSC301	Engineering Mathematics-III	3	1	0	20	20	60	100	4
2	BTEXC302	Analog Circuits	2	1	0	20	20	60	100	3
3	BTEXC303	Electronic Devices & Circuits	2	1	0	20	20	60	100	3
4	BTEXC304	Network Analysis	2	1	0	20	20	60	100	3
5	BTEXC305	Digital Logic Design	2	1	0	20	20	60	100	3
6	BTHM3401	Basic Human Rights	2	0	0	--	50	--	50	(Audit)
7	BTEXL307	Analog Circuits Lab	0	0	2	--	60	40	100	1
8	BTEXL308	Electronic Devices & Circuits Lab	0	0	2	--	60	40	100	1
9	BTEXL309	Network Analysis Lab	0	0	2	--	60	40	100	1
10	BTEXL310	Digital Logic Design Lab	0	0	2	--	60	40	100	1
11	BTEXW311	Electronics Workshop	0	0	2	--	60	40	100	1
12	BTES211P	Field Training/ Internship/Industrial Training Evaluation	--	--	--	--	--	50	50	1
		Total	**13**	**05**	**10**	**100**	**450**	**550**	**1100**	**22**

B. Tech (Electronics & Telecommunication Engineering) / B. Tech (Electronics Engineering)

Curriculum for Semester IV [Second Year]

Sr. No	Course Code	Course Title	Hours Per Week			Evaluation Scheme			Total Marks	Credits
			L	T	P	MSE	CA	ESE		
1	BTEXC401	Electrical Machines and Instruments	2	1	0	20	20	60	100	3
2	BTEXC402	Analog Communication Engineering	2	1	0	20	20	60	100	3
3	BTEXC403	Microprocessor	2	1	0	20	20	60	100	3
4	BTEXC404	Signals and Systems	2	1	0	20	20	60	100	3
5	BTID405	Product Design Engineering	1	0	2	30	30	40	100	2
6	BTBSC406	Numerical Methods and Computer Programming	2	1	0	20	20	60	100	3
7	BTEXL407	Electrical Machines and Instruments Lab	0	0	2	--	60	40	100	1
8	BTEXL408	Analog Communication Engineering Lab	0	0	2	--	60	40	100	1
9	BTEXL409	Microprocessor Lab	0	0	2	--	60	40	100	1
10	BTEXL410	Signals and Systems Lab	0	0	2	--	60	40	100	1
11	BTHML411	Soft-Skill Development	0	0	2	--	60	40	100	1

12	BTEXF412	Field Training/ Internship/Industrial Training (Minimum 4 weeks which can be completed partially in third semester or fourth semester or in at one time)	--	--	--	--	--	--	--	1 (To be evaluated in Vth Semester)
		Total	**11**	**05**	**12**	**130**	**430**	**540**	**1100**	**22**

BTBSC301	Engineering Mathematics-III	4 Credits

Second Year B. Tech Classes (Common to all Branches) Semester: III

Prerequisites: Differential and Integral Calculus, Taylor series and Infinite series, Differential equations of first order and first degree, Fourier series, Vector algebra, Algebra of complex numbers.

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of appropriate solution techniques related to:

1. Linear differential equations of higher order using analytical methods and numerical methods applicable to Control systems and Network analysis.
2. Transforms such as Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Vector differentiation and integration required in Electromagnetics and Wave theory.
4. Complex functions, conformal mappings, contour integration applicable to Electrostatics, Digital filters, Signal and Image processing.

Course Outcomes:

On completion of the course, students will be able to:

1. Solve higher order linear differential equation using appropriate techniques for modeling and analyzing electrical circuits.
2. Solve problems related to Fourier transform, Laplace transform and applications to Communication systems and Signal processing.
3. Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.
4. Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields.
5. Analyze conformal mappings, transformations and perform contour integration of complex functions in the study of electrostatics and signal processing.

UNIT - 1 07 Hours

Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT - 2 07 Hours

Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT - 3 07 Hours

Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval‟s identity for Fourier Transforms.

UNIT - 4 07 Hours

Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange‟s linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation ($\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$), and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$).

UNIT - 5 07 Hours

Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

UNIT - 6 07 Hours

Functions of Complex Variables (Integral calculus)

Cauchy‟s integral theorem; Cauchy‟s integral formula; Residues; Cauchy‟s residue theorem (All theorems without proofs).

TEXT BOOKS

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledge ware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

REFERENCE BOOKS

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2. A Text Book of Engineering Mathematics by Peter O‟ Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy . Knowledge ware, Mumbai.

5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.

GENERAL INSTRUCTIONS

1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

BTEXC302 Analog Circuits 3 Credits

Course Objectives:

1. To understand characteristics of IC and Op-Amp and identify the internal structure.
2. To introduce various manufacturing techniques.
3. To study various op-amp parameters and their significance for Op-Amp.
4. To learn frequency response, transient response and frequency compensation techniques for Op-Amp.
5. To analyze and identify linear and nonlinear applications of Op-Amp.
6. To understand functionalities of PLL.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand the characteristics of IC and Op-Amp and identify the internal structure.
2. Understand and identify various manufacturing techniques.
3. Derive and determine various performances based parameters and their significance for Op-Amp.
4. Comply and verify parameters after exciting IC by any stated method.
5. Analyze and identify the closed loop stability considerations and I/O limitations.
6. Analyze and identify linear and nonlinear applications of Op-Amp.
7. Understand and verify results (levels of V & I) with hardware implementation.
8. Implement hardwired circuit to test performance and application for what it is being designed.
9. Understand and apply the functionalities of PLL.

UNIT - 1	06 Hours

OP-AMP Basics

Block diagram of OP-AMP, Differential Amplifier configurations, Differential amplifier analysis for dual-input balanced-output configurations, Need and types of level shifter, current mirror circuits. Feedback topologies: Voltage series and voltage shunt feedback amplifier and its effect on R_i, R_o, bandwidth and voltage gain.

UNIT - 2	06 Hours

Linear Applications of OP-AMP

Inverting and non-inverting amplifier configurations, voltage follower, summing, averaging scaling amplifier, difference amplifier, integrator, differentiator, and instrumentation amplifiers.

UNIT - 3	06 Hours

Non-linear Applications of OP-AMP

Introduction to comparator, characteristics and applications of comparator, Schmitt trigger, clippers and clampers, voltage limiters, square wave generator, triangular wave generator, Need of precision rectifiers, Half wave and Full wave precision rectifiers.

UNIT - 4	06 Hours

Converters using OP-AMP

V-F, I-V and V-I converter, Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, resistor string etc. Analog-to-digital converters (ADC): Single slope, dual slope, successive approximation, flash type.

UNIT - 5	06 Hours

Oscillators

Principle of Oscillators, Barkhausen criterion, Oscillator types: RC oscillators (design of phase shift, Wien bridge etc.), LC oscillators (design of Hartley, Colpitts, Clapp etc.), non-sinusoidal oscillators, and voltage controlled oscillators.

UNIT - 6	06 Hours

Active filters and PLL

Design guidelines of Active filters: Low pass, high pass, band pass and band stop filters, block diagram of PLL and its function.

TEXT/REFERENCE BOOKS

1. Ramakant A. Gaikwad, “Op Amps and Linear Integrated Circuits”, Pearson Education 2000.
2. Salivahanan and Kanchana Bhaskaran, “Linear Integrated Circuits”, Tata McGraw Hill, India 2008.
3. George Clayton and Steve Winder, “Operational Amplifiers”, 5th Edition Newnes.
4. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, Tata McGraw Hill.
5. Bali, “Linear Integrated Circuits”, McGraw Hill 2008.
6. Gray, Hurst, Lewise, Meyer, “Analysis & Design of Analog Integrated Circuits”, Wiley Publications on Education.

BTEXC303 Electronic Devices & Circuits 3 Credits

Prerequisites:

Basic knowledge of Semiconductor Physics.

Course Objectives:

1. To introduce semiconductor devices FET and MOSFET, their characteristics, operations, circuits and applications
2. To introduce concepts of both positive and negative feedback in electronic circuits
3. To analyze and interpret FET and MOSFET circuits for small signal at low and high frequencies
4. To simulate electronics circuits using computer simulation software and verify desired results
5. To study the different types of voltage regulators.

Course Outcomes:

On completion of the course, students will be able to:

1. Comply and verify parameters after exciting devices by any stated method.
2. Implement circuit and test the performance.
3. Analyze small signal model of FET and MOSFET.
4. Explain behavior of FET at low frequency.
5. Design an adjustable voltage regulator circuits.

UNIT - 1	06 Hours

JFET

Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self).FET as an amplifier and its analysis (CS) and its frequency response, Small signal model, FET as High Impedance circuits

UNIT - 2	06 Hours

MOSFET& its DC Analysis

Basics of MOS Transistor operation, Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFET configurations: DC Analysis, constant current source biasing, MOSFET as switch, diode/active resistor, Current sink and source, current mirror, Voltage references, Basic principle of band gap reference, CMOS Inverter as amplifier: Active load, Current source and Push pull configurations.

UNIT - 3	06 Hours

Electronics Amplifiers

Classification of amplifiers, Fundamentals of Low noise and Power amplifiers. Feedback amplifiers: Feedback concept and topologies, Effect of feedback on terminal characteristics of amplifiers, feedback amplifier analysis, cascade amplifiers, DC Amplifiers.

UNIT - 4	06 Hours

Oscillators

Barkhausen criterion, stability with feedback. Classification of oscillators, RC Oscillators: FET RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator.

UNIT - 5	06 Hours

Multivibrators

IC555 Block diagram, Types of Multivibrators: Astable, Monostable and Bistable, Operation of Multivibrators using FETs and IC555. Applications of IC555 in Engineering.

UNIT - 6	06 Hours

Voltage Regulator

Block diagram of an adjustable three terminal positive and negative regulators (317,337) typical connection diagram, current boosting, Low drop out voltage regulators, Introduction to Switch Mode Power supply (SMPS), Block diagram of SMPS, Types of SMPS. Comparison of Linear Power supply and SMPS.

TEXT/REFERENCE BOOKS

1. Millman Halkias, “Integrated Electronics-Analog and Digital Circuits and Systems”, Tata McGraw Hill, 2000
2. Donald Neaman, “Electronic Circuit Analysis and Design”, 3rd Edition, Tata McGraw Hill
3. Brijesh Iyer, S. L. Nalbalwar, R. Dudhe, “Electronics Devices & Circuits”, Synergy Knowledgeware Mumbai, 2017. ISBN:9789383352616
4. David A. Bell, “Electronic Devices and Circuits”,5th Edition, Oxford Press
5. R. L. Boylstad, L. Nashlesky, “Electronic Devices and circuits Theory”, 9thEdition, Prentice Hall of India, 2006.

BTEXC304	Network Analysis	3 Credits

Course Objectives:

1. To learn about the basic laws of electric circuits as well as the key fundamentals of the communication channels, namely transmission lines.
2. To understand the need of simplification techniques of complicated circuits
3. To learn about the comprehensive insight into the principle techniques available for characterizing circuits, networks and their implementation in practice.
4. To learn about the use of mathematics, need of different transforms and usefulness of differential equations for analysis of networks.
5. To train the students for handling analog filter design through theory of NA along with practical, this is basic requirement of signal processing field.

Course Outcomes:

On completion of the course, students will be able to:

1. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
2. Design passive filters and attenuators theoretically and practically. To apply knowledge for design of active filters as well as digital filters and even extend this to advance adaptive filters.
3. Identify issues related to transmission of signals, analyze different RLC networks.
4. Find technology recognition for the benefit of the society.

UNIT - 1	06 Hours

Basic Circuit Analysis and Simplification Techniques

Basic circuit elements, Simplification of networks, Equivalent „T‟ and „Π‟ networks of any complicated network, Voltage and Current laws (KVL/KCL), Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Principle of duality, Source transformation and source shifting, Network Theorems such as Superposition, Thevenin‟s, Norton‟s and Maximum Power Transfer Theorems.

***Note**: Above circuit analysis, mentioned in this Unit-1, is for AC network only.*

UNIT - 2	06 Hours

Frequency Selective Networks

Significance of Quality factor, Series Resonance: Resonating frequency, Reactance curves, Variation of circuit parameters such as impedance, phase angle, voltage and current with frequency; Bandwidth, Selectivity, Magnification factor, Parallel resonance: Resonant frequency, Variation circuit parameters such as admittance, phase angle, voltage and current with frequency; Bandwidth and selectivity. Analysis of parallel resonating circuit with resistance present in both branches (inductive and capacitive branches) and tank circuit, Effect of generator resistance on BW & Selectivity, Comparison and applications of series and parallel resonant circuits.

UNIT - 3	06 Hours

Electrical Network Parameters and Passive Filters

Classifications: Symmetrical and Asymmetrical networks. Properties of two port Network :(i) Symmetrical Networks (T and Π only): Characteristics impedance and propagation constant in terms of circuit components, open and short circuit parameters (ii) Asymmetrical

Networks: Image Impedance and Iterative Impedance. Passive Filters: Filter fundamentals, Introduction to Neper and Decibel, Relation between Neper and Decibel, Constant K-LPF, HPF, BPF and BSF, m-derived LPF and HPF, Terminating half sections, Concept of composite filters. Attenuators: Symmetrical T and Π type attenuators, Ladder attenuator.

UNIT - 4	06 Hours

Steady State and Transient Response

DC and AC response of R-L, R-C and RLC circuits, Analysis of electrical circuits using Laplace Transform.

UNIT - 5	06 Hours

Two Port Network Parameters and Functions

Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.

UNIT - 6	06 Hours

Transmission Line Theory

Types of Transmission lines, Transmission Line Equation, Equivalent circuits, Primary and Secondary line constants, Terminations of transmission lines, VSWR and Reflection Coefficient, Impedance matching, Transmission line measurements using Smith chart.

TEXT/REFERENCE BOOKS

1. D Roy Choudary, “Network and Systems” 1st edition, New Age International, 1988
2. John D. Ryder, “Network Lines and Fields” 2nd edition, PHI, 1955
3. C. P. Kuriakose, “Circuit Theory Continuous and Discrete Time System, Elements of Network Synthesis” PHI
4. W.H. Hayt Kemmerly, “Engineering Circuit Analysis”, 5th Edition, Tata McGraw Hill Publications, 1993.
5. M. E. Van Valkenburg, “Network Analysis”, 3rd Edition, Pearson, 2004. 6. Boylestead, “Introductory Circuit Analysis”, 4th edition, Charles & Merrill, 1982. 7. Royal Signal Handbook on Line Communication.

BTEXC305 Digital Logic Design 3 Credits

Course Objectives:

1. To acquaint the students with the fundamental principles of two-valued logic and various devices used to implement logical operations on variables.
2. To lay the foundation for further studies in areas such as communication, VHDL, computer.

Course Outcomes:

On completion of the course, students will be able to:

1. Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
2. Design combinational and sequential circuits.
3. Design and implement hardware circuit to test performance and application.
4. Understand the architecture and use of VHDL for basic operations and Simulate using simulation software.

UNIT - 1 06 Hours

Combinational Logic Design

Standard representations for logic functions, k map representation of logic functions (SOP and POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don„t care conditions, Design Examples: Arithmetic Circuits, BCD - to - 7 segment decoder, Code converters. Adders and their use as subtractor, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Design of Multiplexers and De-multiplexers, Decoders.

UNIT - 2 06 Hours

Sequential Logic Design

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops, Conversion of flip flops. Application of Flip-flops: Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, definitions of lock out, Clock Skew, and Clock jitter.

UNIT - 3 06 Hours

State Machines

Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

UNIT - 4 06 Hours

Digital Logic Families

Classification of logic families, Characteristics of digital ICs-Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs. Tri-State logic. CMOS logic – CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output. Interfacing CMOS and TTL, Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I^2L and DCTL

UNIT - 5 06 Hours

Programmable Logic Devices and Semiconductor Memories

Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits using PLDs. General Architecture of FPGA and CPLD Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

UNIT - 6 06 Hours

Introduction to VHDL

Behavioral – data flow, and algorithmic and structural description, lexical elements, data objects types, attributes, operators; VHDL coding examples, combinational circuit design examples in VHDL and simulation.

TEXT/REFERENCE BOOKS

1. R.P. Jain, ―Modern digital electronics‖, 3rd edition, 12threprint Tata McGraw Hill Publication, 2007.

2. M. Morris Mano, ―Digital Logic and Computer Design‖ 4th edition, Prentice Hall of India, 2013.
3. Anand Kumar, ―Fundamentals of digital circuits‖ 1st edition, Prentice Hall of India, 2001.
4. Pedroni V.A., "Digital Circuit Design with VHDL", Prentice Hall India, 2nd 2001 Edition.

BTHM3401	**Basic Human Rights**	**Audit**

Course Objectives:

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency
3. To recognize democratic institutions as a fundamental human right
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture
11. To study the effects of draconian laws and unlawful use of State's machinery and force by the enforcement agencies.

Course Outcomes:

On completion of the course, students will be able to:

1. Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.
2. Strengthen the respect for human rights and fundamental freedoms.
3. Enable all persons to participate effectively in a free society.
4. Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights.
5. Learn about regional, national, state, and local law that reinforces international human rights law.
6. Learn and know about and being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights.

UNIT - 1	06 Hours

The Basic Concepts

Individual, Group, Civil Society, State, Equality, Justice, Human Values: - Humanity, Virtues, Compassion.

UNIT - 2	06 Hours

Human Rights and Human Duties

Origin, Civil and Political Rights, Contribution of American Bill of Rights, French Revolution, Declaration of Independence, Rights of Citizen, Rights of working and Exploited people, Fundamental Rights and Economic program, India‟s Charter of freedom

UNIT - 3	06 Hours

Society, Religion, Culture, and their Inter-Relationship

Impact of Social Structure on Human behavior, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

UNIT - 4	06 Hours

Social Structure and Social Problems

Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged

UNIT - 5	06 Hours

State, Individual Liberty, Freedom and Democracy

The changing of state with special reference to developing countries, Concept of development under development and Social action, need for Collective action in developing societies and methods of Social action, NGOs and Human Rights in India: - Land, Water, Forest issues.

UNIT - 6	06 Hours

Human Rights in Indian Constitution and Law

The constitution of India:

(i) Preamble
(ii) Fundamental Rights
(iii) Directive principles of state policy
(iv) Fundamental Duties
(v) Some other provisions

Universal declaration of Human Rights and Provisions of India, Constitution and Law, National Human Rights Commission and State Human Rights Commission.

TEXT/REFERENCE BOOKS

1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd.), 2005.
2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

BTEXC401	Electrical Machines and Instruments	3 Credits

Course Objectives:

1. Model and Analyze the performance of different types of DC machines
2. Learn the applications of DC generators
3. Analyze the performance of different types of DC motors
4. Analyze the performance of different types of Sensors and Transducers

5. Familiarize with the applications of DC machines
6. To prepare students to perform the analysis of any electromechanical system.
7. To empower students to understand the working of electrical equipment used in everyday life.

Course Outcomes:

On completion of the course, students will be able to:

1. The ability to formulate and then analyze the working of any electrical machine using mathematical model under loaded and unloaded conditions.
2. The skill to analyze the response of any electrical machine.
3. The ability to troubleshoot the operation of an electrical machine.
4. The ability to select a suitable measuring instrument for a given application.
5. The ability to estimate and correct deviations in measurements due to the influence of the instrument and due to the accuracy of the instrument.

UNIT - 1	06 Hours

DC Machines

DC machines construction, working principle (motor & generator), EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), back emf, starters of dc machine, Speed control of DC motor Breaking of DC motor, applications of DC machines (motor and generator).

UNIT - 2	06 Hours

Induction Motor and Synchronous Motor

Induction Motor: Construction, working principle, types, torque equation, torque slip characteristics, power stages, losses and efficiency, starters speed control, breaking, applications. **Synchronous motor:** Construction, working principle, starting methods, effect of load, hunting, V-curve, synchronous condenser, applications.

UNIT - 3	06 Hours

Special Purpose Machines

Construction, working and application of steeper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM.

UNIT - 4 06 Hours

Sensors and Transducers

Classification selection of transducers strain gauges, LVDT, Temperature transducers, piezoelectric, photosensitive transducers, Hall Effect transducers, proximity devices Digital transducers need of signal conditioning and types, interfacing techniques of transducers with microprocessor and controller.

UNIT - 5 06 Hours

Industrial Measurement and Industrial Applications

Measurement of vibration, electrical telemetry thickness, humidity, thermal conductivity and gas analysis emission computerized tomography, smoke and fire detection, burglar alarm, object counter level measurement, on /off timers, RTC, sound level meter, tachometer, VAW meter.

UNIT - 6 06 Hours

I/O Devices

Recorder X- Y plotters and its applications, optical oscillograph.

TEXT/REFERENCE BOOKS

1. A course in Electrical and Electronic Measurement and Instrumentation" by A. K. Sawhney (Publisher name: Dhanpat Rai & Co.)
2. Electronics Instrumentation by H.S. Kalsi (Publisher McGraw Hill)
3. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication
4. Instrumentation Devices System edition C. S. Rajan, G. R. sharma
5. Abhijit Chakrabarti & Sudipta Debnath, “Electrical Machines”, Tata McGraw-hill Publication.
6. William H Hayt, Jack E Kimmerly and Steven M. Durbin, “Engineering Circuit Analysis”, Tata McGraw Hill.
7. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, “Electrical Machinery”, Tata McGraw-hill Publication 6th Edition.
8. I.J Nagarath & D.P Kothari, “Electrical Machines”, Tata McGraw-hill Publication 4th Edition.

9. T. J. E. Miller, “Brushless permanent-magnet and reluctance motor drives”, Oxford University Press (1989).
10. Ned Mohan, “Electric Machines and Drives”: A first course, Wiley.
11. B. L. Theraja, “Electrical technology” volume 2, S. Chand.

BTEXC402	Analog Communication Engineering	3 Credits

Course Objectives:

1. To introduce the concepts of analog communication systems.
2. To equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
3. To understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase)

Course Outcomes:

On completion of the course, students will be able to:

1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Understand the concepts of modulation and demodulation techniques.
3. Design circuits to generate modulated and demodulated wave.
4. Equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.
5. Understand the concepts of modulation and demodulation techniques of angle modulation (frequency and phase).
6. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
7. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

UNIT - 1	06 Hours

Introduction to Communication System

Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation, sampling theorem and pulse analog modulation, multiplexing: TDM, FDM.

UNIT - 2	06 Hours

Amplitude Modulation

Introduction, Mathematical analysis and expression for AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low and high level modulation, Balance Modulator.

Types of AM: DSB-FC, DSB-SC, SSB-SC, ISB and VSB, their generation methods and comparison.

UNIT - 3	06 Hours

Angle Modulation

Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM.

UNIT - 4	06 Hours

Radio Receivers and Demodulators

Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and IFRR, Tracking and Double spotting, TRF, Super heterodyne receivers, RF amplifier, Local oscillator and mixer, IF amplifier, AGC.

UNIT - 5	06 Hours

AM and FM Detectors

AM Detectors: Envelop detector and practical diode detector.

FM Detectors: Slope detector, phase discriminator and ratio detector.

UNIT - 6	06 Hours

Noise

Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature.

TEXT/REFERENCE BOOKS

1. Kennedy, "Electronics Communications Systems", McGraw-Hill New Delhi-1997, 4th Edition.
2. Anokh Singh, "Principles of communication engineering" S.Chand
3. Roddy & Coolen, "Electronic communication" PHI
4. Taub & Schilling "Principles of communication systems" Tata Mc Graw Hill
5. Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition.
6. Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition.
7. R. G. Gupta, "Audio & Video Systems" Tata McGraw-Hill New Delhi-2008.

BTEXC403 Microprocessor 3 Credits

Course Objectives:

1. Objective of this course is to introduce to the students the fundamentals of microprocessor.
2. After learning Microprocessor course, students will get advantage to pursue higher studies in Embedded Systems or employment in core industries.
3. The learner can design microprocessor based systems and thus can become successful entrepreneur and meet needs of Indian and multinational industries.
4. The students can design and develop processor which can be used in Robotics, Automobiles, Space and many research areas.
5. The learners will acquaint optimization skills and undergo concepts design metrics for embedded systems.
6. The students will get acquainted with recent trends in microprocessor like pipelining, cache memory etc.
7. To understand the applications of Microprocessors.
8. To learn interfacing of real world input and output devices.
9. To study various hardware and software tools for developing applications.

Course Outcomes:

1. Learner gains ability to apply knowledge of engineering in designing different case studies.

2. Students get ability to conduct experiments based on interfacing of devices to or interfacing to real world applications.
3. Students get ability to interface mechanical system to function in multidisciplinary system like in robotics, Automobiles.
4. Students can identify and formulate control and monitoring systems using microprocessors.
5. Students will design cost effective real time system to serve engineering solution for Global, social and economic context.
6. This course understanding will enforce students to acquire knowledge of recent trends like superscalar and pipelining and thus finds recognition of continuous updation.
7. Learn use of hardware and software tools.
8. Develop interfacing to real world devices.

UNIT - 1	07 Hours

Fundamentals of Microprocessor

Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pin outs and signals.

UNIT - 2	07 Hours

Programming with 8085

Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs.

UNIT - 3	07 Hours

Interrupts

Interrupt structure of 8085 microprocessor, processing of vectored and non-vectored interrupts, latency time and response time; Handling multiple interrupts.

UNIT - 4	07 Hours

Interfacing

Memory Interfacing, Interfacing with 8255 Programmable Peripheral Interface, 8254 Programmable Interval Timer, 8279 Display controller, Interrupt controller 8259.

UNIT - 5 **07 Hours**

Introduction of 8086 Microprocessor

Detail Architecture of 8086, Addressing Modes, Assembler directives, Co-Processor

TEXT/REFERENCE BOOKS

1. Microprocessor and interfacing 8085, Douglas V Hall, Tata Mc Gram Hill.
2. Microprocessor-Architecture, programming and application with 8085, gaonkar, penram international.
3. Short K. L., "Microprocessors and Programmed Logic", 2nd Ed.,Pearson Education, 2008..
4. D V kodavade, S. Narvadkar, 8085-86 microprocessors Architecture progg and interfaces, wiley.
5. Rout 8085 microcontroller-architecture, programming and application, 2nd edi, penram international.

BTEXC404 Signals and Systems 3 Credits

Course Objectives:

1. To understand the mathematical description of continuous and discrete time signals and systems.
2. To classify signals into different categories.
3. To analyze Linear Time Invariant (LTI) systems in time and transform domains.
4. To build basics for understanding of courses such as signal processing, control system and communication.
5. To develop basis of probability and random variables.

Course Outcomes:

On completion of the course, students will be able to:

1. Understand mathematical description and representation of continuous and discrete time signals and systems.
2. Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.

3. Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
4. Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain.
5. Understand the basic concept of probability, random variables & random signals and develop the ability to find correlation, CDF, PDF and probability of a given event.

UNIT - 1	06 Hours

Introduction to Signals and Systems

Introduction and Classification of signals: Definition of signal and systems, Continuous time and discrete time signal, Classification of signals as even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power, elementary signals used for testing: exponential, sine, impulse, step and its properties, ramp, rectangular, triangular, signum, sinc Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and time folding, Sampling Theorem and reconstruction of sampled signal, Concept of aliasing, examples on under sampled and over sampled signals.

Systems: Definition, Classification: linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

UNIT - 2	06 Hours

Time domain representation of LTI System

System modeling: Input-output relation, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method, Computation of convolution sum. Properties of convolution, properties of the system based on impulse response, step response in terms of impulse response.

UNIT - 3	06 Hours

Fourier Series

Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, FS representation of CT signals using exponential Fourier series, Fourier spectrum representation, properties of Fourier series, Gibbs phenomenon, Discrete Time Fourier Series and its properties.

UNIT - 4	06 Hours

Fourier transform

Fourier Transform (FT) representation of aperiodic CT signals, Dirichlet condition for existence of Fourier transform, evaluation of magnitude and phase response, FT of standard CT signals, FT of standard periodic CT signals, Introduction to Fourier Transform of DT signals, Properties of CTFT and DTFT, Fourier Transform of periodic signals. Concept of sampling and reconstruction in frequency domain, sampling of bandpass signals.

UNIT - 5	06 Hours

Laplace and Z-transform

Definition of Laplace Transform (LT), Limitations of Fourier transform and need of Laplace transform, ROC and its properties, properties of Laplace transform, Laplace transform evaluation using properties, Inverse Laplace transform based on partial fraction expansion, Application of Laplace transforms to the LTI system analysis.

Introduction to Z-transform, and its properties, Inverse Z-transform, different methods of inverse Z-transform, Z-transform for discrete time system LTI analysis.

UNIT - 6	06 Hours

Probability and Random Signals

Probability: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, Random variables: Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Definitions: Statistical averages, mean, moments and expectations, standard deviation and variance, Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

TEXT/REFERENCE BOOKS

1. Alan V. *Oppenheim*. Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, PHI
2. Dr. S. L. Nalbalwar, A.M. Kulkarni and S.P. Sheth, “Signals and Systems”, 2nd Edition, Synergy Knowledgeware, 2017
3. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
4. Shaila Apte, “Signals and Systems-principles and applications”, Cambridge University press, 2016.

5. Mrinal Mandal and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
6. Peyton Peebles, “Probability, Random Variable, Random Processes”, 4th Edition, Tata McGraw Hill.
7. A. Nagoor Kanni “Signals and Systems”, 2nd edition, McGraw Hill.
8. NPTEL video lectures on Signals and Systems.

BTID405	**Product Design Engineering**	**2 Credits**

Teaching Scheme:	**Examination Scheme:**
Lecture-cum-demonstration: 1 hr/week Design Studio: 2 hr/week	Continuous Assessment 1: 30 Marks Continuous Assessment 2: 30 Marks Final Assessment: 40 Marks

- Pre-requisites: Knowledge of Basic Sciences, Mathematics and Engineering Drawing
- Design Studio : 2 hr/week to develop design sketching and practical skills, learning digital tools
- Continuous Assessment: Progress through a product design and documentation of steps in the selected product design
- Final Assessment: Product Design in Studio with final product specifications

Course Outcomes: At the end of the course, students will be able to

1. Create simple mechanical or other designs
2. Create design documents for knowledge sharing
3. Manage own work to meet design requirements
4. Work effectively with colleagues.

UNIT - 1	04 Hours

Introduction to Engineering Product Design:

Trigger for Product/ Process/ System, Problem solving approach for Product Design, Disassembling existing Product(s) and understanding relationship of components with each other, Sketching of components, identifying materials and their processing for final product, fitting of components, understanding manufacturing as scale of the components, Reverse engineering concept, case studies of products in markets, (or in each discipline), underlying principles, Case studies of product failures, revival of failed products, Public/Society‟s perception of products, and its input into product design.

UNIT - 2	04 Hours

Ideation:

Generation of ideas, Funnelling of ideas, Short-listing of ideas for product(s) as an individual or group of individuals, Sketching of products, Market research for need, competitions, scale and cost, Initial specifications of products.

UNIT - 3	04 Hours

Conceptualisation:

Computer operation principles and image editing through a graphical Composition; Computer aided 2D drafting and 3D Modeling through simple exercises.

Designing of components, Drawings of parts and synthesis of a product from its component parts, Rendering the designs for 3-D visualization and to create a photo realistic image, Parametric modelling of product, 3-D Visualization of mechanical products, Detail Engineering drawings of components.

UNIT - 4	04 Hours

Detailing:

Managing assembling, Product specifications- data Sheet, Simple mechanical designs, Workshop safety and health issues, Create documents for knowledge sharing.

Hands-on Activity Charts for Use of Digital Tools

Activity 1	Learn the basic vector sketching tools.	2
Activity 2	General understanding of shading for adding depth to objects. Understanding of editing vectors	2
Activity 3	Begin developing a thought process for using digital sketching.	3
Activity 4	Create a basic shape objects sphere, box cylinders	3
Activity 5	Create Automotive wheel concepts	3
Activity 6	Understanding Navigation and Data Panel Interface	2
Activity 7	Solid and Surface modelling, Rendering 3-D models	4
Activity 8	Product market and Product Specification Sheet	3
Activity 9	Documentation for the product	2

TEXT/REFERENCE BOOKS

1. Model Curriculum for “Product Design Engineer – Mechanical”, NASSCOM (Ref. ID: SSC/Q4201, Version 1.0, NSQF Level: 7)
2. Eppinger, S., & Ulrich, K.(2015). Product design and development. McGraw - Hill Higher Education.
3. Green, W., & Jordan, P. W. (Eds.). (1999).Human factors in product design: current practice and future trends. CRC Press.
4. Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design McGRAW- HILL book company.

5. Roozenburg, N. F., &Eekels, J. (1995). Product design: fundamentals and methods (Vol. 2). John Wiley & Sons Inc.
6. Lidwell, W., Holden, K., & Butler, J.(2010). Universal principles of designs, revised and updated: 125 ways to enhance usability, influence perception, increase appeal, make better design decisions, and teach through design. Rockport Pub.

BTBSC406	**Numerical Methods and Computer Programming**	**3 Credits**

Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programmes and to work in research institutes.
2. To understand different numerical techniques used for solving algebraic and transcendental equations.
3. To understand numerical methods to solve a system of linear equations.
4. To understand numerical integration and differentiation techniques.
5. To understand various difference operators and interpolation techniques.
6. To understand object-oriented programming fundamentals and features.
7. To mold students professionally by course contents and sufficient problem solving and programming exercises and to acquaint them with different types of numerical techniques and programming concepts.

Course Outcomes:

On completion of the course, students will be able to:

1. Able to solve algebraic and transcendental equations by using numerical techniques and will be able to compare different numerical techniques used for this purpose and also will be able to choose a proper one as per the requirement of the problem.
2. Able to solve a system of linear equations with any number of variables using different direct and iterative numerical techniques.
3. Understand the concept of interpolation, finite difference operators and their relations, and can apply different interpolation techniques on equi-spaced or non equi-spaced data values.
4. Prepare them to write computer programs for the numerical computational techniques.

5. Understand application of the NMCP course in many engineering core subjects like signal processing, digital communication, numerical techniques in electromagnetics etc.
6. Understand procedure-oriented and object oriented programming concepts.
7. Capable of writing C and C++ programs efficiently.

UNIT - 1	**06 Hours**

Introduction to Computational Methods and Errors

Computational Methods: General principles of computational techniques, Introduction, common ideas and concepts of computational methods, various computational techniques. Errors: Types and sources of errors, Concept in error estimation, Error propagation, Error due to floating point, Representation of errors, Elementary uses of series in calculation of errors.

UNIT - 2	**06 Hours**

Solution of Transcendental / Polynomial Equations and System of Linear Equation

Solution of Transcendental / Polynomial Equations: Finding root of polynomial equations deploying computational methods such as Bisection, Regula-falsi, Newton-Raphson, Seccant, Successive approximation. System of linear equation: Solving linear equations deploying computational methods such as Gauss elimination, Gauss Jordan, Partial pivoting, Matrix triangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods.

UNIT - 3	**06 Hours**

Interpolation and Polynomial Approximation

Least square approximation, Orthogonal polynomials Chebyshev polynomials, Finite difference operator and their relations, Forward, backward, central and divided difference, Newton's forward divided difference, Backward difference interpolation, Sterling interpolation, Lagrange‟s interpolation polynomials, Spline interpolation, Least square approximation.

UNIT - 4	**06 Hours**

Numerical Integration and Differentiation

Numerical Integration: Methods based on interpolation such as Trapezoidal rule, Simsons 1/3 and 3/8 rules. Numerical differentiation: Euler's method, Modified Euler's method, Taylor's series, Runge Kutta 2ndand 4th order, Stability analysis of above methods.

UNIT - 5	06 Hours

Object Oriented Programming

Software Evaluation, Object oriented programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, Object oriented languages, Applications of OOP Beginning with C++: Structure of C++ program, Creating the source file, Compiling & linking, Basic data types, User defined data types, Symbolic constants, Declaration of variables, Dynamic initialization of variables, Reference variables, Operators in C++, Scope resolution operator, Type cast operator. Functions in C++: Function prototyping, Inline functions, Function overloading, Friend and virtual functions. Classes and Objects: Specifying a class, Defining member functions, C++ program with class, Arrays within a class, Memory allocation for objects, Constructors, Multiple constructor in class, Dynamic initialization of objects, Dynamic constructor, Destructors.

UNIT - 6	06 Hours

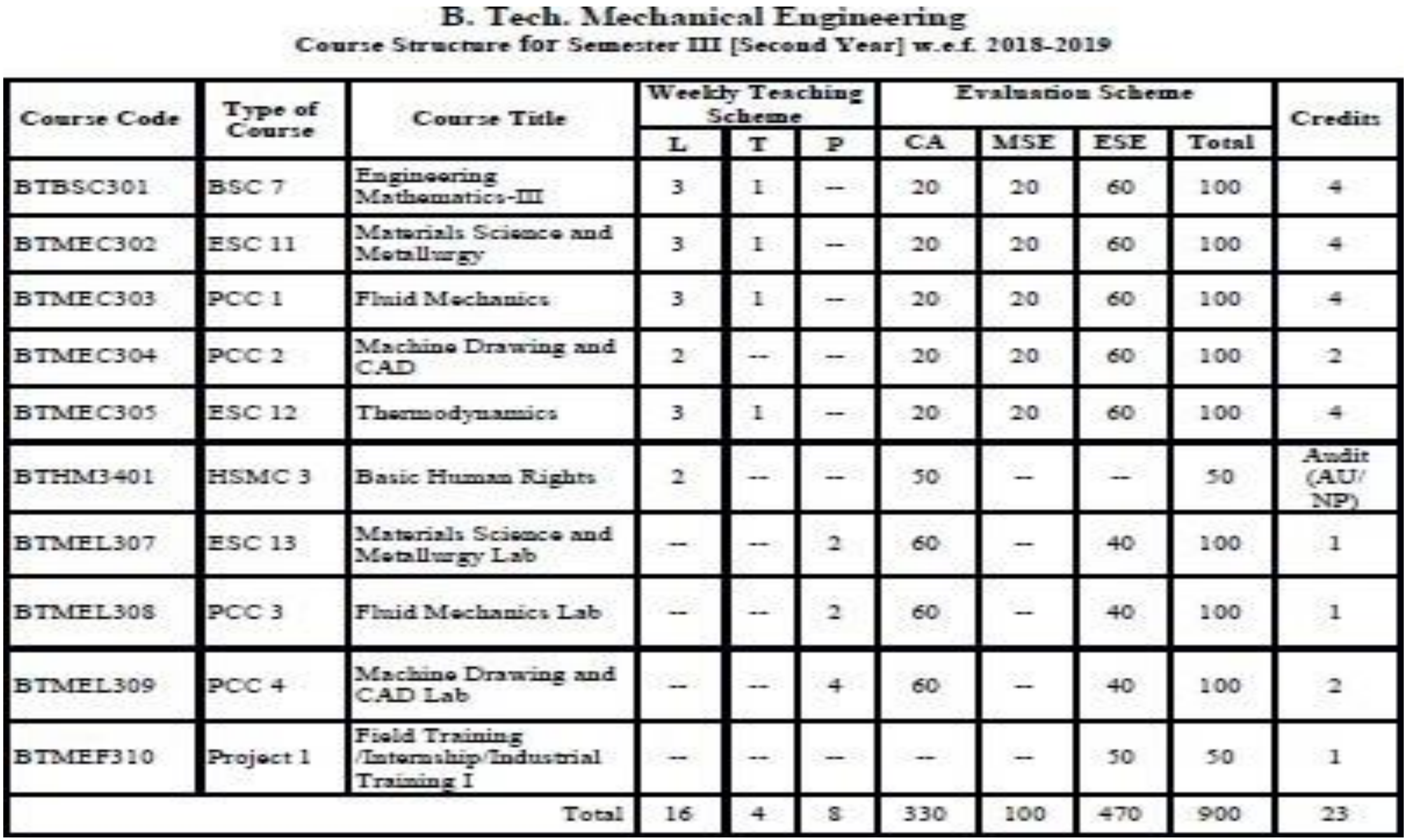
Operator Overloading and Type Conversions

Defining operator overloading, Overloading unary operators, Overloading binary operators, Manipulation of strings operators, Rules for overloading operators. Inheritance: Extending Classes: Defining derived classes, Single inheritance, multilevel inheritance, multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Member classes: Nesting of classes Pointers Virtual Functions and Polymorphism: Pointers to objects, Pointers to derived classes, Virtual functions, pure virtual functions Managing Console I/O Operations C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Managing output with manipulators.

TEXT/REFERENCE BOOKS

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI, 1990, 3rd edition.
2. V. Rajaraman, "Computer Oriented Numerical Methods, PHI, New Delhi", 2000, 3rd Edition.
3. E. V. Krishnamurthy, and Sen S. K., "Numerical Algorithm: Computations in Science and Engg", Affiliated East West, New Delhi, 1996.
4. D. Ravichandran, "Programming with C++", TMH
5. E. Balagurusamy, "Object-Oriented Programming with C++", TMH, New Delhi, 2001,2ndEdition

DBATU-3RD-SEMSETER-SCHEME

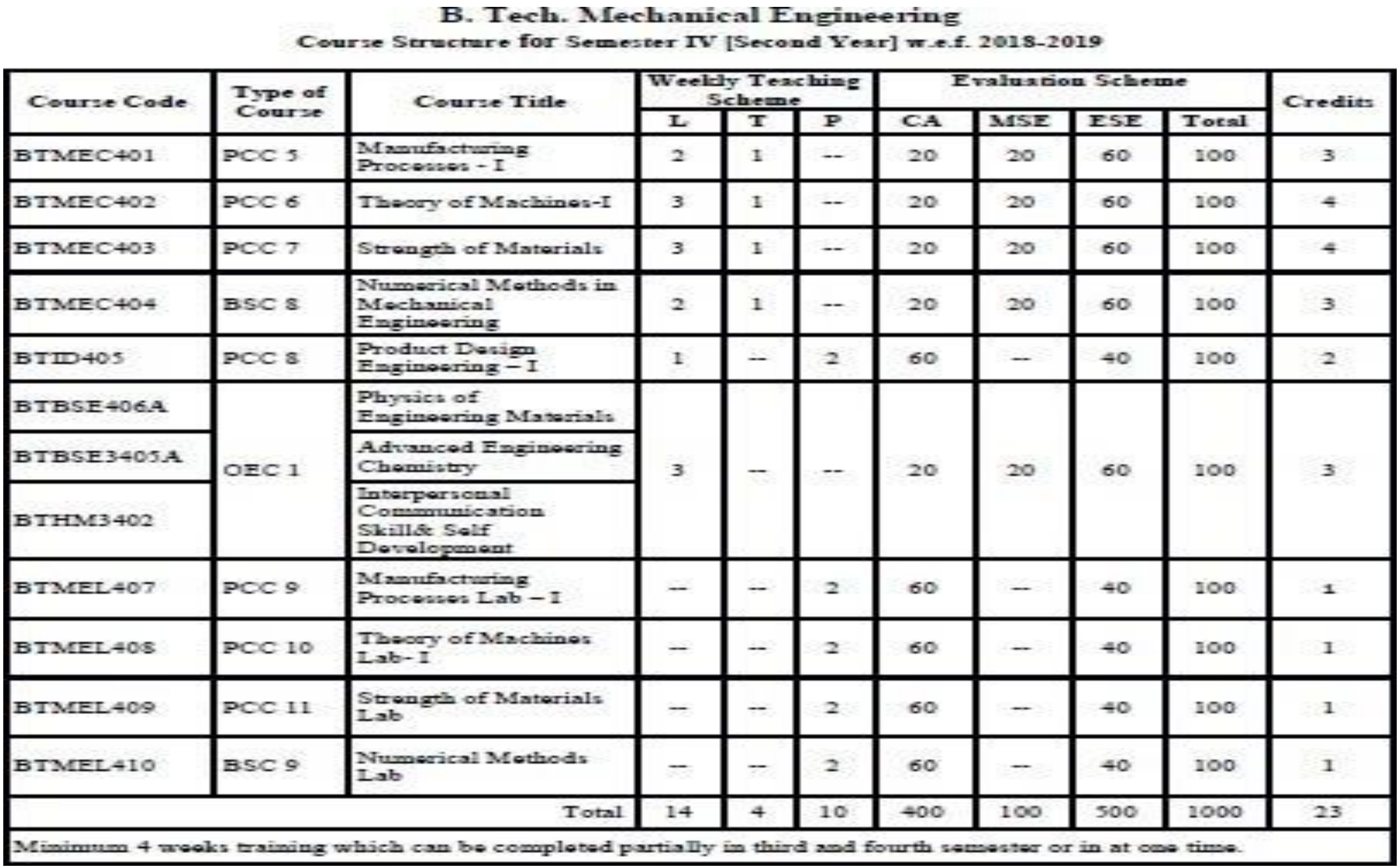


B. Tech. Mechanical Engineering

Course Structure for Semester III [Second Year] w.e.f. 2018-2019

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	CA	MSE	ESE	Total	
BTBSC301	BSC 7	Engineering Mathematics-III	3	1	--	20	20	60	100	4
BTMEC302	ESC 11	Materials Science and Metallurgy	3	1	--	20	20	60	100	4
BTMEC303	PCC 1	Fluid Mechanics	3	1	--	20	20	60	100	4
BTMEC304	PCC 2	Machine Drawing and CAD	2	--	--	20	20	60	100	2
BTMEC305	ESC 12	Thermodynamics	3	1	--	20	20	60	100	4
BTHM3401	HSMC 3	Basic Human Rights	2	--	--	50	--	--	50	Audit (AU/NP)
BTMEL307	ESC 13	Materials Science and Metallurgy Lab	--	--	2	60	--	40	100	1
BTMEL308	PCC 3	Fluid Mechanics Lab	--	--	2	60	--	40	100	1
BTMEL309	PCC 4	Machine Drawing and CAD Lab	--	--	4	60	--	40	100	2
BTMEF310	Project 1	Field Training /Internship/Industrial Training I	--	--	--	--	--	50	50	1
		Total	16	4	8	330	100	470	900	23

DBATU-4TH -SEMSETER-SCHEME



B. Tech. Mechanical Engineering

Course Structure for Semester IV [Second Year] w.e.f. 2018-2019

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	CA	MSE	ESE	Total	
BTMEC401	PCC 5	Manufacturing Processes - I	2	1	--	20	20	60	100	3
BTMEC402	PCC 6	Theory of Machines-I	3	1	--	20	20	60	100	4
BTMEC403	PCC 7	Strength of Materials	3	1	--	20	20	60	100	4
BTMEC404	BSC 8	Numerical Methods in Mechanical Engineering	2	1	--	20	20	60	100	3
BTID405	PCC 8	Product Design Engineering – I	1	--	2	60	--	40	100	2
BTBSE406A	OEC 1	Physics of Engineering Materials	3	--	--	20	20	60	100	3
BTBSE3405A		Advanced Engineering Chemistry								
BTHM3402		Interpersonal Communication Skill& Self Development								
BTMEL407	PCC 9	Manufacturing Processes Lab – I	--	--	2	60	--	40	100	1
BTMEL408	PCC 10	Theory of Machines Lab- I	--	--	2	60	--	40	100	1
BTMEL409	PCC 11	Strength of Materials Lab	--	--	2	60	--	40	100	1
BTMEL410	BSC 9	Numerical Methods Lab	--	--	2	60	--	40	100	1
		Total	14	4	10	400	100	500	1000	23

Minimum 4 weeks training which can be completed partially in third and fourth semester or in at one time.

Annexure - B

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

V Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME501T	Industrial Economics and Entrepreneurship Development	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME502T	Design of Machine Elements	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME503T	Advanced Production Processes	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504T	Heat Transfer	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME504P	Heat Transfer	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME505T	Mechanical Measurement & Metrology	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME505P	Mechanical Measurement & Metrology	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME506P	Computer Applications – I	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME507P	Industrial Visit	-	-	02	Audit Course									
Total		15	07	08		-	400	100	500	-	100	100	200	-
Semester Total		30			26	Marks 700								

Industrial Economics and Entrepreneurship Development (BEME501T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering.

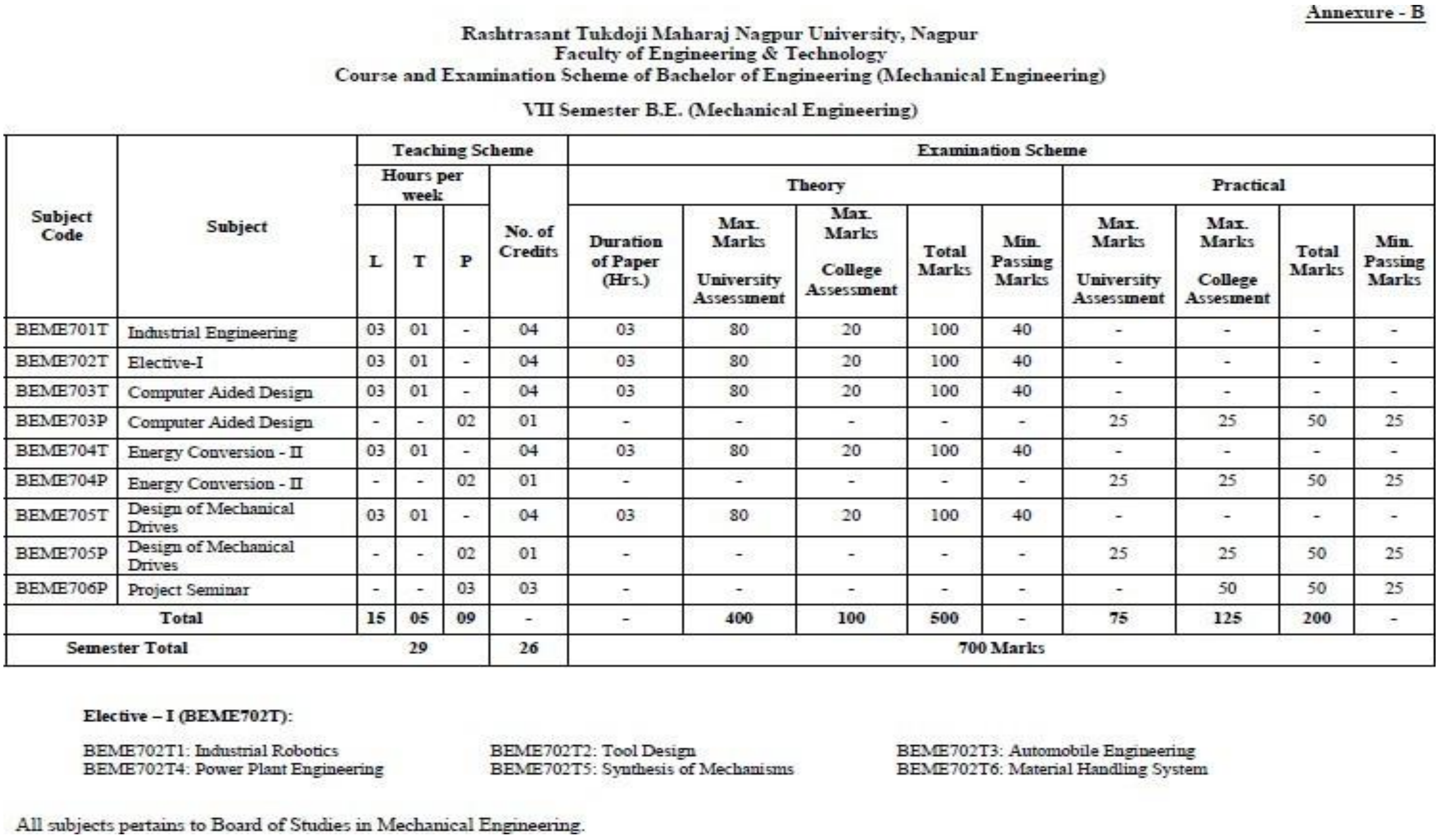
Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VI Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME601T	Energy Conversion- I	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME602T	Control Systems Engineering	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME603T	Operations Research	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604T	Mechatronics	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME604P	Mechatronics	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME605T	Dynamics of Machines	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME605P	Dynamics of Machines	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME606T	Functional English	02	-	-	02	02	40	10	50	20	-	-	-	-
BEME607P	Computer Applications - II	-	02	02	04	-	-	-	-	-	50	50	100	50
BEME608P	Industrial Case Study	-	-	02	02	-	-	-	-	-	-	50	50	25
Total		**17**	**07**	**08**	-	-	**440**	**110**	**550**	-	**100**	**150**	**250**	-
Semester Total		**32**			**30**	**800 Marks**								

Functional English (BEME606T) subject pertains to Board of Studies in Applied Sciences & Humanities and all the remaining subjects pertain to the Board of Studies in Mechanical Engineering. Mechatronics (BEME604T/P) subject can also be taught by a teacher from Electronics/Instrumentation/Mechatronics/relevant disciplines.

RTMNU-7TH -SEMSETER-SCHEME



Annexure - B

Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VII Semester B.E. (Mechanical Engineering)

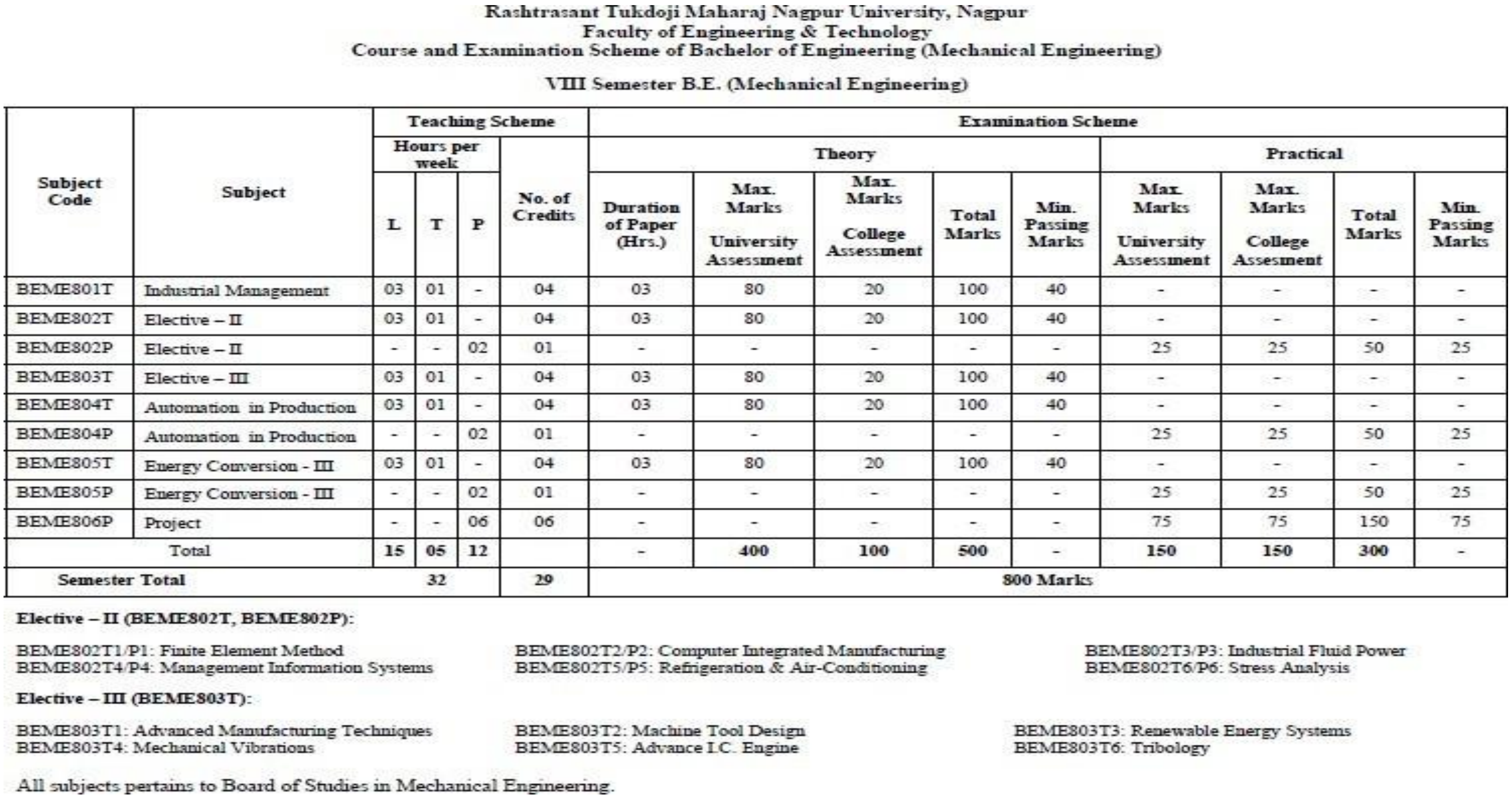
Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME701T	Industrial Engineering	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME702T	Elective-I	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME703T	Computer Aided Design	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME703P	Computer Aided Design	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME704T	Energy Conversion - II	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME704P	Energy Conversion - II	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME705T	Design of Mechanical Drives	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME705P	Design of Mechanical Drives	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME706P	Project Seminar	-	-	03	03	-	-	-	-	-	-	50	50	25
Total		**15**	**05**	**09**	-	-	**400**	**100**	**500**	-	**75**	**125**	**200**	-
Semester Total		29			26	700 Marks								

Elective – I (BEME702T):

BEME702T1: Industrial Robotics
BEME702T4: Power Plant Engineering
BEME702T2: Tool Design
BEME702T5: Synthesis of Mechanisms
BEME702T3: Automobile Engineering
BEME702T6: Material Handling System

All subjects pertains to Board of Studies in Mechanical Engineering.

RTMNU-8TH -SEMSETER-SCHEME



Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur
Faculty of Engineering & Technology
Course and Examination Scheme of Bachelor of Engineering (Mechanical Engineering)

VIII Semester B.E. (Mechanical Engineering)

Subject Code	Subject	Teaching Scheme				Examination Scheme								
		Hours per week			No. of Credits	Theory					Practical			
		L	T	P		Duration of Paper (Hrs.)	Max. Marks University Assessment	Max. Marks College Assessment	Total Marks	Min. Passing Marks	Max. Marks University Assessment	Max. Marks College Assesment	Total Marks	Min. Passing Marks
BEME801T	Industrial Management	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME802T	Elective – II	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME802P	Elective – II	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME803T	Elective – III	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME804T	Automation in Production	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME804P	Automation in Production	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME805T	Energy Conversion - III	03	01	-	04	03	80	20	100	40	-	-	-	-
BEME805P	Energy Conversion - III	-	-	02	01	-	-	-	-	-	25	25	50	25
BEME806P	Project	-	-	06	06	-	-	-	-	-	75	75	150	75
Total		**15**	**05**	**12**		-	**400**	**100**	**500**	-	**150**	**150**	**300**	-
Semester Total		**32**			**29**	**800 Marks**								

Elective – II (BEME802T, BEME802P):

BEME802T1/P1: Finite Element Method
BEME802T2/P2: Computer Integrated Manufacturing
BEME802T3/P3: Industrial Fluid Power
BEME802T4/P4: Management Information Systems
BEME802T5/P5: Refrigeration & Air-Conditioning
BEME802T6/P6: Stress Analysis

Elective – III (BEME803T):

BEME803T1: Advanced Manufacturing Techniques
BEME803T2: Machine Tool Design
BEME803T3: Renewable Energy Systems
BEME803T4: Mechanical Vibrations
BEME803T5: Advance I.C. Engine
BEME803T6: Tribology

All subjects pertains to Board of Studies in Mechanical Engineering.

Dr. Babasaheb Ambedkar Technological University

(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)

P.O. Lonere, Dist. Raigad, Pin- 402 103, Maharashtra
Telephone and Fax. : 02140 - 275142
www.dbatu.ac.in

Detailed Syllabus
for
Second Year, Third Year and Final Year
B. Tech. Programme in Information Technology

Effective from
Academic Year 2018-19
Approved in the 11th meeting of Academic Council dated 8th June, 2018

Teaching and Evaluation Scheme Second Year B. Tech. (Information Technology)

Sr. No.	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
Semester III										
1	BTBSC301	Engineering Mathematics III	3	1	-	20	20	60	4	4
2	BTESC302	Switching Theory and Logic Design	2	1	-	20	20	60	3	3
3	BTITC303	Object Oriented Paradigm with C++	2	1	-	20	20	60	3	3
4	BTCOC304	Computer Architecture and Organization	2	1	-	20	20	60	3	3
5	BTBSCOE305A BTHSMCOE305B BTITOE305C BTITOE305D	**Elective I** A) Advanced Engineering Chemistry B) Interpersonal Communication Skills and Self Development for Engineers C) Programming in Java D) Introduction to Web Technology	1	1	-	20	20	60	2	2
6	BTHM306	Basic Human Rights	2	-	-	-	50	-	Audit	2
7	BTESCL307	Switching Theory and Logic Design Lab	-	-	2	-	60	40	1	2
8	BTITL308	Object Oriented Paradigm with C++ Lab	-	-	4	-	60	40	2	4
9	BTITL309	Programming Lab (Python)	-	-	4	-	60	40	2	4
10	BTITOEL310	**Elective I Lab** A) Advanced Engineering Chemistry Lab B) Interpersonal Communication Skills and Self Development for Engineers Lab C) Programming in Java Lab D) Introduction to Web Technology Lab	-	-	2	-	60	40	1	2
11	BTITF311	Field Training / Internship/Industrial Training Evaluation	-	-	-	-	-	100	1	-
		Total	**12**	**5**	**12**	**100**	**390**	**560**	**22**	**29**
Semester IV										
1	BTITC401	Microprocessors and Microcontrollers	2	1	-	20	20	60	3	3
2	BTITC402	Data Structures and Applications	3	1	-	20	20	60	4	4
3	BTITC403	Discrete Structures and Applications	2	1	-	20	20	60	3	3
4	BTITC404	Internetworking Protocols	2	1	-	20	20	60	3	3
5	BTBSCOE405A BTHMOE405B BTXXOE405C	**Elective II** A) Physics of Engineering Materials B) Organizational Behavior C) Development Engineering	2	1	-	20	20	60	3	3
6	BTXX406	Product Design Engineering	2	-	-	20	20	60	2	2
7	BTITL407	Microprocessors and Micro-controllers Lab	-	-	2	-	60	40	1	2
8	BTITL408	Data Structures and Applications Lab	-	-	4	-	60	40	2	4
9	BTITL409	Internetworking Protocols Lab	-	-	2	-	60	40	1	2
10	BTITF410	Field Training / Internship/Industrial Training (minimum 4 weeks which can be completed partially in third semester and fourth semester or at one time.)						100	To be evaluated in V Semester	-
		Total	**13**	**5**	**8**	**120**	**300**	**580**	**22**	**26**

Programme Objectives:

The program educational objectives for the B. Tech. programme in Information Technology describes accomplishments that graduates are expected to attain within the four years of graduation. Graduates will be able to apply their expertise to contemporary problem solving, be engaged professionally, and have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives are:

1. PEO1: To enable graduates gain strong skills for employment in multidisciplinary domains driven by IT
2. PEO2: To enable graduates to pursue higher education and research
3. PEO3: To enable graduates to develop entrepreneurship and leadership skills
4. PEO4: To enable graduates to contribute to the society in accordance with highest standards of ethics
5. PEO5: To develop breakthrough solutions enabling transformations in a rapidly changing IT world

Programme Outcomes:

The graduates of this programme will be able to demonstrate:

1. PO1: An Understanding of IT architecture, software and hardware concepts, functionalities and applications
2. PO2: An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages
3. PO3: Competency of business domains and functional processes that employ IT systems and applications
4. PO4: Practical use of communication protocols and their applications in the field of Internet and World Wide Web
5. PO5: Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century
6. PO6: An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains
7. PO7: Thought leadership to design and implement practical solutions for global industry needs.
8. PO8: Acumen to embrace and adopt futuristic IT technological developments
9. PO9: Sound knowledge of entrepreneurship traits to succeed
10. PO10: Adoption of practices that are ethical ensuring transparency and accountability
11. PO11: Capability to provide solutions that are socially empowering and environment friendly
12. PO12: Effective communication and collaboration techniques with stakeholders to achieve best results

Course Title:	**Engineering Mathematics – III**	**Semester III**	
Course Code	**BTBSC301**	**Course Type**	**Compulsory**
Prerequisite	**MATH201**	**L – T – P**	**3 – 1 – 0**
Stream	**Basic Science**	**Credits**	**4**

Course Objectives:

1. To provide in depth knowledge of complex numbers
2. To find the solution of differential equations
3. To find an in-depth knowledge of Fourier series analysis of periodic function

Course Outcomes:

After learning the course the students should be able:

1. To develop an ability to use characteristics of complex numbers in problem pertaining to electric circuits
2. To develop an acquaintance with the method of finding solution of differential equations
3. To develop an in depth knowledge of vector differentiation and vector integration
4. To develop Fourier series expansion of different periodic functions

Course Content:

UNIT I

Laplace Transform

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.

UNIT II

Inverse Laplace Transform

Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT III

Fourier Transform

Definitions – integral transforms ; Fourier integral theorem (without proof) ; Fourier sine and cosine integrals ; Complex form of Fourier integrals ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms.

UNIT IV

Partial Differential Equations and Their Applications

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one dimensional heat flow equation $\left(\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}\right)$, and two dimensional heat flow equation (i.e. Laplace equation : $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$).

UNIT V

Functions of Complex Variables (Differential calculus)

Limit and continuity of f(z); Derivative of f(z) ; Analytic functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form; Mapping: Translation, magnification and rotation, inversion and reflection , bilinear transformation; Conformal mapping.

UNIT VI

Functions of Complex Variables (Integral calculus)

Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorems without proofs).

Text Books:

1. B. S. Grewal, ***"Higher Engineering Mathematics"***, Khanna Publishers, New Delhi.
2. H. K. Das, Er. RajnishVerma, ***"Higher Engineering Mathematics"***, S. Chand & CO. Pvt. Ltd., New Delhi.
3. Dr. B. B. Singh, **"A course in Engineering Mathematics (Volume-III)"**, Synergy Knowledge ware, Mumbai.
4. B. V. Ramana, ***"Higher Engineering Mathematics"***, Tata McGraw-Hill Publications, New Delhi.

Reference Books:

1. Erwin Kreyszig, ***"Advanced Engineering Mathematics"***, John Wiley & Sons, New York.
2. Peter O' Neil, ***"A Text Book of Engineering Mathematics"***, Thomson Asia Pvt. Ltd., Singapore.
3. C. R. Wylie, L. C. Barrett, ***"Advanced Engineering Mathematics"***, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. C. R. Wylie & L. C. Barrett, ***"Integral Transforms and their Engineering Applications"***, Synergy Knowledge ware, Mumbai.
5. I. N. Sneddon, ***"Integral Transforms"***, Tata McGraw-Hill, New York.

General Instructions:

1. The tutorial classes in Engineering Mathematics-III are to be conducted batch wise. Each class should be divided into three batches for the purpose.
2. The internal assessment of the students for 20 marks will be done based on assignments, surprise tests, quizzes, innovative approach to problem solving and percentage attendance.
3. The minimum number of assignments should be eight covering all topics.

Course Title:	**Switching Theory and Logic Design**	**Semester III**	
Course Code	**BTESC302**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn numbering systems used in digital world and its representation, arithmetic operations, error detection and correction methods.
2. To learn Boolean algebra, logic gates, logic families, realization of Boolean expressions and minimization techniques.
3. To study the sequential logic circuits design used in synchronous and asynchronous modes.
4. To describe various programmable logic devices.

Course Outcomes:

After learning the course the students should be able to:

1. Illustrate theory of Boolean algebra and the underlying features of various numbering systems.
2. Design various combinational & sequential logic circuits.
3. Demonstrate working of flip-flop.

Course Content:

UNIT I

Number Systems and Codes: Number systems: Binary, Octal, Hexadecimal number systems, Binary arithmetic, Codes: Binary code, Excess-3 code, Gray code, Error detection and correction codes.

UNIT II

Boolean algebra and Logic Functions: Boolean algebra: Postulates and theorems, Logic functions, Minimization of Boolean functions using algebra, Karnaugh map and Quine – McClusky methods, Realization using logic gates.

UNIT III

Classification of logic families, Characteristics of digital ICs- Speed of operation, power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements, TTL logic, Operation of TTL NAND gate, active pull up, wired AND, open collector output, unconnected inputs, Tri-State logic, CMOS logic, CMOS inverter, NAND, NOR gates, unconnected inputs, wired logic, open drain output, Interfacing CMOS and TTL.

UNIT IV

Combinational Functions: Realizing logical expressions using different logic gates, Design of combinational circuits using combinational IC's, Realization of adders and subtractors, Design of code converters, Comparators and decoders, Design of multiplexers, Demultiplexers.

UNIT V

Introduction to Sequential Circuits: Moore and mealy machines, Introduction to flip-flops like SR, JK, D and T with truth tables, Logic diagrams and timing relationships, Conversion of flip-flops, Excitation table, State tables, Realization of state stables.

UNIT VI

Programmable Logic Devices: Semiconductor memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM, PLA, PAL, Memory System design.

Text Books:

1. M. M. Mano, ***“Digital Logic and Computer Design”***, Prentice Hall of India Publication, 4th Edition, 2006.
2. R.P. Jain, ***“Modern Digital Electronics”***, Tata McGraw Hill Publication, 4th Edition, 2010.

Reference Books:

1. D. P. Leach, A. P. Malvino, G. Saha, ***“Digital Principles and Applications”***, Tata McGraw Hill Publication, 8th Edition, 1993.
2. Comer, ***“Digital Logic & State Machine Design”***, Oxford Universities Press, 3rd Edition, 2014.

Course Title:	**Object Oriented Paradigm with C++**	**Semester III**	
Course Code	**BTITC303**	**Course Type**	**Compulsory**
Prerequisite	**ICT106**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. This course focuses on principles of object oriented programming paradigm. The course also includes practice of writing programs in C++ and Java

Course Outcomes:

After learning the course, the students should be able:

1. To draw the control flow of a program.
2. To understand the storage concepts in a simple program.
3. To program using basic concepts of OO languages i.e. objects, encapsulation, data hiding etc.
4. To program using advanced concepts of OO languages i.e. associations, packages, interfaces, exception handling etc.
5. To work with functional, Logic programming paradigms.

Course Content:

UNIT I

Elements of computer systems, DOS commands and Linux environment, Language processors, Algorithms, Flowcharts, Object-Oriented Programming Paradigm: Benefits, Applications, Object-Oriented Systems Development, Object-Oriented Analysis: Static and dynamic modeling, Object-Oriented Design: Class design and algorithm.

UNIT II

Beginning with C++: Tokens, Data types, Operators, Expressions, and Control structures, Array, Functions, Structures and Unions, Class and Objects, specifying a class, Defining member functions, Private member functions, Static data and member functions, Arrays of objects, Friend functions.

UNIT III

Constructors and Destructors: Constructor, Parameterized constructors, Multiple constructors in a class, Copy constructors, Dynamic constructors, Destructor. Programming for class diagram and relationship.

UNIT IV

Inheritance: Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes.

UNIT V

Polymorphism: Operator overloading, Function overloading, Virtual functions, pure virtual functions, Abstract class, Working with Files: Classes for file stream operations and I/O stream operation, Opening and closing a file, Detecting end-of-file, More about Open(): File Modes, Sequential input and output operations.

UNIT VI

Exception Handling: Fundamentals, Types of exceptions, Catching exceptions, Multiple catching, Nested try statements, Uncaught exceptions, Throw and throws, Built-in exceptions, Creating exception subclasses, Using exceptions.

Text Books:

1. Robert Lafore, ***“Object Oriented Programming in C++”***, Pearson Education, 4th Edition, 2008.
2. E. Balagurusamy, ***“Object Oriented Programming with C++”***, Tata McGraw Hill Publication, 6th Edition, 2013.

Reference Books:

1. J. R. Hubbard, ***“Programming with C++: Schaum’s Outlines”***, Tata McGraw-Hill publication, 2005.
2. P. J. Deitel, H.M.Deitel, ***“C++ How to Program”***, Pearson Education, 9th Edition, 2016.

Course Title:	**Computer Architecture and Organization**	**Semester III**	
Course Code	**BTCOC304**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand the structure, functions and characteristics of computer systems.
2. To learn basics of Parallel Computer Architecture.
3. To study hierarchical memory system including cache memories and virtual memory.
4. To identify input / output devices and their data transfer mechanism.

Course Outcomes:

After learning the course, the students should be able:

1. To identify components of a computer system, including CPU, memory, and input/output units.
2. To explain instruction types, its execution and interrupt mechanism.
3. To illustrate numerical and character representations in digital logic and floating point arithmetic.

Course Content:

UNIT I

Introduction: Concept of computer organization and architecture, Fundamental unit, Computer function and interconnection, CPU structure and function.

UNIT II

Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Machine state and processor status, Structure of program, Introduction to RISC and CISC architecture.

UNIT III

Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Floating point arithmetic, Introduction of arithmetic co-processor.

UNIT IV

Memory Organization: Internal Memory: Semiconductor main memory, Error correction, Advanced DRAM organization, Virtual memory systems and cache memory systems, External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, RAID, Memory controllers.

UNIT V

Control Unit: Control unit operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Micro-instruction sequencing, Micro-instruction execution, Applications of micro-programming.

UNIT VI

Input/ Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface.

Instruction pipe-lining: Concepts, Parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.

Text Books:

1. William Stalling, ***"Computer Organization and Architecture: Designing for Performance"***, 8th Edition, Prentice Hall Publication, 2009.
2. Hayes, ***"Computer Architecture and Organization"***, 3rd Edition, McGraw-Hill Publication, 2012.
3. Zaky, ***"Computer Organization"***, 5th Edition, McGraw-Hill Publication, 2011.

Reference Books:

1. Morgan and Hennessy and Patterson, ***"Computer Architecture: A Quantitative Approach"***, 4th Edition, Kaufman Publication, 2007.
2. Morris Mano, ***"Computer System Architecture"***, 3rd Edition, Pearson Education India, 2007.
3. Mostafa Abd-El-Barr, Hesham El-Rewini, ***"Fundamentals of Computer Organization and Architecture"***, 1st Edition, Wiley Publication, 2004.
4. Miles J. Murdocca, Vincent P. Heuring, ***"Computer Architecture and Organization: An Integrated Approach"***, 1st Edition, Wiley Publication, 2007.

Course Title:	**Advanced Engineering Chemistry**	**Semester III**	
Course Code	**BTBSCOE305A**	**Course Type**	**Elective**
Prerequisite	**CHM103**	**L – T – P**	**1 – 1 – 0**
Stream	**Basic Science**	**Credits**	**2**

Course Objectives:

1. To introduce this subject of Advanced Engineering Chemistry.
2. To impart the basic and advanced knowledge to the students.
3. To understand, remember and capable to explain and apply this knowledge in the field of Engineering/ Technology.

Course Outcomes:

After learning the course, the students should be able:

1. To classify and explain various types of Corrosion and should apply methods to minimize the rate of Corrosion.
2. To apply concepts of Photochemical and Thermal reactions.
3. To explain basic concepts of Polymers, Polymerization.
4. To determine molecular weight of High-Polymer.
5. To apply the basic techniques in Chemistry and capable to explain concept of Solvent Extraction.
6. To explain concept of Thermo Gravimetric Analysis (TGA).

Course Content:

UNIT I

Corrosion and its Control:

Introduction, Fundamental reason, Electrochemical Corrosion, Direct Chemical Corrosion, Factors affecting the rate of corrosion, types of corrosion-Galvanic, Pitting Corrosion, Stress corrosion, methods to minimize the corrosion- Proper design, Cathodic and Anodic protection.

UNIT II

Photochemical and Thermal Reactions

Introduction, Laws of Photochemistry, Measurement of absorbed intensity, Quantum yield or efficiency, Jablonski Diagram, Photosynthesis reaction of Hydrogen Bromide, Brief discussion on Thermal Reactions- Cope Rearrangement.

UNIT III

Polymers

Introduction, Nomenclature of polymers, types of polymerisation, molecular weight determination by osmotic pressure and viscosity method. Plastic and its classification, Constituents of Plastic, Moulding of plastic by Injection method.

UNIT IV

Reaction Mechanism and Reaction Intermediates

Introduction of reaction mechanism, Brief introduction of reactivity of substrate (Inductive effect, Mesomeric effect, Electromeric Effect, Hyperconjugative effect), Bond fission: Homolytic and Heterolytic bond fission, Reaction Intermediates: Carbocation(Structure, Stability and applications), Carbanion (Structure, Stability and applications).

Rearrangement reactions:

Intramolecular Rearrangement: Isomerisation, Beckmann Rearrangement, Benzidine Rearrangement

Intermolecular Rearrangement: Orton Rearrangement, Diazoamino Rearrangement

UNIT V

Spectroscopy

Brief introduction to spectroscopy, UV – Visible Spectroscopy: Laws of absorption, instrumentation and application. IR spectroscopy: introduction, theory, instrumentation and application. Brief discussion on NMR Spectroscopy, AAS (Atomic Absorption Spectroscopy)

UNIT VI

Instrumental Methods of Analysis

Introduction to Chromatography, Types of Chromatography (Adsorption and partition chromatography), Thin Layer Chromatography, Gas Chromatography – introduction, theory, instrumentation. Brief discussion of Thermo gravimetric analysis (TGA).

Text Books:

1. Bhal and Bhal, ***“Advance Organic Chemistry”***, S. Chand & Company, New Delhi, 1995.
2. Jain P.C & Jain Monica, ***“Engineering Chemistry”***, Dhanpat Rai & Sons, New Delhi, 1992.
3. Bhal & Tuli, ***“Text book of Physical Chemistry”,*** S. Chand & Company, New Delhi, 1995.
4. Chatwal Anand, **“Instrumental Methods of Analysis”**, Himalaya Publication.
5. Rakesh K. Parashar, V.K. Ahluwalia, “***Text Book of Organic Chemistry***”.

Reference Books:

1. Finar I.L., ***“Organic Chemistry (Vol. I & II)”***, Longman Gr. Ltd & English Language Book Society, London.
2. Barrow G.M., ***“Physical Chemistry”***, McGraw-Hill Publication, New Delhi.
3. Shikha Agarwal, ***“Engineering Chemistry- Fundamentals and Applications”***, Cambridge Publishers, 2015.
4. O. G. Palanna, ***“Engineering Chemistry”***, Tata McGraw-Hill Publication, New Delhi.
5. WILEY, ***“Engineering Chemistry”***, Wiley India, New Delhi, 2014.
6. Willard, Dean, Merrit, ***“Instrumental Methods of Analysis”***, McGraw - Hill.
7. Glasstone, ***“Physical Chemistry”***.
8. Peter Atkins, ***“Physical Chemistry”***, W.H. Freeman & Co. 9th Edition, 2009.

Course Title:	**Interpersonal Communication Skills and Self Development for Engineers**	**Semester III**	
Course Code	**BTHSMCOE305B**	**Course Type**	**Elective**
Prerequisite	**HS202**	**L – T – P**	**1 – 1 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**2**

Course Objectives:

1. To build the skills like team building so that they can work efficiently in groups.
2. To provide knowledge of conflict management while working in large organizations.
3. To develop management skills required in routine work environment.
4. To polish the personality of the learners in order to make them good leaders and employees.

Course Outcomes:

1. Learners will acquire interpersonal communication skills.
2. Learners will develop the ability to work independently.
3. Learners will develop the qualities like self-discipline, self-criticism and self-management.
4. Learners will have the qualities of time management and discipline.

UNIT I

Development of Proficiency in English

Speaking skills, Feedback & questioning technique, Objectivity in argument (Both one on one and in groups), 5 Ws & 1 H & 7 Cs for effective Communication, Imbibing Etiquettes and manners, Study of different pictorial expressions of non-verbal communication and their analysis

UNIT II

Self Management

Self Management, Self Evaluation, Self discipline, Self criticism, Recognition of one’s own limits and deficiencies, dependency, etc.

Self Awareness, Self Management, Identifying one’s strengths and weaknesses, Planning & Goal setting, Managing self-emotions, ego, pride,- Leadership & Team Dynamics

UNIT III

Time Management Techniques

Practice by game playing and other learning strategies to achieve the set targets Time Management Concept, Attendance, Discipline & Punctuality, Acting in time, Quality /Productive time.

UNIT IV

Motivation/ Inspiration

Ability to shape and direct working methods according to self-defined criteria, Ability to think for oneself, Apply oneself to a task independently with self-motivation,

Motivation techniques: Motivation techniques based on needs and field situations

UNIT V

Interpersonal Skills Development

Positive Relationship, Positive Attitudes, Empathies: comprehending others' opinions, points of views, and face them with understanding, Mutuality, Trust, Emotional Bonding, Handling Situations (Interview), Importance of interpersonal skills

UNIT VI

Effective Computing Skills

Designing an effective Presentation: Contents, appearance, themes in a presentation, Tone and Language in a presentation, Role and Importance of different tools for effective presentation

Reference books:

1. Mitra, Barun, ***"Personality Development and Soft Skills"***, Oxford University Press, 2016.
2. Ramesh, Gopalswamy, ***"The Ace of Soft Skills: Attitude, Communication and Etiquette for Success"***, Pearson Education, 2013.
3. Covey, Stephen R., ***"Seven Habits of Highly Effective People: Powerful Lessons in Personal Change"***.
4. Osenberg Marshall B., ***"Nonviolent Communication: A Language of Life"***.

Course Title:	**Programming in Java**	**Semester III**	
Course Code	**BTITOE305C**	**Course Type**	**Elective**
Prerequisite	**ICT106**	**L – T – P**	**1 – 1 – 0**
Stream	**Professional Core**	**Credits**	**2**

Course Objectives:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Outcomes:

After learning the course, the students should be able to:

1. Know the structure and model of the Java programming language.
2. Use the Java programming language for various programming technologies.
3. Develop software in the Java programming language (application).

UNIT I

Introduction to Java

Fundamentals of Object-oriented Programming, Evolution of Java, Overview of Java Language: Data types in Java, Operators and expressions, Decision Making and Branching: Control Statements such as If Else, Do statement, For statement, The Else if ladder, Jumps in loops, Labelled loops, While repetition statement, Switch statement, Break and continue statement, Arrays, Strings and Vectors: Creating one dimensional and multidimensional array, Strings, Vectors, Wrapper classes, Enumerated types, Annotations.

UNIT II

Object Oriented Programming

Classes , Objects And Methods: Defining class , Methods, Creating objects , Accessing Class members, Static Methods , Finalize Methods, Visibility Control, Method overloading, Method Overriding, Recursion. Interfaces, Constructors and finalizes Methods.

UNIT III

Packages and Applet Programming

Java API Packages, Using System Packages, Naming conventions, Creating Packages and Jar Files, Accessing and using a package, Hiding Classes, Applet Programming.

UNIT IV

Multithreading

Creating threads, Extending Thread Class, Stopping and Blocking a thread, Life cycle of a thread, Using thread method, Thread exceptions, Implementing the Run able interface, Interthread communication.

Managing Errors and Exceptions: Types of errors, Exceptions, Syntax of exception handling code, Multiple catch statements, Throwing your own exception, Using exceptions for debugging.

UNIT V

Graphics Programming

The Graphics class, Lines and Rectangles, Circles, Arc and ellipses, Polygons, Drawing Bar charts, AWT Package and Swings.

UNIT VI

Managing Files & I/O Handling

Files and Streams, Stream classes, Byte Stream Classes , Character Stream Classes, Using Streams, Reading / writing bytes and characters , Interactive Input and Output, Other Stream classes.

Text Books

1. E. Balagurusamy, ***“Programming with Java – A Primer”***, Tata – McGraw-Hill Publication, 4th Edition, 2010.
2. Steven Holzner et al. ***“Java 2 Programming”***, Black Book, Dreamtech Press, 2009.

Reference Books

1. H.M. Deitel, P.J. Deitel, ***“Java - How to Program”***, PHI Publication, 6th Edition, 2005.
2. Bruce Eckel, ***“Thinking in Java”***, PHI Publication.
3. Patric Naughton, Michael Morrison, ***“The Java Handbook”***, McGraw Hill Publication.
4. Tim Lindholm, Frank Yellin, Bill Joy, Kathi Walrath, ***“The Java Virtual Machine Specification”***, Addison Wesley Publication.

Course Title:	**Introduction to Web Technology**	**Semester III**	
Course Code	**BTITOE305D**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**1 – 1– 0**
Stream	**Professional Core**	**Credits**	**2**

Course Objectives:

1. Overview of modern Web technologies.
2. To use different web scripting technology.
3. To understand web hosting, server type, debugging, and performance driven application development.
4. To understand user interface and awareness of real-world knowledge.

Course Outcomes:

1. To understand World Wide Web and latest trends in web-development.
2. Real world knowledge of design and development.
3. Design and development of web application with all industrial standards.
4. Awareness of web hosting, server type, debugging.

UNIT I

Introduction to World Wide Web, Features of web, HTTP, Web Servers, Introduction to Scripting Language, Browser, Integrated Development Environment.

UNIT II

HTML: Introduction to HTML, Basics of HTML, Formatting and fonts, Commenting code, HTML heading, Block element, Inline element, Comment, Attributes, Hyperlink, Lists, Tables, Images, Forms, Meta tags, Character entities, Frames sets.

UNIT III

Advance HTML: Overview and features of HTML5, Includes External File, Responsive Layout with Media Queries, Marquee, Semantic Tags, HTML Symbol, URL Encode, Cashing, Video Tags, Audio Tags, Image Maps.

UNIT IV

CSS: Introduction To CSS, Selector, Basic Syntax And Structure, Padding, Margin, Manipulating Texts, Display, Height, Width, Border, Color, Fonts, Positioning Using CSS, Overview And Features Of CSS3.

UNIT V

PHP: Introduction to PHP, Features of PHP, Basics of PHP, Syntax, Variable, Printing Output, Array, String, Function, Data types, Operator, Loops, Conditional Statement, Introduction To Advance PHP, Form Processing, Files, PHP Cookies, PHP Sessions, Constant, PHP Magic Function, PHP Global Variable, Error Handling, Exception, Connection with Database, Curd Operation in PHP.

UNIT VI

Web Hosting, Debugging and Unit Testing, Browser Compatibility.

Text Book

1. Snehal Joglekar, ***"HTML and CSS- Web Technologies"***, Nirali Prakashan, 2013.

Reference Books

1. Thomas Powell, ***"HTML & CSS: The Complete Reference"***, 5th Edition, McGraw Hill Publication.
2. Steven Holzner, ***"PHP: The Complete Reference"***, 1st Edition, McGraw Hill Publication.

Course Title:	**Basic Human Rights**	**Semester III**	
Course Code	**BTHM306**	**Course Type**	**Audit**
Prerequisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**Audit**

Course Objectives:

1. To work for ensuring that basic human rights are respected everywhere.
2. To cooperate to avoid compromising on human rights for economic or political expediency.
3. To recognize democratic institutions as a fundamental human right.
4. To work towards the sovereignty and self-determination of entities with historical, cultural and ecological identity.
5. To actively engage with the Government of India and other countries to promote human rights education.
6. To bring diplomatic and commercial pressures on regimes that violates human rights, to ensure that they respect the basic rights of their citizens.
7. To keep the interests of disempowered communities foremost in all dealings with countries in which human rights violations occur.
8. To develop a more distinctive and effective role for the International Court of Justice in the field of human rights.
9. To promote a culture for educating the citizenry that cultivation and promotion of human rights culture is the sine qua non for the smooth functioning of the organs of a democratic State and for the kind of development that results into overall development of the society.
10. To train the young men and women for facing the challenges of the pluralistic society and the rising conflicts and tensions in the name of particularistic loyalties to caste, religion, region and culture.
11. To study the effect of draconian laws and unlawful use of State's machinery and force by the enforcement agencies.

Course Outcomes:

After learning the course, the students should be able to:

1. Appreciate the importance of the values of human rights.
2. Strengthen respect for human rights and fundamental freedoms and respect others caste, religion, region and culture.
3. Know about regional, national, state, and local law that reinforces international human rights law.
4. Understand being able to use global, regional, national, and local human rights instruments and mechanisms for the protection of human rights.
5. Be aware of rights as Indian citizen.
6. Understand the importance of groups and communities in the society.
7. Realize the philosophical and cultural basis and historical perspectives of human rights.
8. Make students aware of their responsibilities towards the nation.

Course Content:

UNIT I

Introduction: Magna Carta, English bill of rights, American/French declaration, Universal declaration of human rights: Background, Content and relevance, Theories/Justification/Perspectives on Human Rights, Natural, Moral, Legal and human rights, Natural rights, Positivist, Liberal, Marxist, Feminist, Asian perspectives.

UNIT II

Debates: Universality of rights, Rights vs. duties, Individual vs. group rights, Civil and political rights vs. social, The notion of rights in various religious traditions (Hindu, Muslim, Buddhist traditions), Western Influence (especially the impact of the British rule), National freedom movement, The roles of Gandhi, Ambedkar and Nehru.

UNIT III

Constitutional provisions (especially fundamental rights vs. directive principles of state policy and emergency), Intergovernmental Organization, The United Nations (study of specific UN agencies related to human rights), Regional instruments.

UNIT IV

International NGO - Amnesty international: It's working and impact on India, Case studies of selected national NGOs, Case studies of selected regional NGOs, The government: Role of some of its agencies including the army, Police and paramilitary forces.

UNIT V

National Human Rights Commission of India - Background, Structure and functioning, International humanitarian law, International refugee law, The judiciary including public interest litigation, The medical profession and human rights, The role of the media in human rights.

UNIT VI

Some Issues in Human Rights : Violence and terrorism, Women's rights, Child rights, Dalit rights, Minority rights, Tribal rights, Refugee rights, Capital punishment, Euthanasia, Rights of the elderly, Gay Rights.

Text Books

1. D. D. Basu, V. R. Manohar, B. P. Banerjee, S.A. Khan, ***"Introduction to the Constitution of India"***, 20th Edition, Lexis Nexis Butterworths publication, 2008.
2. A. R. Desai, ***"Violation of Democratic Rights in India"***, Bombay Popular Prakashan.

Reference Books:

1. M. Mohanty, P. N. Mukherji, O. Tornquist, ***"People's Rights: Social Movements and the State in the Third World"***, New Delhi, Sage Publications, 1998.
2. Nanda, P. Ved, J. R. Scarritt, G. W. Shepherd, ***"Global Human Rights: Public Policies Comparative Measures and NGO Strategies"***, Boulder Westview Press Inc., 1981.
3. Nirmal, J. Chiranjivi, ***"Human Rights in India: Historical, Social and Political Perspectives"***, New Delhi, Oxford University Press, 2000.
4. Kothari, Smitu, Harsh Sethi, ***"Rethinking Human Rights: Challenges for Theory and Action"***, Lokayan, Delhi, 1991.
5. A. J. M. Milne, ***"Human Rights and Human Diversity: An Essay in the Philosophy of Human Rights"***, New York State University of New York Press, 1986.

Course Title:	**Switching Theory and Logic Design Lab**	**Semester III**	
Course Code	**BTESCL307**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. Implement Flip-Flops, Multiplexer and De-multiplexer, Counters and arithmetic operations

Lab Experiments List:

1. Study of basic and Universal gates
2. Implementation of Boolean functions using Gates
3. Implementation of following code conversions:
    a) Binary to gray
    b) Gray to binary
    c) Excess –3 to BCD
    d) BCD to Excess –3.
4. Implementation of half adder, full adder
5. Implementation of half subtractor, full subtractor
6. Implementation of K-map examples
7. Implementation of Quine- McClusky examples
8. Implementation of Multiplexer and Demultiplexer
9. Implementation of BCD adder using 4 bit adder IC
10. Study of flip flops:
    a) RS flip-flop
    b) D flip-flop
    c) T flip-flop
    d) J-K flip-flop

Course Title:	**Object Oriented Paradigm with C++ Lab**	**Semester III**	
Course Code	**BTITL308**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. Programming using C++

Lab Experiments List:

1. Raising a number n to a power p is the same as multiplying n by itself p times. Write a function called power () that takes a double value for n and an int value for p, and returns the result as double value. Use a default argument of 2 for p, so that if this argument is omitted, the number will be squared. Write a main () function that gets values from the user to test this function.

2. A point on the two-dimensional plane can be represented by two numbers: an X coordinate and a Y coordinate. For example, (4,5) represents point 4 units to the right of the origin along the X axis and 5 units up the Y axis. The sum of two points can be defined as a new point whose X coordinate is the sum of the X coordinates of the points and whose Y coordinate is the sum of their Y coordinates. Write a program that uses a structure called point to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. Interaction with the program might look like this:

```
Enter coordinates for P1: 3 4
Enter coordinates for P2: 5 7
Coordinates of P1 + P2 are: 8, 11
```

Create the equivalent of a four-function calculator. The program should request the user to enter a number, an operator, and another number. It should then carry out the specified arithmetical operation: adding, subtracting, multiplying, or dividing the two numbers. (It should use a switch statement to select the operation). Finally, it should display the result. When it finishes the calculation, the program should ask if the user wants to do another calculation. The response can be Y or N. Some sample interaction with the program might look like this:

```
 Enter first number, operator, second number: 10/ 3
Answer = 3.333333
 Do another (Y/ N)? Y
Enter first number, operator, second number 12 + 100
Answer = 112
Do another (Y/ N)? N
```

3. A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767) and the number (8900). Write a program that uses a structure to store

these three parts of a phone number separately. Call the structure phone. Create two structure variables of type phone. Initialize one, and have the user input a number for the other one. Then display both numbers. The interchange might look like this:

```
Enter your area code, exchange, and number: 415 555 1212
My number is (212) 767-8900
Your number is (415) 555-1212
```

Create two classes DM and DB which store the value of distances. DM stores distances in meters and centimeters and DB in feet and inches. Write a program that can read values for the class objects and add one object of DM with another object of DB. Use a friend function to carry out the addition operation. The object that stores the results maybe a DM object or DB object, depending on the units in which the results are required. The display should be in the format of feet and inches or meters and centimeters depending on the object on display.

4. Create a class rational which represents a numerical value by two double values- NUMERATOR and DENOMINATOR. Include the following public member Functions: constructor with no arguments (de-fault), constructor with two arguments, void reduce () that reduces the rational number by eliminating the highest common factor between the numerator and denominator.

   Overload + operator to add two rational numbers
   Overload - operator to enable input through cin
   Overload * operator to enable output through cout
   Write a main ( ) to test all the functions in the class.

5. Consider the following class definition:

```
class father {
protected age;
public;
father (int x) {age = x;}
virtual void iam()
{
cout<<“I AM THE FATHER ” ;
cout << “My age is : ” <<age<< endl;}
};
```

Derive the two classes son and daughter from the above class and for each, define iam () to write similar but appropriate messages. You should also define suitable constructors for these classes. Now, write a main() that creates objects of the three classes and then calls iam ( ) for them. Declare pointer to father. Successively, assign addresses of objects of the two derived classes to this pointer and in each case, call iam () through the pointer to demonstrate polymorphism in action.

6. Write a program that creates a binary file by reading the data for the students from the terminal. The data of each student consist of roll number, name (a string of 30 or lesser number of characters) and marks.

7. A hospital wants to create a database regarding its indoor patients. The information to store include

   Name of the patient
   Date of admission
   Disease
   Date of discharge

   Create a structure to store the date (year, month and date as its members). Create a base class to store the above information. The member function should include functions to enter information and display a list of all the patients in the database. Create a derived class to store the age of the patients. List the information about all the patients to store the age of the patients. List the information about all the pediatric patients (less than twelve years in age).

8. Imagine a tollbooth with a class called toll Booth. The two data items are a type Unsigned Int to hold the total number of cars, and a type double to hold the total amount of money collected. A constructor initializes both these to 0. A member function called payingCar ( ) increments the car total and adds 0.50 to the cash total. Another function called nopayCar( ), increments the car total but adds nothing to the cash total. Finally, a member function called display() displays the two totals i.e. total cars and total cash. Include a program to test this class. This program should allow the user to push one key to count a paying car, and another to count a nonpaying car. Pushing the ESC key should cause the program to print out the total cars and total cash and then exit.

Course Title:	**Programming Lab (Python)**	**Semester III**	
Course Code	**BTITL309**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. To learn Python programming

Lab Experiments List:

1. Program to find the union of two lists.
2. Program to find the intersection of two lists.
3. Program to remove the “i” th occurrence of the given word in a list where words repeat.
4. Program to remove all tuples in a list of tuples with the USN outside the given range.
5. Program to count the occurrences of each word in a given string sentence.
6. Program to check if a substring is present in a given string.
7. Program to map two lists into a dictionary.
8. Program to count the frequency of words appearing in a string using a dictionary.
9. Program to create a dictionary with key as first character and value as words starting with that character.
10. Program to find the length of a list using recursion.
11. Program to read a file and capitalize the first letter of every word in the file.
12. Program to read the contents of a file in reverse order.
13. Program to create a class in which one method accepts a string from the user and another prints it.
14. Program to create a class and get all possible subsets from a set of distinct integers.

Course Title:	**Advanced Engineering Chemistry Lab**	**Semester III**	
Course Code	**BTITOEL310**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Basic Science**	**Credits**	**1**

List of Experiments: (Perform any 8 – 9 Experiments)

1. To determine λmax of given solutions.
2. To Verify Beer's Lambert's law.
3. Experiments on Paper and Thin Layer Chromatography. (two experiments)
4. Determination of rate of corrosion of metal.
5. Experiments related with Organic Chemistry. (three experiments)
6. Experiments on pH metry.
7. Experiments on Conductometry.
8. Experiments on Flame Photometry.
9. Experiments on Solvent Extraction.
10. Estimation of Metals from Solution/ Alloys. (two experiments)
11. Synthesis of materials by various techniques. (two experiments)

Reference Books:

1. A. Sethi, "***Systematic experiments in Chemistry***", New Age International Publication, New Delhi.
2. A. I. Vogel, "***Practical Inorganic Chemistry***", ELBS Publication.
3. S. S. Dara, ***"Practical in Engineering Chemistry"***.
4. A. I. Vogel, "***Practical Organic Chemistry***", ELBS Publication.

Course Title:	**Interpersonal Communication Skills and Self Development for Engineers Lab**	**Semester III**	
Course Code	**BTITOEL310**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Humanities, Social Science and Management**	**Credits**	**1**

List of Experiments:

1. General etiquettes and manners
2. Team building and group dynamics
3. Presentation Skills
4. Conducting meetings
5. Leadership Development
6. Skills in dealing with difficult people/situations
7. Persuasive writing
8. Negotiation skills
9. Conflict Resolution
10. Y-O-U-R-N-M-A-M-E Activity

Course Title:	**Programming in Java Lab**	**Semester III**	
Course Code	**BTITOEL310C**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Professional Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn Java Programming

Lab Experiment Lists:

1. To create simple application to access data base using JDBC.
2. To read and write the files.
3. To implement polymorphism and method overriding in java.
4. To write programs implementing exception handling.
5. To write programs to illustrate interfaces in java.
6. To write programs to create package in java.
7. To design multi threaded programs in java.
8. To write programs to manipulate strings.
9. To write programs to draw various shapes using java applets.

Course Title:	**Introduction to Web Technology Lab**	**Semester III**	
Course Code	**BTITOEL310D**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Professional Core**	**Credits**	**1**

Lab Experiments List:

1. Download XAMPP or WAMPP server, IDE, browsers to run HTML program
2. Develop page to display fruits list with different color with heading on top of the page and link each fruit with fruit description page
3. Develop using semantic element, page having menu bar in header section
4. Develop user personal info form using HTML5 input control and decorate with CSS
5. Develop responsive page layout using media queries
6. Write a PHP program to print list of user info using array
7. Write a PHP program to fetch user info from MYSQL database
8. Write a PHP program to perform crud operation
9. Write a PHP function to check palindrome string
10. Write a PHP program using for loop to add all the integers between 0 and 30 and display the total
11. Create a script to construct the pyramid of asterisk ('*') using nested for loop
12. Write a program to calculate factorial of a number using for loop
13. Write a program which will count the specific characters in the text
14. Debug web site using developer tools, inspect element

Course Title:	**Microprocessors and Microcontrollers**	**Semester IV**	
Course Code	**BTITC401**	**Course Type**	**Compulsory**
Prerequisite	**BTCOC304**	**L – T – P**	**2– 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand 8086 microprocessor Architecture.
2. To understand design aspects of I/O and Memory Interfacing circuits.
3. To acquaint with instruction set and logic required to build assembly language programs.
4. To learn micro-controller architecture, its instruction set and interfaces.

Course Outcomes:

After learning the course the students should be able:

1. To design and implement programs on 8086 microprocessor.
2. To design I/O circuits and Memory Interfacing circuits.
3. To exhibit knowhow on micro-controller interfaces & programming.
4. To experiment with MCS51 and PIC18 micro-controller.

Course Content:

UNIT I

Intel 8086/8088 Microprocessor Family: Architecture and organization of 8086/8088 microprocessor family, Instruction set, Assembly language programming, Introduction to mixed language programming using C and Assembly language, 8086 family minimum and maximum mode operation, Timing diagram for 8086 family, Detailed study of maximum mode connection: Study of 8288 bus controller, 8086 interrupt structure.

UNIT II

8086 Instruction Set and Programming: Addressing modes, Instruction Set, ALP, Mixed language programming, Stacks, Strings, Procedures, Macros, Timers, Counters and delay, Programming examples using DOS and BIOS Interrupts, Device drivers programming.

UNIT III

8086 Interrupt System: 8086 Interrupt structure, Types and applications: Study of Interrupt Controller 8259A and Interrupt Priority Management using 8259A.

UNIT IV

Memory System Design and I/O Interfacing: Interfacing SRAM, ROM and DRAM to 8086, Address decoding and Timing Considerations, I/O interfacing in 8086: Serial communication interface includes Synchronous and Asynchronous, Protocols, Parallel communication interface includes I/O Mapped I/O, Memory Mapped I/O, and Handshaking Signals, 8087 Math Co-processor: Study of architecture of 8087, Floating point coprocessor, Data types supported by 8087, Host and coprocessor interface, Assembly language Programming for 8086 - 8087 based systems.

UNIT V

Intel MCS 51 Family: Introduction to Single chip microcontrollers of Intel MCS 51 family, Architectural and operational features, Instruction set, CPU timing and machine cycles, Interrupt structure and priorities, Internal Timer / counters, Serial interface, Connection of external memory, Power saving modes, Interfacing of 8051 with EPROM, Programming for EPROM versions, 8051 variation.

UNIT VI

Introduction to the PIC18 Microcontroller: Overview of the PIC18 MCU, The PIC18 Memory Organization, The PIC18 CPU Register, The PIC18 Pipelining, PIC18 Instruction Format, Addressing Modes, A Sample of PIC18 Instruction, Overview of the 8-Bit MCU Market.

Text Books:

1. Douglas Hall, ***“Microprocessors and Interfacing: Programming and Hardware”***, Tata McGraw-Hill, 2nd Edition.
2. Han-Way Huan, ***“An Introduction to Software and Hardware Interfacing”***, Delmar Cengage Learning, 2nd Edition, 2006.

Reference Books:

1. Peter Norton, ***“IBM PC, Assembly Language programming”***, BPB publication.
2. John Uffenback, ***“8086/8088 Interfacing, Programming and Design”***, Prentice Hall of India Publication.
3. A. K. Ray, K. M. Bhurchandi, ***“Advanced Microprocessors and Peripherals”***, Tata McGraw Hill, 2000.
4. John Uffenback**, *“8086/8088 Interfacing, Programming and Design”*,** Prentice Hall of India Publication.

Course Title:	**Data Structures and Applications**	**Semester IV**	
Course Code	**BTITC402**	**Course Type**	**Compulsory**
Prerequisite	**BTITC303**	**L – T – P**	**3 – 1 – 0**
Stream	**Core**	**Credits**	**4**

Course Objectives:

1. To assess how the choice of data structures and algorithm design methods affects the performance of programs.
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
4. To solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, branch and bound and writing programs for these solutions.

Course Outcomes:

After learning the course, the students should be able:

1. To write neat code by selecting appropriate data structure and demonstrate a working solution for a given problem.
2. To think of all possible inputs to an application and handle all possible errors properly.
3. To analyze clearly different possible solutions to a program and select the most efficient one.
4. To write an application requiring an effort of at least 1000 lines of code to demonstrate a good working solution.
5. To demonstrate the ability to write reusable code and abstract data types in C, using object-based way of thinking.

Course Content:

UNIT I

Introduction to Data Structures and Analysis of Algorithms: Need of data structures, Types of data structures, Recursion, ADT (Abstract Data Types), Basics of algorithm, Analysis of algorithm through time complexity and space complexity, Asymptotic notations, Pseudo code analysis, Recurrence relations and solving recurrences using substitution, Recursion tree and master method.

UNIT II

Stack and Queue: Stack: Representation, Stack operation, Application. Queue: Representation, Queue operation, Circular and priority queue, Applications.

UNIT III

Linked list: Operation on linked list, Linked stacks and Queues, Array implementation of linked list, Linked list using dynamic variable, doubly linked list, Circular linked list.

UNIT IV

Binary Tree: Basic tree concept, Binary tree operations, Binary tree representation, Binary tree traversals, Binary search tree and operations, Balanced tree: AVL trees and operations, Applications of binary trees, implementing priority queue using binary heap data structure.

UNIT V

Graphs: Basics concepts of graphs, Representation of graphs, Graph traversals BFS and DFS, Minimum spanning tree algorithms: Kruskal's algorithm and Prim's algorithm, Applications of graphs.

UNIT VI

Searching Techniques and Hashing: Linear search and binary search, Hashing: Direct-address tables, Hash tables, Open addressing, Perfect Hashing, Sorting techniques: Various sorting methods and their time complexity analysis: Insertion sort, Selection sort, Merge sort, Quick sort, Heap sort.

Text Books:

1. E. Horowitz, D. Mehta, S. Sahni, ***"Fundamentals of Data Structures in C++"***, Silicon Press, 2nd Edition, 2008.
2. R.S. Bichkar, ***"Programming with C and Data structures"***, Universities Press, 1st Edition, 2014.

Reference Books:

1. Goodrich, Tamassia, "***Data Structures and Algorithm in Java***", Wiley publication, 6th Edition, 2014.
2. T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, "***Introduction to Algorithms***", MIT Press, 3rd Edition, 2009.
3. Y. Langsam, M. J. Augenstein and A. M. Tanenbaum, "***Data structures using Java***", Pearson Education, 2003.
4. J. Murach, "***Murach's Java Programming***", Shroff Publishers, 4th Edition, 2012.
5. V. Goyal, L. Goyal, P. Kumar, "***A Simplified Approach to Data Structures***", Shroff Publishers, 1st Edition, 2014.

Course Title:	**Discrete Structures and Applications**	**Semester IV**	
Course Code	**BTITC403**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To develop a foundation of set theory concepts, notation and applications.
2. To inculcate the habit of logical and mathematical thinking and its application to computer science and IT.
3. Understand logic, basic counting principles, relations, induction, sequences and summations.
4. To be able to present a coherent and mathematically accurate argument.
5. To understand the theory of graphs and algebraic structures and their applications.

Course Outcomes:

After learning the course the students should be able:

1. To perform operations on various discrete structures such as sets functions, relations, and sequences.
2. To solve problems using counting techniques, permutation and combination, recursion and generating functions
3. To construct and verify correctness of a Boolean expression using K-Maps and truth tables.
4. To use graphs as tools to visualize and simplify Problems.
5. To solve problems using algebraic structures (Rings, Monoids and Groups).

Course Content:

UNIT I

The Foundations: Sets theory and its applications sets, Set operations, Laws of set theory, Power sets, Partitions, Multi-sets, Cardinality, Principle of inclusion and exclusion, Algebra of sets and duality, Applications of sets: Problems on set operations and principle of inclusion-exclusion, Logics and proofs, Propositional logic, Propositional equivalences, Propositional algebra, Basic logical operations, De Morgan’s laws, Predicates and quantifiers, Nested quantifiers, Rules of inference, Proof methods and strategy, Applications of logic: Translating English statements into propositions, Boolean searches in web pages, Bit operations.

UNIT II

Induction, Sequences and Summations: Induction and recursion: Mathematical induction, Strong induction, Recursive definitions, Re-cursive algorithms, Applications: Proofs using mathematical induction, Program correctness, Well formed formula, Functions, Sequences and summations, Definition and types of functions: Injective, subjective and bijective , Composition, Identity and inverse of function, Re-cursively defined functions, Applications of functions, Job scheduling problem, Countability of rational numbers.

UNIT III

Basic Counting Principles: Permutations, Combinations, Binomial coefficients, Generalized permutations and combinations, Combinations and permutations with repetition, Generating permutations and combinations, Recurrence relation, Solving linear recurrence relations with constant coefficients, Applications of counting principles, Pigeonhole principle and its applications.

Relations: Properties of binary relations, Closure of relations, Warshall's algorithm, Equivalence relations and partitions, Partial ordering relations and lattice application of relations: N-ary relations and their applications, Databases and relations.

UNIT V

Graph Theory: Basic terminology, Multi graphs and weighted graphs, Paths and circuits, Shortest path in weighted graph, Hamiltonian and Euler paths and circuits, Factors of a graph, Shortest path algorithm, Traveling salesman problem, Transport networks, Special types of graphs and applications: Job assignment, LAN, Interconnection networks for parallel computation, Mesh networks, Graph coloring and applications.

UNIT VI

Algebraic Structures: Algebraic systems, Groups, Semi groups, Monoid, Subgroups, Permutation groups, Codes and group codes, Isomorphism and automorphisms, Homomorphism, Fermat's little theorem, Polynomial rings, Applications of groups.

Text Books:

1. K. H. Rosen, ***"Discrete Mathematics and Its Applications"***, Tata McGraw Hill Publication, 7th Edition, 2012.
2. J. P. Tremblay, R. Manohar, ***"Discrete Mathematical Structures with Applications to Computer Science"***, 1st Edition, McGraw Hill Publication, 2001.

Reference Books:

1. B. Kolman, R. Busby, S. Ross, ***"Discrete Mathematical Structures"***, Pearson Education, 6th Edition, 2009.
2. R. K. Bisht, H. S. Dhami, ***"Discrete Mathematics"***, Oxford University Press, 2015.

Course Title:	**Internetworking Protocols**	**Semester IV**	
Course Code	**BTITC404**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand the basic concepts of TCP/IP Architecture.
2. To Understand Network Layer and Applications.
3. To learn UDP and TCP applications.
4. To learn Transport Layer Reliability.

Course Outcomes:

After learning the course, the students should be able:

1. To compare and contrast TCP and UDP in terms of the application that uses them.
2. To design network-based applications using the socket mechanism.
3. To work with IPv4 addresses in terms of subnetting and supernetting.
4. To setup a host and network in terms of IP addressing.

Course Content:

UNIT I

Introduction and Underlying Technologies : ARPANET, Birth of the Internet, Transmission Control Protocol/Internetworking Protocol (TCP/IP) , MILNET , CSNET , NSFNET ,ANSNET, The Internet Today ,World Wide Web, Time Line, Growth of the Internet, Protocols and Standards, Standards Organizations: Internet Standards Internet Administration.

The OSI Model and the TCP/IP Protocol Suite:

Protocol Layers: Hierarchy Services, The OSI Model: Layered Architecture , Layer-to-Layer Communication, Encapsulation, Layers in the OSI Model, TCP/IP Protocol Suite: Comparison between OSI and TCP/IP Protocol Suite, Layers in the TCP/IP Protocol Suite, Addressing: Physical Addresses, Logical Addresses, Port Addresses, Application-Specific Addresses, Wired Local Area Networks: IEEE Standards, Frame Format, Addressing, Ethernet Evolution, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Ten-Gigabit Ethernet.

UNIT II

Wireless LANS: IEEE, MAC Sublayer, Addressing Mechanism, Bluetooth, Point-to-Point WANS, DSL Technology, Cable Modem, ATM, Connecting devices: Repeaters, Bridges and Routers.

Introduction to Network Layer: Switching: Packet Switching, Circuit Switching, Packet Switching at Network Layer, Network Layer Services, Other Network Layer Issues.

IPv4 Addresses, Address Space Notation, Range of Addresses, Operations, Classful Addressing: Classes, Classes And Blocks, Two-Level Addressing, Three-Level Addressing: Subnetting, Supernetting, Classless Addressing: Variable-Length Blocks, Two-Level Addressing, Block Allocation, Special Addresses: Special Blocks, Special Addresses in Each block, NAT, Address Translation, Translation Table.

UNIT III

Delivery and Forwarding of IP Packets: Delivery: Direct Delivery, Indirect Delivery, Forwarding: Forwarding Based on Destination Address, Forwarding Based on Label, Structure of a Router: Components.

Internet Protocol Version 4(IPv4): Datagrams, Fragmentation, Maximum Transfer Unit (MTU), Fields Related to Fragmentation, Options: Format, Option Types, Checksum: Checksum Calculation at the Sender, Checksum Calculation at the Receiver, Checksum in the IP Packet, IP PACKAGE : Header-Adding Module, Processing Module, Queues, Routing Table, Forwarding Module, MTU Table, Fragmentation Module, Reassembly Table, Reassembly Module

Address Resolution Protocol (ARP): Address Mapping: Static Mapping, Dynamic Mapping, The ARP Protocol: Packet Format, Encapsulation, Operation, Proxy ARP, ARP Package: Cache Table, Queues, Output Module, Input Module, Cache-Control Module.

UNIT IV

Internet Control Message Protocol (ICMP): Messages: Message Format, Error Reporting Messages, Query Messages, Checksum, Debugging Tools: Ping, Traceroute, ICMP Package: Input Module, Output Module.

Unicast Routing Protocols (RIP, OSPF, and BGP), Static versus Dynamic Routing Tables, Routing Protocol, Intra- And Inter-Domain Routing, Distance Vector Routing :Bellman-Ford Algorithm, Distance Vector Routing Algorithm, Count to Infinity, RIP: RIP Message Format, Requests and Responses Timers in RIP, RIP Version, Encapsulation , Link State Routing: Building Routing Tables, OSPF, Areas, Metric Types of Links, Graphical Representation OSPF Packets, Link State Update Packet, Other Packets, Encapsulation, Path Vector Routing: Reachability , Routing Tables, BGP: Types of Autonomous Systems, Path Attributes, BGP Sessions, External and Internal BGP, Types of Packets, Packet Format, Encapsulation.

UNIT V

Introduction to Transport Layer: Transport-Layer Services: Process-to-Process communication, Addressing: Port Numbers, Encapsulation and Decapsulation , Multiplexing and Demultiplexing, Flow Control, Error Control , Combination of Flow and Error Control, Congestion Control, Connectionless and Connection-Oriented Services.

User Datagram Protocol (UDP): User Datagram, UDP Services: Process-to-Process Communication, Connectionless Services, Flow Control, Error Control, Congestion Control, Encapsulation and Decapsulation, Queuing, Multiplexing and Demultiplexing, Comparison between UDP and Generic Simple Protocol, UDP Applications: UDP Features, Typical Applications, UDP Package: Control-Block Table, Input Queues, Control-Block Module, Input Module, Output Module.

UNIT VI

Transmission Control Protocol (TCP): TCP Services: Process-to-Process Communication, Stream Delivery Service, Full-Duplex Communication, Multiplexing and Demultiplexing, Connection-Oriented Service, Reliable Service. TCP Features: Numbering System, Flow Control, Error Control, Congestion Control, Segment: Format, Encapsulation, A TCP Connection: Connection Establishment, Data Transfer, Connection Termination, Connection Reset, State Transition Diagram, Scenarios ,Windows in TCP ,Send Window, Receive Window, Flow Control : Opening and Closing Windows, Shrinking of

Windows, Silly Window Syndrome, Error Control :Checksum, Acknowledgment, Retransmission, Out-of-Order Segments, Data Transfer in TCP, Some Scenarios, Congestion Control : Congestion Window, Congestion Policy, TCP Timers: Retransmission Timer, Persistence Timer, Keepalive Timer, Time-Wait Timer, TCP Package: Transmission Control Blocks (TCBs), Timers, Main Module, Input Processing Module, Output Processing Module.

Text Books:

1. Douglas E. Comer, ***“Internetworking with TCP/IP: Principles, Protocols and Architecture”***, Volume 1, 6th Edition, PHI publication, 2013.
2. Behrouz A. Forouzan, ***“TCP-IP Protocol Suite”***, 4th Edition, McGraw Hill publication, 2010.

Reference Books:

1. Comer, ***“Internetworking with TCP-IP”***, Volume 3, 5th Edition, Pearson publication, 2013.
2. W. Richard Stevens, ***“UNIX Network Programming: Interprocess Communications”***, Volume 2, 2nd Edition, PHI publication, 1999.
3. William Stalling, ***“SNMP, SNMPv2, SNMPv3, and RMON 1 and 2”***, 2nd Edition, Pearson education publication, 2001.
4. Hunt Craig, ***“TCP-IP Network Administration”***, 3rd Edition, O’Reilly publication, 2002.
5. Loshin, Harwurt, ***“TCP-IP Cleanly Explained”***, BPB publication.

Course Title:	**Physics of Engineering Materials**	**Semester III**	
Course Code	**BTBSCOE405A**	**Course Type**	**Elective**
Prerequisite	**PHY203**	**L – T – P**	**1 – 1 – 0**
Stream	**Basic Science**	**Credits**	**2**

Course Objectives:

1. To impart the basic and advanced knowledge to the students.
2. To understand, remember and capable to explain and apply this knowledge in the field of Engineering/ Technology.

Course Outcomes:

After learning the course, the students should be able:

1. To explain the concepts of Crystallography, X -rays, Conducting Materials, Magnetic Materials.

Course Content:

UNIT I

Crystallography: Crystal directions and planes, Diatomic Crystal (CsCl, NaCl, Diamond, BaTiO3) Crystal imperfection, Point defects, Line defects, Surface and Volume defects, Structure properties relationship, structure determination by X-ray diffraction.

UNIT II

Magnetic Materials: Origin of magnetization using atomic theory, classification of magnetic materials and properties, Langevin’s theory of Dia, Para and ferromagnetism, Soft and Hard magnetic materials and their uses, Domain theory of ferromagnetism, Hysteresis loss, Ant ferromagnetic and Ferromagnetic materials, Ferrites and Garnets, magnetic bubbles, magnetic recording.

UNIT III

Conducting and Superconducting Materials: Band theory of solids, Classical free electron theory of metals, Quantum free electron theory, Density of energy states and carrier concentration, Fermi energy, Temperature and Fermi energy distribution, Superconductivity, Factor affecting Superconductivity, Meissner effect, Type-I and Type-II superconductors, BCS theory, Josephson effect, High temperature superconductors, Application of superconductors (Cryotron, magnetic levitation)

UNIT IV

Semiconducting Materials: Band structure of semiconductor, Charge carrier concentration, Fermi level and temperature, Electrical conductivity, Hall effect in semiconductors, P-N junction diode, Preparation of single crystals, LED, Photovoltaic Cell

UNIT V

Dielectric Materials: Dielectric constant and polarizability, types of polarization, temperature and frequency dependences of Dielectric parameter, internal fields in solids, Clausius-Mosotti equation, dielectric loss, dielectric breakdown, ferroelectric, pyroelectric and piezoelectric materials, applications of dielectric materials

UNIT VI

Nano Materials: Introduction and properties, synthesis of nanomaterials, Carbon Nano Tubes, Characterization techniques of nanomaterials- SEM, TEM, EDAX, FMR, XRD. Applications of nanomaterials.

Text Books:

1. C. Kittle, ***“Introduction to Solid state Physics”***.
2. C. M. Srivastava, C. Srinivasan, ***“Science of Engineering Materials and Carbon Nanotubes”***.
3. A. J. Dekker, ***“Solid State Physics”***.

Reference Books:

1. V. Raghavan, ***“Material Science and Engineering”***.
2. A. J. Dekker, ***“Electrical Engineering Materials”***.

Course Title:	**Organizational Behavior**	**Semester IV**	
Course Code	**BTHMOE405B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Humanities, Social Science and Management**	**Credits**	**3**

Course Objectives:

1. To explore the organization as a micro-social system - a medium to facilitate and improve the interpersonal relationships in the context of organizational functioning.

Course Outcomes:

1. Students will become more self aware and will have identified areas of development for long term effectiveness.
2. Students will understand the role that individuals play collectively to perform in organizations.

Course Content:

UNIT I

Introduction to Organizational Behavior: Definition of organization and behavior, Historical Development of OB, Human relations movement, Impact of technology on organizational behavior.

Organizational Design: Key factors in organizational design, Types of organizational design, Need and significance of a sound organizational design, Organizational Structures - traditional and contemporary structures.

UNIT II

Organizational Culture: Meaning and dimensions, Role of founders' values and vision in creating and sustaining culture, Types of organizational cultures, Impact of culture on image and performance of the organization, Organizational Communication - Tool and Techniques, Johari window transactional analysis, Lateral thinking, Brain storming, Delphi technique, Power of grapevine and other informal communication techniques.

UNIT III

Groups and Organizations: Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, Five stages of group/team development, Determinants of group behavior, Typical teams in organizations.

Leadership: Leadership as a concept and its essence, Leaders versus managers, Blake and Mouton's managerial grid, Hersey and Blanchard's situational leadership, Transactional versus Transformational leadership, Women as leaders, Leadership in entrepreneurial and family business, organizations.

UNIT IV

Foundations of Individual Behavior: Factors affecting individual behavior - personal, environmental and organizational, Nature and Determinants of Personality, Personality Traits - Big Five, Locus of Control, Self-esteem, Type A/ Type B Personality, Risk Taking, Machiavellianism, Self Monitoring,

Personality and OB
Motivation: Power and purpose of motivation, Theories of motivation - Locke's goal setting theory, Vroom's expectancy theory, Porter and Lawler's model, Adam's equity theory, McClelland's theory of needs, Motivational Techniques – Job design/enlargement /enrichment / rotation, Managing rewards - Job status based rewards, Competency based rewards, performance based rewards, Empowerment and Self Managed Teams.

UNIT V

Work Related Attitudes, Values and Perception: Meaning and definitions, Factors influencing perception Social and Person perception, When perception fails, Perception and OB.
Organizational Outcomes: Power and Politics, Power - Dynamics, Sources and Tactics, Politics - Essence, Types of political activities, Ethics of power and politics.

UNIT VI

Conflicts and Negotiations, Nature of conflict, Functional and Dysfunctional conflict, Conflict resolution and negotiations, Managing conflict during change initiatives.
Stress: Meaning and definition, Work stress model, Sources of stress, Stress Management - Individual and organizational strategies, Impact of stress on performance.

Text books:

1. Uma Sekaran, ***"Organization Behaviors"***, McGraw Hill Company, New Delhi, 2011.
2. LM Prasad, ***"Organization Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
3. Nair, Banerjee, Agarwal, ***"Organization Behavior"***, Prgathi Prakashan, New Delhi, 2006.

Reference books:

1. Rosy Joshi and Sashi K Gupta, ***"Organization Behaviors"***. Kalyani publishers, New Delhi, 2005.
2. S.S. Khanka, ***"Organization Behavior"***, S. Chand and Co. Ltd, New Delhi, 2008.
3. Fred Luthans, ***"Organizational Behavior",*** McGraw Hill Book Co., 2005.

Course Title:	**Development Engineering**	**Semester IV**	
Course Code	**BTXXOE405C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**2 – 1 – 0**
Stream	**Interdisciplinary**	**Credits**	**3**

Course Objectives:

1. Development Engineering prepares students to develop, pilot, and evaluate technological interventions designed to improve human and economic development within complex, low-resource settings.
2. Students can include topics related to the application of technology to address the needs of people living in poverty.

Course Outcomes:

After learning the course, the students should be able:

1. To understand the core disciplines issues in development.
2. To understand certifications.
3. To understand the planning of developing of rural areas.

Course Content:

UNIT I

Introduction to Development Engineering: Introduction to development engineering, need of development engineering, core disciplines and concept, major issues in development, urban development, rural development, socioeconomic development, scientific social research, formulation of research problem, field work and data collection, report drafting.

UNIT II

Design of Sustainable Communities: Concept and development of sustainable communities, Sustainable design principles, Building regulations, Codes and standards – ANSI, ASTM, ASHRAE, Approval process, Green buildings – green building techniques-energy solutions, Site solutions, Exterior and interior solutions, Certification – BREEAM, GRIHA, NAHB, LEED, IGBC.

UNIT III

Town/City Planning: Town Planning, History of town planning in India, Characteristics of city/town, Town planning at national, Regional and local levels, Planning standards, Master plan, Site layout and development, Zoning and density control, Green belt, Slum redevelopment, Smart city planning, Introduction to city planning, Infrastructure elements of smart city planning, Dimensions of smart cities global standards and performance benchmark, Smart solutions e-governance, Waste management, Water management, Energy management, Urban mobility, Citizen services, Other services such as telemedication and education, Trade facilitation, Skill development, GIS for Planning.

UNIT IV

Planning and Development of Rural Areas: District administration, District Planning, Introduction to various sectors of rural areas such as drinking water, Waste water treatment, Electricity, Public transport, Irrigation, Sanitation and cooking energy, Issues and challenges associated with these sectors, People's participation and role in development of rural areas, Various schemes and policies floated by state and central government – phases in the schemes; life cycle costing of these schemes.

UNIT V

GeoInformatics for Planning and Development: Introduction to GeoInformatics, Advantages, Benefits and limitations, Interdisciplinary applications, Data extraction, Use of GeoInformatics for planning, Mapping and preparation of layouts.

UNIT VI

Development aspects: Urban and Rural: Planning and designing of a model town / city and using Auto-CAD and/or GIS, Visit to a village or small town – The project will be carried out in groups, Problem faced by the villagers pertaining to various sectors or existing schemes, Define the need, method, Tools and techniques for development, Deliver technology based solution.

Text Books

1. Chand M. and Purr U.K., ***"Regional Planning in India"***, Allied Publisher, New Delhi, 1983.
2. Kaiser E. J., et.al, ***"Urban Land use Planning"***, 4th Edition Urbana, University of Illinois Press.
3. Sundaram K. V., ***"Geography Planning"***, Concept Publishing Co., New Delhi.
4. Ayyar C.P.V., ***"Town Planning in Early South India"***, Mittal Publications, Delhi.
5. Reeder, Hoboken, ***"Guide to green building rating systems"***, John Wiley and Sons Inc.
6. Longley, et.al, ***"Geographic Information Systems and Science"***, John Wiley and Sons, New York.
7. Desai V., ***"Rural Development of India"***, Himalaya Publishing House, Mumbai.
8. Rau S. K., ***"Global Search for Rural Development"***, NIRD, Hyderabad.

Reference Books:

1. Institute of Town Planners, India, Ministry of Urban Affairs and Employment, Government of India, New Delhi, UDPFI Guidelines, 1996.
2. Miles R. Simon, 1970, ***"Metropolitan Problems"***, Methuen Publications, Canada.
3. B.I.S., 1980, ***"National Building Code of India"***, ISI, New Delhi.
4. ANSI/ASHRAE/USGBC/IES Standard 189.1, Standard for the Design of High – Performance Green Buildings Except Low-Rise Residential Buildings.
5. ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

Course Title:	**Product Design Engineering**	**Semester IV**	
Course Code	**BTXX406**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Interdisciplinary**	**Credits**	**2**

Course Outcomes:

After completing this programme, participants will be able to:

1. Create simple mechanical designs.
2. Create documents for knowledge sharing.
3. Manage own work to meet requirements.
4. Work effectively with colleagues.
5. Maintain a healthy, safe and secure working environment.
6. Provide data/information in standard formats.
7. Develop their knowledge, skills and competence.

Course Content:

UNIT I

Creating simple products and modules Document Creation and Knowledge Sharing

UNIT II

Self and work Management

UNIT III

Team Work and Communication

UNIT IV

Managing Health and Safety

UNIT V

Data and Information Management

UNIT VI

Learning and Self Development

Course Title:	**Microprocessors and Microcontrollers Lab**	**Semester IV**	
Course Code	**BTITL407**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn assembly language.
2. To program microprocessor and microcontroller for arithmetic operations.
3. To interface microprocessor and microcontroller with I/O devices.

Lab Experiments List:

1. 8085 and 8086 kit familiarization and basic experiments
2. Arithmetic operation of 16 bit binary numbers
3. Programming exercise: sorting, searching and string
4. Interfacing with A/D and D/A converters
5. Interfacing with stepper motors
6. Keyboard interfacing to 8086
7. 8255 interface to 8086
8. Assembly language programming of 8051
9. Timer programming of 8051, using interrupts
10. LCD interfacing to 8051 – project

Course Title:	**Data Structures and Applications Lab**	**Semester IV**	
Course Code	**BTITL408**	**Course Type**	**Compulsory**
Prerequisite	**BTITL308**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

Lab Experiments Objective:

1. To implement all linear and non-linear data structures in C++/Java.

Lab Experiments List:

1. To implement a character stack data type and use it to reverse a string
2. To implement an integer stack data type that grows on demand
3. To write a program using appropriate stacks for evaluating an infix expression with parenthesis
4. To write a program, using a queue data type, to simulate a bank where customers are served on a first-come-first-serve basis
5. To write one program for each of the following operations with singly linked lists:
    - Concatenate two linked list and create third one
    - Free all nodes in a linked list
    - Reverse a linked list

   Given two linked list, create a third list which is set-intersection of the elements in the two.
6. To delete every third element from the linked list
7. To copy a given linked list into another (new) list
8. To implement a queue using a doubly linked list
9. To write the following recursive functions for a singly-linked NULL-terminated list: insert(), traverse(), search()

Course Title:	**Internetworking Protocols Lab**	**Semester IV**	
Course Code	**BTITL409**	**Course Type**	**Compulsory**
Prerequisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments List:

1. Conversion of IP addresses
   (e.g. I/P: 10.24.164.254 O/P: 00001010.00011000.10000000.11111110 and I/P:binary dotted O/P: decimal dotted)
2. Introduction to Wireshark
3. Wireshark Lab: Ethernet and ARP
4. Wireshark Lab: IP
5. Wireshark Lab: ICMP, study of ping and traceroute command
6. Wireshark Lab: UDP
7. Wireshark Lab: TCP
8. Study of ftp, telnet tools and network configuration files
9. DHCP server configuration
10. Socket programming for UDP and TCP

Teaching and Evaluation Scheme Third Year B. Tech. (Information Technology)

Sr. No	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
Semester V										
1	BTITC501	Database Management Systems	3	-	-	20	20	60	3	3
2	BTITC502	Design and Analysis of Algorithms	3	-	-	20	20	60	3	3
3	BTITC503	Software Engineering	3	-	-	20	20	60	3	3
4	BTITOE504	Open/Departmental Elective - Group 1	3	-	-	20	20	60	3	3
5	BTITSE505	Stream Elective - Group 1	3	-	-	20	20	60	3	3
6	BTITS506	Seminar	-	2	-	-	-	50	2	2
7	BTITL507	Programming Lab – Minor (R Programming)	-	-	2	-	25	25	1	2
8	BTHM508	Constitutions of India/ Essence of Indian Traditional Knowledge	-	-	-	-	-	-	-	Audit
9	BTITL509	Database Management Systems Lab	-	-	2	-	25	25	1	2
10	BTITL510	Design and Analysis of Algorithms Lab	-	-	2	-	25	25	1	2
Summary of Semester Assessment Marks, Credit & Hours			**15**	**2**	**6**	**100**	**175**	**425**	**20**	**23**
Semester VI										
1	BTITC601	Operating Systems	3	-	-	20	20	60	3	3
2	BTITC602	Compiler Construction	3	-	-	20	20	60	3	3
3	BTITC603	Object Oriented Software and Web Engineering	3	-	-	20	20	60	3	3
4	BTITOE604	Open/Departmental Elective Group 2	3	-	-	20	20	60	3	3
5	BTITSE605	Stream Elective - Group 2	3	-	-	20	20	60	3	3
6	BTITL606	Programming Lab – Major (Web Technologies)	-	-	4		25	25	2	4
7	BTITL607	Operating Systems Lab	-	-	2	-	25	25	1	2
8	BTITL608	Object Oriented Software and Web Engineering Lab	-	-	2	-	25	25	1	2
9	BTITSEL609	Departmental Elective - Group 2 Lab	-	-	2	-	25	25	1	2
Summary of Semester Assessment Marks, Credit & Hours			**15**	**-**	**10**	**100**	**200**	**400**	**20**	**25**

List of Open/Departmental Electives – Group 1

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITOE504A	Graph Theory	Nil
2	BTITOE504B	Human Computer Interaction	Nil
3	BTITOE504C	Probability and Queuing Theory	Engineering Mathematics III

List of Stream Electives – Group 1

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTIT SE505A	Embedded Systems	Microprocessors and Microcontrollers
2	BTIT SE505B	IT Service Management	Nil
3	BTIT SE505C	Information Storage Management	Computer Architecture &Organization
4	BTIT SE505D	Network Management	Internetworking Protocols
5	BTIT SE505E	Data Visualisation	Database Management Systems

List of Open/Departmental Electives – Group 2

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITOE604A	Enterprise Resource Planning	Database Management Systems
2	BTITOE604B	Decision Support System	Database Management Systems
3	BTITOE604C	Software Project Management	Software Engineering

List of Stream Electives – Group 2

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE605A	Software Testing	Software Engineering
2	BTITSE605B	Data Storage Technologies & Networks	Internetworking Protocols, Operating Systems
3	BTITSE605C	Service Oriented Architecture	Nil
4	BTITSE605D	Network Programming	Internetworking Protocols, Operating Systems
5	BTITSE605E	Advanced Database Technology	Database Management Systems

Course Title:	**Database Management Systems**	**Semester V**	
Course Code	**BTITC501**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand architecture and functioning of database management systems.
2. To learn relational mode.
3. To use structured query language (SQL) and its syntax, transactions, database recovery and techniques for query optimization.
4. To acquaint with various normalization forms and query processing.
5. To learn indexing methods.

Course Outcomes:

After learning the course the students should be able:

1. To explain need of database management.
2. To design and implement a database schema for a given problem-domain.
3. To normalize a database.
4. To create and query a database using SQL DML/DDL commands, stored procedures and functions.
5. To declare and enforce integrity constraints on a database.
6. To illustrate understanding of indexing methods.

Course Content:

UNIT I

Introduction: Basic concepts, Advantages of DBMS over file-processing systems, Data abstraction, Data models and data independence, Components of DBMS and overall structure of DBMS, Data modeling, Entity, Attributes, Relationships, Constraints, Keys E-R diagrams, Components of E-R Model.

UNIT II

Relational Model: Basic concepts, Attributes and domains, Concept of integrity and referential constraints, Schema diagram. Relational query languages, Relational Algebra and Relational Calculus: Tuple relational and domain relational calculus.

UNIT III

Structured Query Language-I: Introduction, Characteristics and advantages, Data types and literals, DDL, Tables: creating, modifying, deleting, Views: creating, dropping, Updation using views, DML, Operators, SQL DML queries, SELECT query and clauses.

UNIT IV

Structured Query Language- II: Set operations, Predicates and joins, Set membership, Tuple variables, Set comparison, Ordering of tuples, Aggregate functions, Nested queries, Database modification using SQL Insert, Update and Delete queries, Dynamic and embedded SQL and concept of stored procedures, Query-by-example.

UNIT V

Relational Database Design: Notion of normalized relations, Functional dependency, Decomposition and properties of decomposition, Normalization using functional dependency, Multi-valued dependency and join dependency. Storage and File Systems: Secondary storage, RAID, File organization, Indices, Static and dynamic hashing, B-Trees and B+ Trees.

UNIT VI

Query Processing and Transaction Management: Measures of query cost, Selection operation, Sorting and join operation, Transaction concept, Components of transaction management, Concurrency and recovery sys-tem, Different concurrency control protocols such as timestamps and locking, Validation, Multiple granularity, Deadlock handling, Different crash recovery methods such as log-based recovery, Shadow-paging, Buffer management and Remote backup system.

Text Books

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, ***"Database System Concepts"***, , McGraw Hill Education, 6th Edition, 2011.
2. Ramez Elmasri and Shamkant B. Navathe, ***"Fundamental Database Systems"***, Pearson Education, 7th Edition, 2015.
3. Raghu Ramkrishnan, Johannes Gehrke, ***"Database Management Systems"***, McGraw Hill Education, 3rd Edition, 2007.

Reference Books:

1. Carlos Coronel, Steven Morris ***"Database systems: Design Implementation and Management"***, Cengage Learning Press, 11th Edition, 2014.
2. J. Murach, ***"Murach's MySQL"***, Shroff Publication, 2nd Edition, 2016.
3. J. Murach, ***"Murach's Oracle SQL and PL/SQL: Works with All Versions Through 11g"***, Shroff Publication, 2008.

Course Title:	**Design and Analysis of Algorithms**	**Semester V**	
Course Code	**BTITC502**	**Course Type**	**Mandatory**
Pre-requisite	**Data Structures**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn fundamentals of algorithms design techniques.
2. To understand basic knowledge of computational complexity, approximation and randomized algorithms, selection of the best algorithm to solve a problem.
3. To analyze the performance of algorithms, to compare algorithms with respect to time and space complexity.
4. To develop proficiency in problem solving and programming.

Course Outcomes:

After learning the course the students should be able:

1. Develop efficient algorithms for simple computational tasks.
2. Gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.
3. Design standard algorithms such as sorting, searching, and problems involving graphs.
4. Compute complexity measures of algorithms, including recursive algorithms using recurrence relations.

Course Content:

UNIT I

Introduction: Instruction counts, Growth functions, Necessity of time and space analysis of algorithms, Order notations (O, Θ, Ω notations), Problem instance size, frequently occurring recurrence relations in analysis of algorithms.

UNIT II

Design Techniques-I: Divide and Conquer: Binary search, finding maximum and minimum, Merge sort, Quick sort, Strassen’s matrix multiplication. Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, optimal storage on tapes, Optimal merge pattern, Single source shortest paths.

UNIT III

Design Techniques-II: Dynamic Programming: Multistage graphs, All pairs shortest paths, 0/1 Knapsack, Travelling salesman problem.

UNIT IV

Design Techniques: Backtracking: 8-Queens Problems, Sum of subsets, Graph coloring. Branch-and-bound: Least cost (LC) search, Control abstractions for LC search, FIFO branch and bound, LC branch and bound.

UNIT V

Selected Algorithms from Various Areas: Graph Theory, Elementary Algorithms: DFS, BFS, Topological Sort, Minimum spanning trees (Kruskal and Prim’s algorithms), Shortest Paths: Single source shortest paths, all pairs shortest paths, String Matching: The naive string-matching algorithm, The Robin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

UNIT VI

Complexity Theory: Lower-bound arguments, NP-completeness: Introduction to NP-Complete, Reducibility (SAT, Independent Set, 3VC, Subset Sum and Partition, Hamiltonian Circuit).

Text Books:

1. Thomas Cormen, Charles Leiserson, Ronald Rivest and Cliford Stein, ***“Introduction to Algorithms”***, MIT Press, 3rd Edition, 2009.
2. E. Horowitz, S. Sahni and S. Rajsekaran, ***“Computer Algorithms”***, Silicon Press, 2nd Edition, 2008.

Reference Books:

1. B. K. Joshi, ***“Data Structures and Algorithms in C++”***, Tata McGraw Hill Education, 2010.
2. G. T. Heineman, Gary Pollice, Stanley Selkow, ***“Algorithms in a Nutshell”***, Shroff Publication, 1st Edition, 2008.
3. Kyle Loudon, ***“Mastering Algorithms with C”***, Shroff Publication, 1st Edition, 2008.

Course Title:	**Software Engineering**	**Semester V**	
Course Code	**BTITC503**	**Course Type**	**Core**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To understand software lifecycle development models.
2. To understand and apply software requirements engineering techniques, software design principles, modeling and software testing techniques.
3. To understand the use of metrics in software engineering.
4. To understand software project management.

Course Outcomes:

After learning the course the students should be able:

1. To use the techniques, skills, and modern engineering tools necessary for engineering practice.
2. To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. To identify, formulate and solve engineering problems.

Course Content:

UNIT I

Software Development Process: Software crisis and myths, Software process and development: Generic view of process, Software life cycle and models, Analysis and comparison of varies models, an agile view of process.

UNIT II

Requirement Engineering: Requirements engineering tasks, Initiating requirement engineering process, Eliciting requirement, developing use-cases, Building the analysis model, Negotiating and validating requirement, Building the analysis model.

UNIT III

System Design Overview: Design process and design quality, Design concepts, Design model, Pattern based software design, Architectural design, User interface design. UML: Different methods: Rambaugh / Booch / Jakobsons, Need for standardization. Developing diagrams in UML (Use CASE, Class, Interaction, State diagrams) CASE TOOLS.

UNIT IV

Validation and Testing: Strategic approach to Software testing, Strategic issues, Test strategies for conventional software, Validation testing, System testing, Debugging. White box testing and Black box testing.

UNIT V

Web Engineering: WebApps engineering layers, Web engineering processes planning for web engineering projects, Project management issue for web engineering. Metrics, Requirement analysis, Analysis models for web engineering design for WebApps, testing for WebApps.

UNIT VI

Planning and Management of Project: Project management, Metrics for process and projects, Estimation, Project scheduling, Risk management, Importance of software quality and measurements software engineering techniques for quality assurance, and Change management. ISO 9000 and CMM/PCMM.

Text Books

1. Roger S. Pressman, "***Software Engineering***", Tata McGraw-Hill, 6th Edition, 2006.
2. G. Booch, J. Rambaugh, and I. Jacobson, ***"The Unified Modeling Language User Guide"***,
3. Addison Wesley, 2nd Edition, 2005.

Reference Books:

1. Shari Pfleeger, ***"Software Engineering"***, Pearson Education, 3rd Edition, 2008.
2. Ian Sommerville, ***"Software Engineering"***, Pearson Higher Education, 10th Edition, 2016.
3. Pankaj Jalote, ***"An Integrated Approach to Software Engineering"***, Springer New York, 2nd
4. Edition, 2013.

Course Title:	**Graph Theory**	**Semester V**	
Course Code	**BTITOE504A**	**Course Type**	**Elective**
Pre-requisite	**Discrete Structures and Applications**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental Elective**	**Credits**	**3**

Course Content:

UNIT I

Basics – Graphs, degree sequences, distance in graphs, complete, regular and bipartite graphs, basic properties.

UNIT II

Structure and Symmetry – Cut vertices, bridges and blocks, automorphism groups, reconstruction problem.

UNIT III

Trees and connectivity – Properties of trees, Arboricity, vertex and edge connectivity, Mengers theorem

UNIT IV

Eulerian and Hamiltonian graphs – Characterization of Eulerian graphs -Sufficient conditions for Hamiltonian graphs.

UNIT V

Colouring and planar graphs – vertex and edge colouring, perfect graphs, planar graphs, Euler's theorem, Kuratowski's theorem, Colouring of planar graphs, Crossing number and thickness.

UNIT VI

Matching, factors, decomposition and domination. Extremal Graph theory – Turan's theorem, Ramsay's theorem, Szemeredi's 97 regularity lemma, applications.

Text Books:

1. J. A. Bondy, U. S. R. Murthy, ***“Graph Theory”***, Springer Verlag, 2008.
2. D. B. West, ***“Introduction to Graph Theory”***, PHI, 2004.

Reference Books:

1. R. Diestel , ***“Graph Theory”***, Springer Verlag (Free Download available), 2003.

Course Title:	**Human Computer Interaction**	**Semester V**	
Course Code	**BTITOE504B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Content:

UNIT I

Introduction: The human, The computer, The interaction, Paradigms, Usability of Interactive Systems, Guidelines, Principles, and Theories.

UNIT II

Design Process- Interaction design basics, HCI in the software process, Design rules, Implementation support, Evaluation techniques, Universal design, User support.

UNIT III

Models and Theories0 Cognitive models, Socio-organizational issues and stakeholder requirements, Communication and collaboration models, Task analysis, Dialogue notations and design, Models of the system, Modeling rich interaction.

UNIT IV

Interaction Styles- Direct Manipulation and Virtual Environments, Menu Selection, Form Filling and Dialog Boxes, Command and Natural Languages, Interaction Devices, Collaboration and Social Media Participation.

UNIT V

Design Issues- Quality of Service, Balancing Function and Fashion, User Documentation and Online Help, Information Search, Information Visualization.

UNIT VI

Outside the Box- Group ware, Ubiquitous computing and augmented realities, Hypertext, multimedia, and the World Wide Web

Text Books:

1. Alan Dix, Janet Finlay, ***"Human Computer Interaction"***, Pearson Education, 2004.
2. Ben Shneiderman, ***"Designing the User Interface - Strategies for Effective Human Computer Interaction"***, Pearson Education, 2010.

Reference Books:

1. M. B. Rosson, J. M. Carroll ***"Usability Engineering: Scenario-Based Development of Human-Computer Interaction"***, Elsevier, 2002.
2. Alan Cooper, ***"The Essentials of Interaction Design"***, Wiley Publishing, 2007.
3. Nielsen, J. Morgan Kaufmann, San Francisco, ***"Usability Engineering"***, 1993.
4. Heim, S., ***"The Resonant Interface: HCI Foundations for Interaction Design"***, Addison-Wesley, 2007.

Course Title:	**Probability and Queuing Theory**	**Semester V**	
Course Code	**BTITOE504C**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics-III**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental Elective**	**Credits**	**3**

Course Objectives:

1. Be through with probability concepts.
2. To acquire knowledge on Probability Distributions.
3. Get exposed to the testing of hypothesis using distributions.
4. Gain strong knowledge inn principles of Queuing theory.
5. Get exposed to Discrete time Markov chain.

Course Outcomes:

1. To acquire analytical ability in solving mathematical problems as applied to the respective branches of engineering.

Course Content:

UNIT I

Random Variables: Review of probability concepts, Types of Events, Axioms, Conditional probability, Multiplication theorem, Applications.

Discrete and continuous Random Variables – Discrete case, Probability Mass function, Cumulative distribution function, Applications, Characteristics of random variables – Continuous case, Probability density function, Cumulative distribution function, Applications, Expectation, Variance, Expectation, Variance, Moment Generating Function, Functions of Random Variable (One dimensional only)
Chebychev‟s Inequality – (Statement only). Applications of Chebychev’s Inequality.

UNIT II

THEORETICAL DISTRIBUTIONS:
Discrete Probability distribution: Binomial distribution – MGF, Mean, Variance, Applications of Binomial distribution, Fitting a Binomial distribution, Poisson distribution – MGF, Mean, Variance, Applications of Poisson distribution, Fitting a Poisson distribution, Geometric distribution – MGF, Mean, Variance, Memoryless Property , Applications of Geometric distribution, Continuous Probability Distributions: Uniform distribution – MGF, Mean, Variance & Applications, Exponential Distribution - MGF, Mean, Variance, Memoryless Property Applications of Exponential distribution, Normal distribution – Mean, Variance, Standard Normal distribution and Applications of Normal distribution

UNIT III

Testing of Hypothesis:
Introduction to Sampling Distributions, Population and Sample, Null Hypothesis and Alternative Hypothesis, Single and Two Tailed Test.
Testing of Hypothesis, Level of Significance, Critical Region, Procedure for Testing of Hypothesis
Large Sample Test- Test For Single Proportion, Two Sample Proportions.

Large Sample Test- Test For Single Mean, Two Sample Means.
Small Sample Tests – „t‟ Test For a Single Mean „t‟ Test For The Difference Of Means, Paired „t‟ Test
F Test – Test of Significance of the Difference between Two Population Variances.
Chi Square Test for Goodness of Fit, Independence of Attributes.

UNIT IV

Queuing Theory: Introduction to Markovian queuing models.
Single Server Model with Infinite system capacity, Characteristics of the Model (M/M/1): (∞/FIFO)
Problems on Model (M/M/1): (∞/FIFO), Problems on Model (M/M/1): (∞/FIFO), Single Server Model with Finite System Capacity, Characteristics of the Model (M/M/1): (K/FIFO), Problems on Model (M/M/1): (K/FIFO).

UNIT V

Markov Chains:
Introduction to Stochastic process, Markov process, Markov chain one step & n-step Transition Probability, TPM and Applications, Chapman Kolmogorov theorem (Statement only), Applications on Chapman Kolmogorov theorem.

UNIT VI

MARKOV CHAINS: Transition probability- Applications, Classification of states of a Markov chain, Classification of states of a Markov chain – Applications.

Text Books:

1. Veerarajan T., ***“Probability, Statistics and Random Processes”***, Tata McGraw Hill, 1st Reprint 2004.
2. S.C. Gupta and V.K. Kapoor, ***“Fundamentals of Mathematical Statistics”***, Sultan Chand & Sons, 9th extensively revised Eition,1999

Reference Books:

1. Trivedi K S, **“ *Probability and Statistics with reliability, Queueing and Computer Science Applications***”, Prentice Hall of India, New Delhi, 1984
2. Gross.D, Harris.C.M. , ***“Fundamentals of Queuing Theory”***, John Wiley and Sons, 1985.
3. Allen.A.O., ***“Probability Statistics and Queuing Theory”***, Academic Press, 1981

Course Title:	**Embedded Systems**	**Semester V**	
Course Code	**BTITSE505A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessor & Microcontroller**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application and Development**	**Credits**	**3**

Course Objectives:

1. To understand the fundamental concepts in Embedded Systems.
2. To learn Real Time Operating Systems.
3. To get acquainted with hardware & interfaces.
4. To know Embedded System Design Techniques.

Course Outcomes:

After learning the course the students should be able:

1. To demonstrate & explain embedded systems hardware & software components.
2. To define embedded systems using real time operating system – VxWorks/ µCOS II RTOS.
3. To design & develop embedded applications using C language.
4. To apply design techniques in real-life application.

Course Content:

UNIT I

Introduction: Introduction to embedded systems-hardware and software components, Types, Examples, Characteristics, Challenges in embedded computing system design, Embedded sys-tem design processes, Introduction to IC technology.

UNIT II

Analysis and Design of Embedded System: Software engineering practices in the embedded systems, Software develop process, Interprocess communication and synchronization of process, Task and threads, Programme language, Program concept and embedded programming in C, Software components-Interpreter, Compiler, Assembler, Cross assembler.

UNIT III

OS for Embedded Systems: Introduction to real time theory, Operating system services, Real time operating system concepts, Basic design using a RTOS, Introduction to RTOS programming tools Micro C/OSII and VxWorks.

UNIT IV

Hardware for Embedded Systems: Hardware components, SOC, Processors, CPU, Types of memory, Memory management, I/O devices and interfacing, Parallel I/O interface, Blind counting synchronization and busy waiting, Parallel port interfacing with switches, Keypads and display unit, Memory and high speed interfacing, Interfacing of data acquisition systems, Interfacing of controllers, Serial communication interface, Implementation of above using C language.

UNIT V

Performance Issues of an Embedded System: CPU performance, CPU power consumption, Analysis and optimization of CPU power consumption program execution time, Analysis and optimization of energy and power, Analysis of program size, Hardware accelerators.

UNIT VI

Design Examples and Case Studies: Personal Digital Assistants, Set Top Boxes, Ink Jet Printers, Digital thermometer, Case Studies of digital camera, Smart card, Case study of coding for sending application layer byte stream on TCP/IP network using RTOS VxWorks.

Text Books

1. Raj Kamal, ***“Embedded Systems Architecture, and Programming”***, TMH Publication, 3rd Edition, 2015.
2. Iyer, Gupta, ***“Embedded Real Time Systems Programming”***, TMH Publication, 2003.

Reference Books:

1. Wayne Wolf, ***“Computer as Components – Principles of Embedded Computing System Design”***, Gulf Professional Publishing, 2nd Edition, 2008.
2. David E Simon, ***“An Embedded Software Primer”***, Addison Wesley Publication, 2004.

Course Title:	**IT Service Management**	**Semester V**	
Course Code	**BTITSE505B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To introduce practical implementation of Information Technology Service Management (ITSM).
2. To understand how an integrated ITSM framework can be utilized to achieve IT business integration, cost reductions and increased productivity.
3. To learn the best practices of ITSM methodology.

Course Outcomes:

After learning the course the students should be able:

1. To identify IT services as a means to provide functionality and value to customers.
2. To describe the needs and targets of the different stakeholders (service providers, customers, suppliers/partners) in the services value chain.
3. To demonstrate the value of a service management framework.
4. To explain the service management processes for given customers.
5. To select the appropriate tools to support a given designed service management solution.

Course Content:

UNIT I

IT Infrastructure: Introduction, Challenges in IT Infrastructure Management, Design Issues of IT Organizations and IT Infrastructure, IT System Management Process, IT Service Management Process, Information System Design Process.

UNIT II

Service Delivery Process: Service Level Management, Financial Management, IT Service Continuity Management, Capacity Management & Availability Management.

UNIT III

Service Support Process: Configuration Management, Incident Management, Problem Management, Change Management & Release Management.

UNIT IV

Storage Management: Storage, Backup, Archive and Retrieve, Disaster Recovery, Space Management, Database and Application Protection and Data Retention.

UNIT V

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access Control System and Intrusion Detection.

UNIT VI

Case Studies on how IT Service Management and ITIL processes make IT efficient and save cost for organizations.

Text Books

1. Phalguni Gupta, Surya Prakash & Umarani Jayaraman, ***"IT Infrastructure & Its Management"***, Tata McGraw-Hill Education.

Reference Books:

1. W. Ronald Hudson, Ralph C. G. Haas, Waheed Uddin, ***"Infrastructure Management: Integrating Design, Construction, Maintenance, Rehabilitation, and Renovation"***, McGraw-Hill, 1997.
2. Anita Sengar, ***"IT Infrastructure Management"***, S.K. Kataria and Sons, 2nd Edition, 2009.

Course Title:	**Information Storage Management**	**Semester V**	
Course Code	**BTITSE505C**	**Course Type**	**Elective**
Pre-requisite	**Computer Architecture & Organization**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To evaluate storage architecture; understand logical and physical components of storage Infrastructure including storage subsystems.
2. To describe storage networking technologies such as FC-SAN, NAS, IP-SAN and data archival solution –CAS.
3. To identify different storage virtualization technologies and their benefits.
4. To understand and articulate business continuity solutions including, backup and recovery technologies, and local and remote replication solutions.
5. To define information security, and storage security domains and Identify parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions.

Course Outcomes:

After learning the course the students should be able:

1. To describe and apply storage technologies.
2. To identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers.
3. To describe important storage technologies' features such as availability, replication, scalability and performance.
4. To design, analyze and manage clusters of resources.

Course Content:

UNIT I

Introduction to Information Storage Management - Intelligent Storage System (ISS) and its components Implementation of ISS as high-end and midrange storage-arrays. Direct Attached -Storage - Introduction to SCSI.

UNIT II

Introduction to parallel SCSI, SCSI Command Model – Storage Area Networks - Fiber Channel Connectivity, Login types, Topologies.

UNIT III

Storage networking technologies: Network-Attached Storage- General purpose servers vs. NAS Devices - Benefits of NAS, NAS File I/O – NAS Components, Implementation, File Sharing protocols, I/O operations – IPSAN-ISCSI, Components of ISCSI- Content-Addressed Storage.

UNIT IV

STORAGE VIRTUALIZATION: Fixed Content and Archives, Types, Features, Benefits, CAS Architecture, object storage and Retrieval, examples - Storage Virtualization-forms of virtualization, SNIA Taxonomy – Storage virtualization configurations, challenges, Types of storage virtualization -

Business Continuity- Overview of emerging technologies such as Cloud storage, Virtual provisioning, Unified Storage, FCOE, FAST.

UNIT V

BUSINESS CONTINUITY AND RECOVERY: Information Availability, BC Terminology, Life cycle, Failure analysis - Backup and Recovery- Backup purpose, considerations, Backup Granularity, Recovery considerations- Backup methods, process, backup and restore operations , Overview of emerging technologies - duplication, offsite backup.

UNIT VI

STORAGE SECURITY AND MANAGEMENT: Storage security framework, Securing the Storage infrastructure Risk triad - Managing the storage infrastructure, Monitoring the storage infrastructure, identify key parameters and components to monitor in a storage infrastructure List key management activities and examples Define storage management standards and initiative-Industry trend.

Text Books

1. EMC Corporation, ***“Information Storage and Management”***, Wiley India, 1st Edition, 2009.

Reference Books:

1. IBM, ***“Introduction to Storage Area Networks and System Networking”***, 5th edition, November 2012.
2. Robert Spalding, ***“Storage Networks: The Complete Reference”***, Tata McGraw Hill, Osborne, 6th reprint 2003.
3. Marc Farley, ***“Building Storage Networks”***, Tata McGraw Hill, Osborne, 1st Edition, 2001.
4. Tom Clark, ***“Designing Storage Area Networks -A Practical Reference for Implementing Fiber Channel and IP SANs”,*** Tata McGraw Hill 2003, 2nd edition.

Course Title:	**Network Management**	**Semester V**	
Course Code	**BTITSE505D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Network**	**Credits**	**3**

Course Objectives:

1. To understand the principles of network management, different standards and protocols used in managing complex networks.
2. To understand the automation of network management operations and making use of readily available network management systems.

Course Outcomes:

After learning the course the students should be able:

1. To acquire the knowledge about network management standards (OSI and TCP/IP).
2. To acquire the knowledge about various network management tools and the skill to use them in monitoring a network.
3. To analyze the challenges faced by Network managers.
4. To evaluate various commercial network management systems and open network management systems.
5. To analyze and interpret the data provided by an NMS and take suitable actions.

Course Content:

UNIT I

Data communication and network management overview: Analogy of Telephone Network Management, Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions, Network and System Management, Network Management System Platform, Current Status and future of Network Management.

UNIT II

SNMPV1 network management, Managed network: Organization and Information Models. Managed network: Case Histories and Examples, The History of SNMP Management, The SNMP Model, The Organization Model, System Overview, The Information Model.

UNIT III

SNMPV1 Network Management: Communication and Functional Models, The SNMP Communication Model, Functional model. SNMP MANAGEMENT: SNMPv2 Major Changes in SNMPv2, SNMPv2 System architecture, SNMPv2 Structure of Management Information, The SNMPv2 Management Information Base, SNMPv2 Protocol, Compatibility with SNMPv1.

SNMP MANAGEMENT: RMON: What is Remote Monitoring? , RMON SMI and MIB, RMON1, RMON2, ATM Remote Monitoring, A Case Study of Internet Traffic Using RMON

UNIT IV

Telecommunication management network: Why TMN? , Operations Systems, TMN Conceptual Model, TMN Standards, TMN Architecture, TMN Management Service Architecture, An Integrated View of TMN, Implementation Issues.

UNIT V

Network management tools and systems: Network Management Tools, Network Statistics Measurement Systems, History of Enterprise Management, Network Management systems, Commercial Network management Systems, System Management and Enterprise Management Solutions.

UNIT VI

Web-Based Management: NMS with Web Interface and Web-Based Management, Web Interface to SNMP Management, Embedded Web-Based Management, Desktop management Interface, Web-Based Enterprise Management, WBEM: Windows Management Instrumentation, Java management Extensions, Management of a Storage Area Network , Future Directions. Case Studies:

Text Books:

1. Mani Subrahmanian, ***"Network Management Principles and Practice"***, Pearson Education, 2nd Edition, 2010.

Reference Books:

1. Morris, ***"Network management"***, Pearson Education, 1st Edition, 2008.
2. Mark Burges, ***"Principles of Network System Administration"***, Wiley DreamTech, 1st Edition, 2008.

Course Title:	**Data Visualisation**	**Semester V**	
Course Code	**BTITSE505E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. Learn and understand the importance of data visualization.
2. Learn what is user experience in data visualization and its importance.
3. Learn about basic and advance chart types used in data visualization.
4. Learn the psychology of visualization with Gestalt Principles.

Course Outcomes:

After learning the course the student will be able:

1. Get a solid understanding of how people work in data visualization project.

Course Content:

UNIT I

The seven stages of Data Visualization: Why data display requires planning, An example, Iteration and Combination, Principles.

Getting Started with Processing: Sketching with processing, Example and Distributing your work, Examples and references, Functions, Sketching and Scripting

Mapping: Drawing a Map, Locations on map, Data on Map, Using your own data, Next step.

UNIT II

Time series:

Milk, Tea, and Coffee (Acquire and parse), Cleaning the table(Filter and Mine), A simple plot(Represent and refine), Labeling the current data set(Refine and Interact), Drawing Axis labels(Refine), Choosing a proper representation(Represent and refine), Using rollovers to Highlights points(Interact), Ways to connect points(refine), Text labels as tabbed panes(Interact), Interpolation between data sets(Interact).

UNIT III

Connections and Correlations:

Changing data sources, Problem statement, Preprocessing, Using the processed data(Acquire, Parse Filter and Mine), Displaying the results(Represent), Returning to the questions(Refine), Sophisticated sorting: Using salary as a Tiebreaker(Mine), Moving to multiple days(Interact), Smoothing out Interaction(Refine), Deployment Consideration(Acquire, Parse, filter).

UNIT IV

Scatterplot Maps: ++Preprocessing, Loading the data(Acquire and Parse), Drawing a scatterplot of Zip codes(Mine and represent), Highlighting Points while typing(Refine and Interact), Show the currently selected points(refine), Progressively Dimming and Brightening points(Refine), Zooming In (Interact),Changing How Points are Drawn when Zooming (Refine), Development issues(Acquire and Refine)

UNIT V

Trees, Hierarchies, and Recursion: Using recursion to build a Directory Tree, Using a Queue to Load Asynchronously (Interact), An improving the TreeMaps Display (Refine), Flying through files(Interact).

Networks and Graphs: A simple graph Demo, A more complicated Graph, Approaching Network Problem, Advanced graph example, Mining additional example.

UNIT VI

Acquiring Data:Where to find data, Tools for Acquiring data from Internet, Loading files for use with processing, Loading text data, Dealing with files and folders, Listing files in folders, Asynchronous Image download, Using openStream() As a bridge to Java, Dealing with Byte arrays, Advanced web techniques, Using Databases, Dealing with large number of files.

Parsing Data**:** Levels of efforts, Tools for gathering clues, Text is Best, Text Markup language, Regular expressions(regexps), Grammars and BNF Notations, Compressed Data, Vectors and Geometry, Binary data formats, Advanced detective work.

Text Books:

1. Ben Fry, ***"Visualizing Data: Exploring and Explaining data with Processing Environment"***, Shroff/O'Reilly Media, 2016

Reference Books:

1. Scott Murray, ***"Interactive Data Visualization for the web"***, Shroff/O'Reilly Media, 2016.
2. Julia Steele, Noah Lliinsky, ***"Designing Data Visualizations"***, Shroff/O'Reilly Media, 2012.
3. Kyran Dale, ***"Data Visualization with Python and JavaScript: Scrape, Clean, Explore & Transform your data"***, Shroff/O'Reilly Media, 2016.
4. Julia Steele, Noah Lliinsky, ***"Beautiful Visualization"***, Shroff/O'Reilly Media, 2016.

Course Title:	**Seminar**	**Semester V**	
Course Code	**BTITS506**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 2 – 0**
Stream	**Core**	**Credits**	**2**

Seminar topic is included to enable the students to apply their knowledge to understand advanced technologies, designs etc. Literature survey may help to select such topics which are invaluable to an engineer in an Information Technology industry. It will encourage students to develop their presentation skills, good communication skills and skills of collecting the correct information regarding the technical topic.

The students will be able to deliver seminar with useful information. He/she should under-stand the technologies, designs and skills of writing technical report, to do literature survey and to attempt the queries from examiner.

Course Title:	**Programming Lab – Minor(R programming)**	**Semester V**	
Course Code	**BTITL507**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn R programming.

Lab Experiments List:

1. Download R programming language SDK and setup to run programs.
2. Develop and write a program to declare R variables, constants, operators and reserved words and understand the operator precedence.
3. Write a program to declare and understand the functioning of all the decision and loop constructs like If-Else, While, Break-Next and Repeat.
4. Execute all R functions.
5. Execute program to demonstrate Vectors, Matrix, data frame and factor.
6. Execute programs to test R Objects and Class.
7. Write a program to use and display various graphs and charts in R.
8. Execute programs to use plot in R.

Course Title:	**Database Management Systems Lab**	**Semester V**	
Course Code	**BTITL509**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To design a database adopting the principles of relational database model.
2. To practice and master DDL and DML through SQL.
3. To learn building efficient queries to interact with a database.

Lab Experiments List:

1. Creation of databases and use of SQL commands (DDL, DML and DCL).
2. Suitable exercises to practice SQL commands may be given for Insert, Update and Delete.
3. Write SQL procedure for an application which uses exception handling.
4. Write SQL procedure for an application with cursors.
5. Write SQL for implementing Nested Queries.
6. Write SQL for implementing Join Queries.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write SQL block containing triggers.
9. Write SQL block containing stored procedures.
10. Develop a menu driven, GUI-based database application in any one of the domains such as Banking, Billing, Library management, Payroll, Insurance, Inventory, Healthcare etc. integrating all the features specified in the above exercises.

Course Title:	**Design and Analysis of Algorithms Lab**	**Semester V**	
Course Code	**BTITL510**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To design and develop various algorithms and analyze its efficiency to a specific problem.

Lab Experiments List:

1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate how the divide and conquer method works along with its time complexity analysis: worst case, average case and best case.
2. Implement the 0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program.
4. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program.
5. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
6. Write programs to (a) Implement All-Pairs Shortest Paths problem using Floyd's algorithm
7. (b) Implement Travelling Sales Person problem using Dynamic programming.
8. Design and implement a program to find a subset of a given set S = Sl, S2,.....,Sn of n positive integers whose SUM is equal to a given positive integer d. For example, if S = 1, 2, 5, 6, 8 and d = 9, there are two solutions 1, 2,6and 1, 8. Display a suitable message, if the given problem instance doesn't have a solution.
9. Design and implement a program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Course Title:	**Operating Systems**	**Semester VI**	
Course Code	**BTITC601**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To study the basic concepts and functions of operating systems.
2. To understand the structure and functions of OS.
3. To learn about Processes, Threads and Scheduling algorithms.
4. To understand the principles of concurrency and Deadlocks.
5. To learn various memory management schemes.
6. To study I/O management and File systems.

Course Outcomes:

After learning the course the students should be able:

1. To design various Scheduling algorithms.
2. To apply the principles of concurrency.
3. To design deadlock, prevention and avoidance algorithms.
4. To compare and contrast various memory management schemes.
5. To design and Implement a prototype file systems.

Course Content:

UNIT I

Operating System Structures: Definition, Types of operating system, Real time operating system, System components, Sys-tem services, Systems calls, System programs, System structure, Virtual machines, System design and implementation.

UNIT II

Processes and CPU scheduling: Process concept, Process scheduling, Operation on a process, Co-operating processes, Threads, Interprocess communication, Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling, Scheduling algorithms and performance evaluation.

UNIT III

Process Synchronization: The critical-section problem, Critical regions, Synchronization hardware, Semaphores, Classical problems of synchronization, Monitors.

UNIT IV

Deadlocks: Systems model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, Combined approach to deadlock handling.

UNIT V

Memory Management and Virtual Memory: Logical versus physical address space, Swapping, Contiguous allocation, Paging, Segmentation with paging, Demand paging, Page replacement algorithms, Thrashing.

UNIT VI

File Management: File system and secondary storage devices, Real-time operating systems.

Text Books

1. A. Silberschatz, P. Galvin, ***"Operating System Concepts"***, Wiley Publication, 9th Edition, 2013.
2. A. S. Tanenbaum, H. Bos, ***"Modern Operating Systems"***, Pearson Education, 4th Edition, 2015.

Reference Books:

1. D.M. Dhamdhere, ***"Systems Programming and Operating Systems"***, Tata McGraw Hill Publication, 2nd Edition, 2001.
2. G. Nutt, ***"Operating Systems Concepts"***, Addison Wesley Publication, 3rd Edition.
3. H. M. Deitel, ***"An Introduction to Operating Systems"***, Addison Wesley Publication, 1990.

Course Title:	**Compiler Construction**	**Semester VI**	
Course Code	**BTITC602**	**Course Type**	**Elective**
Pre-requisite	**Data Structures**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To introduce the major concept areas of language translation and compiler design.
2. To develop an awareness of the function and complexity of modern compilers.
3. To provide practical, hands on experience in compiler design.

Course Outcomes:

After learning the course the students should be able:

1. To understand the major concept areas of language translation and compiler design.
2. To develop an awareness of the function and complexity of compilers.
3. To identify the similarities and differences among various parsing techniques and grammar transformation techniques.

Course Content:

UNIT I

Introduction to Compiling and Lexical Analysis: Definition, analysis of the source program, the phases of a compiler, the grouping of phases, Compiler-Construction tools, The role of the Lexical analyzer, Input buffering, Specification of Tokens, A Language for Specifying Lexical Analyzers, Design of a Lexical Analyzer generator.

UNIT II

Syntax Analysis: The role of the Parser, Context-free grammars, Writing a Grammar, Top-Down Parsing, Bottom- Up Parsing, Operator-precedence Parsing, LR-Parsers, Using Ambiguous Grammars, Parser Generators.

UNIT III

Syntax-Directed Translation: Definitions, Construction of Syntax Trees, Bottom-Up Evaluation of S-Attributed definitions, Top-Down Translation, Bottom-Up Evaluation of Inherited attributes.

UNIT IV

Intermediate Code Generation: Intermediate Languages, Declarations, Assignment Statements, Boolean Expressions, Case Statements, Back patching, Procedure Calls.

UNIT V

Code Generation: Issues in the Design of a Code Generator, The target Machine, Run-Time Storage Management, Basic Blocks and Flow Graphs, Next-Use Information, Simple Code Generator, Register allocation and Assignment, The DAG Representation of Basic Blocks, Generating Code from DAGs, Dynamic Programming, Code-Generation Algorithm, Code-Generators.

UNIT VI

Code Optimization: Peephole optimization, principal sources of optimization, introduction to Global data flow analysis.

Text Books:

1. Aho, Sethi, Ullman, ***“Compilers-Tools and Techniques”***, Pearson, 2nd Edition, 2011.
2. Tremblay, Sorenson, ***“Theory and Practice of Compiler Writing”***, McGraw Hill Publication.
3. Hopcroft, ***“Introduction to Automata Theory, Languages and Computation”***, Pearson Publication.

Reference Books:

1. Paul G. Sorenson, ***“Compiler Writing”***, Tata McGraw Hill.
2. Robin Hunter, ***“The Essence of Compilers”***, Pearson Publication, 1998.

Course Title:	**Object Oriented Software and Web Engineering**	**Semester VI**	
Course Code	**BTITC603**	**Course Type**	**Mandatory**
Pre-requisite	**Object Oriented Paradigm with C++**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**Credits**	**3**

Course Objectives:

1. To learn the concept of Object Oriented Software Development Process.
2. To get acquainted with UML Diagrams.
3. To understand Object Oriented Analysis Processes.
4. Understand the characteristics of web application.
5. Learn to Model web applications.
6. Be aware of Systematic methods.
7. Be familiar with the testing techniques for web applications.

Course Outcomes:

After learning the course the students should be able:

1. To understand Object Oriented Software Development Process.
2. To gain exposure to Object Oriented Methodologies & UML Diagrams.
3. To apply Object Oriented Analysis Processes for projects.
4. Apply the characteristics of web applications.
5. Model web applications.
6. Design web applications.
7. Test web applications.

Course Content:

UNIT I

Object Basics, Object oriented philosophy, objects, classes, attributes, object behavior and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence.. Object oriented systems development life cycle: Software development process, building high quality software, use- case driven approach, reusability.

UNIT II

Object Oriented Methodologies: Rumbaugh et al.’s object modeling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, and the unified approach. Unified modeling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modeling, packages, UML extensibility and UML Meta model.

UNIT III

Object Oriented Analysis Process: Business object analysis, use-case driven object oriented analysis, business process modeling, use-case model, developing effective documentation, case study. Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes.

UNIT IV

Identifying Object Relationships, Attributes and Methods: Association, super-subclass relationships, a-part of relationships, case study, class responsibility, Defining attributes for vianet bank objects, object responsibility, defining methods for vianet bank objects Design process and design axioms: Corollaries, design patterns.

Designing Classes: UML object constraint languages, designing classes, class visibility, refining attributes for the vianet bank objects, designing methods and protocols, designing methods for the vianet bank objects, packages and managing classes. Designing access layer, Designing view layer, macro level process.

UNIT V

Introduction to Web Engineering and requirement engineering: Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering – Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools.

Web Application Architecture and Modelling Web Applications: Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management, Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relation to Hypertext Modeling, Customization Modeling, Relation to Content, Hypertext, and Presentation Modeling

UNIT VI

Web Application Design: Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Inter action Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.

Testing Web Applications: Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability

Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation.

Web Project Management: Understanding Scope, Refining Framework Activities, Building a Web Team, Managing Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project, Introduction to node JS – web sockets.

Text Books

1. Ali Bahrami, ***“Object Oriented Systems Development using the Unified Modeling Language”***, McGraw Hill, Reprint, 2009.
2. Craig Larman, *"**Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”***, Pearson Education, 3rd Edition, 2005.
3. Gerti Kappel, Birgit Proll, ***“Web Engineering”***, John Wiley and Sons Ltd, 2006.
4. Roger S. Pressman, David Lowe, ***“Web Engineering”***, Tata McGraw Hill Publication, 2007.
5. Guy W. Lecky-Thompson, ***“Web Programming”***, Cengage Learning, 2008.

Reference Books:

1. Bernd Oestereich, ***“Developing Software with UML, Object-Oriented Analysis and Design in Practice”***, Addison-Wesley, 2000.
2. James Rumbaugh, Ivar Jacobson, Grady Booch, ***“The Unified Modeling Language Reference Manual”***, Addision Wesley, 2nd Edition, 2005
3. Simon Bennett, Steve Mc Robb and Ray Farmer, ***“Object Oriented Systems Analysis and Design Using UML”***, McGraw Hill Education, 4th Edition, 2010.
4. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, ***“Design Patterns: Elements of Reusable Object-Oriented Software”***, Addison-Wesley, 1995.
5. Chris Bates, **“Web Programming: Building Internet Applications”**, Third Edition, Wiley India Edition, 2007.
6. John Paul Mueller, **“Web Development with Microsoft Visual Studio 2005”**,Wiley Dream tech, 2006.

Course Title:	**Enterprise Resource Planning**	**Semester VI**	
Course Code	**BTITOE604A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To introduce to enterprise systems and show how organizations use enterprise systems to run their operations more efficiently and effectively.
2. To learn about the critical success factors and implementation strategies that lead to enterprise system success.
3. To learn about the informational, knowledge, and decision-making opportunities afforded by enterprise systems.
4. To examine typical Enterprise Systems modules: materials management (MM), supply chain management (SCM), customer relationship management (CRM), financials, projects, human resource management (HRM).

Course Outcomes:

After learning the course the students should be able:

1. To demonstrate a good understanding of basic issues in Enterprise Systems.
2. To explain the scope of common Enterprise Systems (e.g., MM, SCM, CRM, HRM, procurement).
3. To explain the challenges associated with implementing enterprise systems and their impacts on organizations.
4. To describe the selection, acquisition and implementation of enterprise systems.
5. To use one of the popular ERP packages to support business operations and decision-making.
6. To communicate and assess an organization’s readiness for enterprise system implementation with a professional approach in written form.
7. To demonstrate an ability to work independently and in a group.

Course Content:

UNIT I

Enterprise Resource Planning: Introduction, Disadvantages of non-ERP systems, What Is ERP? Need of ERP, Advantage of ERP, Risks of ERP, Growth of ERP.

UNIT II

ERP Modules: Finance, Production Planning, Control and Management, Sales and Distribution, Human Resource Management, Inventory Control System, Quality Management, Plant Maintenance.

UNIT III

ERP Implementation: ERP Implementation (Transition) strategies, ERP Implementation Life Cycle, Implementation Methodologies, Evaluation and selection of ERP package, ERP Project Team: Vendors, Employees, Consultants, Training & Education, Project management & Monitoring, Post Implementation Activities, Operation & maintenance of ERP system, Measuring the Performance of ERP System, Success & failure factors of an ERP, Implementation.

UNIT IV

ERP Market and Vendors: ERP Marketplace and Marketplace Dynamics, Comparison of Current ERP Packages and Vendors, like; SAP, Oracle, PeopleSoft, BAAN etc.

UNIT V

ERP and related technologies: Business Process Re-Engineering (BPR), Information Systems -Management Information, System (MIS), Decision Support System (DSS), Executive Support System (ESS) Data Warehousing, Data Mining, On-Line Analytical Processing (OLAP), Supply Chain Management, Customer Relationship Management

UNIT VI

ERP Case Studies: ERP systems implemented in – for example :TISCO, SKF Automotive Bearings Co. Ltd, Qualcomm CDMA, California, Post Implementation review of ERP packages – in, Manufacturing, Services and Others Organizations, Customization of ERP for different types of Industries.

Text Books

1. Alexis Leon, ***“ERP Demystified”***, TMH New Delhi, 2nd Edition.
2. V. K. Garg & N. K. Venkita Krishnan, ***“ERP Ware: ERP Implementation Framework”***, PHI.

Reference Books:

1. V. K. Garg & N. K. Venkita Krishna, ***“ERP Concepts & Planning”***, PHI, 2nd Edition.

Course Title:	**Decision Support Systems**	**Semester VI**	
Course Code	**BTITOE604B**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To select appropriate modeling techniques for supporting semi-structured business decision making.
2. To identify and select appropriate decision support systems for generating innovative business solutions.
3. To design and implement decision support systems for generating innovative business solutions.

Course Outcomes:

After learning the course the students should be able:

1. To recognize the relationship between business information needs and decision making.
2. To appraise the general nature and range of decision support systems.
3. To appraise issues related to the development of DSS.
4. To select appropriate modeling techniques.
5. To analyze, design and implement a DSS.

Course Content:

UNIT I

Basic Concepts: Decision making systems, Modeling and support, Basics and definition Systems models, Modeling process, Decision making, Intelligence phase, Design phase Choice phase, Evaluation, Implementation phase, Alternative decision making models, Decision support systems, Decision makers, Case applications.

UNIT II

Decision Support System Development: Decision support system development, Basics, Life cycle, Methodologies, Prototype, Technology levels and tools, Development platforms, Tool selection, Developing DSS, Enterprise systems, Concepts and definition, Evolution of information systems, Information needs, Characteristics and capabilities, Comparing and integrating EIS and DSS, EIS data access, Data warehouse, OLAP, Multidimensional analysis, Presentation and the Web, Including soft information enterprise on systems, Organizational DSS, Supply and value chains, Decision support, Supply chain problems and solutions, Computerized systems. MRP, ERP, SCM, Frontline decision support systems.

UNIT III

Knowledge Management: Organizational learning and memory, Knowledge management, Development Methods, Technologies and tools, Success , Knowledge management and artificial intelligence, Electronic Document Management, Knowledge Acquisition and Validation, Knowledge Engineering – Scope, Acquisition Methods, Interviews, Tracking Methods, Observation and other Methods, Grid Analysis, Machine Learning, Rule Induction, Case-Based Reasoning, Neural Computing, Intelligent Agents, Selection of an appropriate Knowledge Acquisition Methods, Multiple Experts, Validation and

Verification of the Knowledge Base-Analysis, Coding, Documenting, and Diagramming, Numeric and Documented.

UNIT IV

Knowledge Acquisition, Knowledge Acquisition and the Internet/Intranets, Knowledge Representation Basics, Representation in Logic and other Schemas, Semantic Networks, Production Rules, Frames, Multiple Knowledge Representation, Experimental Knowledge Representations, Representing Uncertainty. Intelligent System Development: Inference Techniques, Reasoning in Artificial Intelligence, Inference with Rules, Inference Tree, Inference with Frames, Model Based and Case Based Reasoning, Explanation and Meta Knowledge, Inference with Uncertainty, Representing Uncertainty, Probabilities and Related Approaches, Theory of Certainty, Approximate Reasoning using Fuzzy Logic

UNIT V

Intelligent Systems Development, Prototyping, Project Initialization, System Analysis and Design, Software Classification, Building Expert Systems with Tools, Shells and Environments, Software Selection, Hardware, Rapid Prototyping and a Demonstration Prototype, System Development, Implementation, Post Implementation.

UNIT VI

Management Support Systems: Implementing and Integrating Management Support Systems, Implementation, Major Issues, Strategies, System Integration, Generic Models MSS, DSS–ES, Integrating EIS, DSS and ES, Global Integration, Intelligent DSS, Intelligent Modeling and Model Management, Examples of Integrated Systems, Problems and Issues in Integration.

Text Books

1. Efrain Turban and Jay E. Aronson, "***Decision Support Systems and Intelligent Systems"***, Pearson Education, 6th Edition,2001.

Reference Books:

1. Ganesh Natarajan and Sandhya Shekhar, ***"Knowledge Management Enabling Business Growth"***, Tata McGraw Hill, 2002.
2. George M. Marakas, ***"Decision Support System"***, Prentice Hall, India, 2003.
3. Efrem A. Mallach, ***"Decision Support and Data Warehouse Systems"***, Tata McGraw, Hill, 2002.
4. Kimiz Dalkir, ***"Knowledge Management: Theory and Practice"***, Elsevier Science, 2005.
5. Becerra Fernandez and Laidener, ***"Knowledge Management: An Evolutionary View"***, PHI, 2009.

Course Title:	**Software Project Management**	**Semester VI**	
Course Code	**BTITOE604C**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

UNIT I

Project Evaluation and Planning - Activities in Software Project Management, Overview of Project Planning, Stepwise planning, contract management, Software processes and process models.

UNIT II

Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques, Risk Evaluation. Project costing, COCOMO 2, Staffing pattern, Effect of schedule compression, Putnam's equation, Capers Jones estimating rules of thumb, Project Sequencing and Scheduling Activities, Scheduling resources, Critical path analysis, Network Planning, Risk Management, Nature and Types of Risks, Managing Risks, Hazard Identification, Hazard Analysis, Risk Planning and Control, PERT and Monte Carlo Simulation techniques.

UNIT III

Monitoring And Control- Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control

UNIT IV

Software Configuration Management (SCM), Managing Contracts, Types Of Contracts, Stages In Contract Placement, Typical Terms of A Contract, Contract Management and Acceptance.

UNIT V

Quality Management and People Management- Introduction, Understanding Behavior, Organizational Behaviour, Selecting The Right Person For The Job, Motivation, The Oldman – Hackman Job Characteristics Model , Working in Groups, Organization and team structures, Decision Making, Leadership, Organizational Structures, Stress, Health and Safety. ISO and CMMI models, Testing, and Software reliability, test automation.

UNIT VI

Overview of project management tools.

Text Books:

1. Bob Hughes, Mike Cotterell, ***"Software Project Management"***, Tata McGraw Hill, 2009.

Reference Books:

2. Royce, ***"Software Project Management"***, Pearson Education, 2005.
3. Robert K. Wysocki, ***"Effective Software Project Management"***, Wiley, 2006.

Course Title:	**Software Testing**	**Semester VI**	
Course Code	**BTITSE605A**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application & Development**	**Credits**	**3**

Course Objectives:

1. To study fundamental concepts in software testing, including software testing objectives, processes, criteria, strategies, and methods.
2. To learn planning of a test project, designing test cases and test data, conducting test operations, managing software problems and defects, and generating a test report.
3. To develop an understanding of the meaning and importance of quality in relation to software systems and the software development process.
4. To study issues and techniques for implementing and managing software quality assurance processes and procedures.

Course Outcomes:

After learning the course the students should be able:

1. To apply software testing knowledge and its processes to software applications.
2. To identify various software testing problems.
3. To solve software testing problems by designing and selecting software test models, criteria, strategies and methods.
4. To apply the techniques learned to improve the quality of software development.
5. To prepare a software quality plan for a software project.

Course Content:

UNIT I

Principles of Testing Software development life cycle model: Phases of software project, Quality, Quality assurance and quality control, Testing, Verification and validation, Process models to represent various phases, Life cycle models, Software testing life cycle.

UNIT II

White Box Testing (WBT) and Black Box Testing: Static testing, Structural testing, Challenges in WBT. Black box testing: Black box testing process.

UNIT III

Integration Testing: Definition, As a type of testing: Top-down integration, Bottom-up integration, Bi-directional integration, System integration, Choosing integration method, As a phase of testing, Scenario testing: System scenarios, Use case scenarios, Defect bash.

UNIT IV

System and Acceptance Testing, Functional Vs non Functional, Functional system testing, Non-functional system testing, Acceptance testing.

UNIT V

Performance testing, Regression testing, Internationalization testing, Adhoc testing. Factors governing performance of testing, Methodology, tools and process for performance testing. Regression Testing: Introduction, Types of Regression testing, Regression testing process. Adhoc testing: Introduction, Buddy testing, Pair testing, exploratory testing, Iterative testing, Agile and Extreme testing, XP work flow, Defect seeding.

UNIT VI

Testing Object Oriented Software: Introduction, Comparison of object oriented and procedural software, Sys-tem testing example, Unit testing of classes, Tools for testing object oriented software, Testing web applications.

Text Books

1. Srinivasan Desikan, Gopalaswamy Ramesh, ***"Software Testing: Principles and Practices"***, Pearson publication, 2nd Edition, 2006.

Reference Books:

1. Loise Tamres, ***"Introducing Software Testing"***, Pearson publication, 2002.
2. Boris Beizer, ***"Software Testing Techniques"***, Dreamtech press, 2nd Edition, 2014

Course Title:	**Data Storage Technologies & Networks**	**Semester VI**	
Course Code	**BTITSE605B**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols,, Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To gain knowledge and understand the design of a Data Centre.
2. To understand the best practice of design in the Data Centre.
3. To learn the options in the running of an efficient Data Centre.
4. To understand the value of data to a business, Information Lifecycle.
5. To understand the challenges in data storage and data management.
6. To learn solutions available for data storage.

Course Outcomes:

After learning the course the students should be able:

1. To explain the design of a data center and storage requirements.
2. To discuss the various types of storage and their properties.
3. To explain physical and virtualization of storage.
4. To explain the backup, archiving with regard to recovery and business continuity.

Course Content:

UNIT I

DATA CENTRE: Introduction, Site Selection and Environmental Considerations, Hierarchical or Layered Architecture, Architect Roles, Goals and Skills, Architecture Precursors.

UNIT II

DATA CENTRE DESIGN: Architecture Design and Standards Recommendations, Raised Access Floor and Design Best Practices, connecting the infrastructure with copper and fiber. IT Hardware, Cooling System Options and Environmental Control, Electrical Power Systems, Room Layout, Fire Protection and Security Systems, Building Automation and Energy Management Systems, Commissioning and Handover.

UNIT III

STORAGE MANAGEMENT: Introduction to Storage Technology, Storage Systems Architecture, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their functions, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Integrated and Modular storage systems, high-level architecture and working of an intelligent storage systems.

UNIT IV

NETWORKED STORAGE: Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, Need for long-term archiving solutions and describe how CAS fulfill the need, Appropriateness of the different networked storage options for different application environments.

UNIT V

Managing Data Center: Reasons for planned/unplanned outages, Impact of downtime, Difference between business continuity (BC) and disaster recovery (DR), RTO and RPO, Identification of single points of failure in a storage infrastructure and solutions to mitigate these failures, Architecture of backup/recovery and the different backup/recovery topologies, replication technologies and their role in ensuring information availability and business continuity Remote replication technologies and their role in providing disaster recovery and business continuity capabilities, Key areas to monitor in a data center, Industry standards for data center monitoring and Management Key metrics to monitor storage infrastructure.

UNIT VI

Securing Storage and Storage Virtualization: Information Security, Critical security attributes for information systems, Storage security domains, Analyze the common threats in, each domain, Storage Virtualization: Forms, Configurations and Challenges, Types of Storage Virtualization: Block-level and File-Level.

Text Books

1. Mauricio Arregoces, ***“Data Center Fundamentals”***, Cisco Press, 1st edition, 2003.
2. Robert Spalding, ***“Storage Networks: The Complete Reference”***, Tata McGraw Hill, Osborne, 2003.
3. Marc Farley, ***“Building Storage Networks”***, Tata McGraw Hill, Osborne. 2001.
4. Meeta Gupta, ***“Storage Area Network Fundamentals”***, Pearson Education Limited, 2002

Reference Books:

1. G. Somasundaram, Alok Shrivastava, ***“Information Storage and Management”***, EMC Education Series, Wiley Publishing Inc., 2011.
2. Gustavo Santana, ***“Data Center Virtualization Fundamentals: Understanding Techniques and Designs for Highly Efficient Data Centers with Cisco Nexus, UCS, MDS, and Beyond”***, Cisco Press, 1st Edition, 2013

Course Title:	**Service Oriented Architecture**	**Semester VI**	
Course Code	**BTITSE605C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To gain understanding of the basic principles of service orientation.
2. To learn service oriented analysis techniques.
4. To learn technology underlying the service design.
5. To learn advanced concepts such as service composition, orchestration and Choreography.
6. To know about various WS specification standards.

Course Outcomes:

After learning the course the students should be able:

1. Build applications based on XML.
2. Develop web services using technology elements.
3. Build SOA-based applications for intra-enterprise and inter-enterprise applications.

Course Content:

UNIT I

Introducing SOA: Fundamental SOA: Common Misperceptions about SOA, Common tangible benefits of SOA, Common pitfalls of adopting SOA, The Evolution of SOA:-from XML to Web services to SOA, The continuing evolution of SOA, The roots of SOA. Web Services and Primitive SOA: The Web services framework-Services, Service descriptions, messaging with SOAP.

UNIT II

Web Services and Contemporary SOA: Message exchange patterns- Service activity-coordination-Atomic transactions-Business activities-Orchestration-Choreography- Web Services and Contemporary SOA: Addressing- Reliable messaging-Correlation- Policies- Metadata exchange- Security- Notification and eventing.SOA and Service-Orientation: Principles of Service - Anatomy of a service-oriented architecture- Common principle of service orientation-Service Layers –Service orientation.

UNIT III

Building SOA: SOA Delivery Strategies- SOA delivery lifecycle phases. Service-Oriented Analysis: Introduction to service-oriented analysis-Benefits of a business-centric SOA- Deriving business services-Service-Oriented Analysis: Service modeling, Service modeling guidelines- Classifying service model logic- Contrasting service modeling approaches.

UNIT IV

Service-Oriented Design: Introduction to service-oriented design- WSDL-related XML Schema language basics- WSDL language basics- SOAP language basics- Service interface, design tools. SOA Composition Guidelines: Steps to composing SO Considerations for choosing service layers and SOA standards, positioning of cores and SOA extensions.

UNIT V

SOA Service Design: - Overview-Service design of business service, application service, task centric service and guidelines. SOA Business Process Design: WS-BPEL language basics-WS Coordination.

UNIT VI

SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)-Web Services Interoperability Technologies (WSIT)

Text Books

1. Thomas Erl, ***“Service-Oriented Architecture: Concepts, Technology, and Design”***, Pearson Education, 2006.
2. Frank. P. Coyle, ***“XML, Web Services And The Data Revolution”***, Pearson Education, 2002.
3. Sandeep Chatterjee, James Webber, ***“Developing Enterprise Web Services. An Architect’s Guide”***, Pearson Education, 2005.
4. Eric Newcomer, Greg Lomow, ***“Understanding SOA with Web Services”***, Pearson Education, 2005.
5. Ron Schmelzer et al. ***“XML and Web Services”***, Pearson Education, 2002

Reference Books:

1. Dan woods and Thomas Mattern, ***“Enterprise SOA designing IT for Business Innovation”***, O’REILLY, 1st Edition, 2006.
2. James McGovern, Sameer Tyagi, Michael E. Stevens, Sunil Mathew, ***“Java Web. Services Architecture”***, Morgan Kaufmann Publishers, 2003.
3. Atul Kahate, ***“XML and Related technologies”***, Pearson Education, 2008.
4. Kennard Scibner and Mark C. Stiver, ***“Understanding SOAP”***, SAMS publishing.
5. B. V. Kumar, S. V. Subrahmanya, ***“Web Services: An Introduction”***, TMH India, 2nd Edition, 2012.

Course Title:	**Network Programming**	**Semester VI**	
Course Code	**BTITSE605D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols, Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Network**	**Credits**	**3**

Course Objectives:

1. To learn the basics of socket programming using TCP Sockets.
2. To learn about Socket Options.
3. To learn to develop Macros for including Objects In MIB Structure.
4. To understand SNMPv1, v2 and v3 protocols & practical issues.

Course Outcomes:

After learning the course the students should be able:

1. To analyze the requirements of a networked programming environment and identify the issues to be solved;
2. To create conceptual solutions to those issues and implement a programming solution;
3. To understand the key protocols that support the Internet;
4. To apply several common programming interfaces to network communication;
5. To understand the use of TCP/UDP Sockets
6. To apply advanced programming techniques such as Broadcasting, Multicasting.

Course Content:

UNIT I

Socket And Application Devlopment: Introduction to Socket Programming - System Calls - Address conversion functions - POSIX Signal Handling - Server with multiple clients - Boundary conditions - Server process Crashes, Server host Crashes, Server Crashes and reboots, Server Shutdown - I/O Multiplexing - I/O Models -TCP echo client/server with I/O Multiplexing

UNIT II

Socket Optian: Socket options - getsockopt and setsockopt functions - Generic socket options - IP socket options -ICMP socket options - TCP socket options - Multiplexing TCP and UDP sockets - SCTP Sockets -SCTP Client/server - Streaming Example - Domain name system - gethostbyname, gethostbyaddr, getservbyname and getservbyport functions - Protocol Independent functions in TCP Client/Server Scenario

UNIT III

Advanced Socket: IPv4 and IPv6 interoperability - Threaded servers - Thread creation and termination - TCP echo server using threads - Mutex - Condition variables - Raw sockets - Raw socket creation - Raw socket output - Raw socket input - ping program - traceroute program

UNIT IV

Simple Network Management: SNMP network management concepts - SNMPv1 - Management information - MIB Structure – Object syntax - Standard MIB’s - MIB-II Groups - SNMPv1 protocol and Practical issues.

UNIT V

SNMP V2, V3 and RMO: Introduction to SNMPv2 - SMI for SNMPV2 - Protocol - SNMPv3 - Architecture and applications -Security and access control model - Overview of RMON.

UNIT VI

Protocols, Sessions, State, and Implementing Custom Protocols State vs. Stateless, Methods for Maintaining State, What Is a Protocol? Designing a Custom Protocol, Our Chat Protocol, Protocol Registration

Elementary Name, Address Conversions and design decisions Domain Name System, gethostbyname Function, RES_USE_INET6 Resolver Option, gethostbyname2 Function and IPv6 Support, gethostbyaddr Function, uname Function, gethostname Function, getservbyname and getservbyport Functions

Text Books

1. W. Richard Stevens, ***“UNIX Network Programming Vol-I”***, Addison-Wesley Professional, 3rd Edition, 2003.
2. William Stallings, ***“SNMP, SNMPv2, SNMPv3 and RMON 1 and 2”***, Pearson Edition, 3rd Edition, 2009.

Reference Books:

1. D.E. Comer, ***“Internetworking with TCP/IP Vol- III: Client-Server Programming and Application BSD Sockets Version”***, Pearson Edition, 2nd Edition, 2003.

Course Title:	**Advanced Database Technology**	**Semester VI**	
Course Code	**BTITSE605E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To learn the various types of databases and their advanced applications.
2. To understand how and where databases are used in industry.
3. To examine the requirements on special databases.
4. To learn complex queries and interface them with applications.

Course Outcomes:

After learning the course the students should be able:

1. To explain how databases are used in various fields of industry.
2. To apply query evaluation techniques and query optimization techniques.
3. To develop transaction processing systems with concurrency control.
4. To design and develop a database application system as part of a team.
5. To explore open issues in advanced databases.

Course Content:

UNIT I

PARALLEL AND DISTRIBUTED DATABASES: Database System Architectures: Centralized and Client-Server Architectures – Server System, Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

UNIT II

OBJECT AND OBJECT RELATIONAL DATABASES: Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL /Oracle – Case Studies.

UNIT III

XML DATABASES: XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC– Information Retrieval – Data Warehousing – Data Mining.

UNIT IV

MOBILE DATABASES: Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes.

UNIT V

INTELLIGENT DATABASES: Active databases – Deductive Databases – Knowledge bases – Multimedia Databases-Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

UNIT VI

COMPLEX QUERIES AND REASONING: Logic of Query Languages – Relational Calculi – Recursive rules – Syntax and semantics of Datalog – Fix-point semantics – Implementation Rules and Recursion – Rule rewriting methods – Compilation and Optimization – Recursive Queries in SQL – Open issues.

Text Books

1. Carlo Zaniolo, Stefano Ceri, ***“Advanced Database Systems”***, Morgan Kauffmann Publishers.
2. Subramaniam, ***“Multimedia Databases”***, Morgan Kauffman Publishers, 2008.
3. Rajesh Narang, ***“Object Oriented Interfaces and Databases”***, Prentice-Hall of India, Pvt. Ltd., 2004.
4. Thomas Cannolly and Carolyn Begg, ***“Database Systems, A Practical Approach to Design, Implementation and Management”***, Pearson Education, 3rd Edition, 2007.
5. Jeffrey A. Hoffer, Mary B. Prescottand Fred R. McFadden, ***“Modern Database Management”***, Prentice Hall, 2007.

Reference Books:

1. Henry F Korth, Abraham Silberschatz and S. Sudharshan, ***“Database System Concepts”***, McGraw Hill, 6th Edition, 2011.
2. C. J. Date, A. Kannan and S. Swamynathan, ***“An Introduction to Database Systems”***, Pearson Education, 8th Edition,2006.
3. R. Elmasri, S. B. Navathe, ***“Fundamentals of Database Systems”***, Pearson Education/Addison Wesley, 5th Edition, 2007.
4. Ramakrishnan, Gehrke, ***“Database Management System”***, Tata McGraw Hill Publications, 4th Edition.
5. Ramez Elmasri, Sham Navathe, ***“Fundamentals of Database Systems”***, Addison-Wesley, 2000.

Course Title:	**Operating Systems Lab**	**Semester VI**	
Course Code	**BTITL607**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn shell programming and the use of filters in the UNIX environment.
2. To learn to programming in C using system calls.
3. To learn to use the file system related system calls.
4. To process creation and inter process communication.
5. To familiarize with implementation of CPU Scheduling Algorithms, page replacement algorithms and Deadlock avoidance.

Lab Experiments List:

1. Basics of UNIX commands.
2. Shell Programming.
3. Implement the following CPU scheduling algorithms:
    - Round Robin
    - SJF
    - FCFS
    - Priority
4. Implement all file allocation strategies:
    - Sequential
    - Indexed
    - Linked
5. Implement Semaphores.
6. Implement all File Organization Techniques:
    - Single level directory
    - Two level
    - Hierarchical
    - DAG
7. Implement Bankers Algorithm for Dead Lock Avoidance.
8. Implement an Algorithm for Dead Lock Detection.
9. Implement e all page replacement algorithms:
    - FIFO
    - LRU
    - LFU
10. Implement Shared memory and IPC.
11. Implement Paging Technique of memory management.
12. Implement Threading & Synchronization Applications.

Course Title:	**Object Oriented Software and Web Engineering Lab**	**Semester VI**	
Course Code	**BTITL608**	**Course Type**	**Mandatory**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credits**	**1**

Lab Experiments Objective:

1. To learn the concept of Object Oriented Software Development Process.
2. To get acquainted with UML Diagrams.
3. To understand Object Oriented Analysis Processes.

Lab Experiments List:

1. Program to implement classes and objects.
2. Program to implement constructors and destructors with array of objects.
3. Program to demonstrate function overloading.
4. Program to implement different types of inheritances like multiple, Multilevel and hybrid.
5. I/O Program to demonstrate the use of abstract classes.
6. Program to demonstrate I/O streams and functions.
7. Program to perform all possible type conversions.
8. Program to demonstrate exception handling technique.
9. Program to implement networking concepts.
10. Program to implement RMI concepts.
11. Program to implement AWT concepts.
12. Program to implement swing concepts.
13. Program to design and implement applet.
14. Program to design and implement JDBC.
15. Program to design an event handling event for simulating a simple calculator.

Course Title:	**Software Testing Lab**	**Semester VI**	
Course Code	**BTITSEL609A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 2**
Stream	**Software Application & Development**	**Credits**	**1**

Lab Experiments Objective:

1. To implement different testing techniques to practical teat and understand their merits and demerits.

Lab Experiments List:

1. Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of data flow testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
2. Design, develop, code and run the program in any suitable language to solve the NextDate problem. Analyze it from the perspective of decision table-based testing, derive at least 10 different test cases, execute these test cases and discuss the test results.
3. Design, develop, code and run the program in any suitable object-oriented language to solve the calendar problem. Analyze it from the perspective of OO testing, derive test cases to test the method that increment the date and the method that increments the month., execute these test cases and discuss the test results.
4. Design, develop, code and run the program in any suitable object-oriented language to solve the currency converter problem. Analyze it from the perspective of use case-based system testing, derive appropriate system test cases, execute these test cases and discuss the test results.
5. Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.
6. Design, develop, code and run the program in any suitable language to implement the binary search algorithm. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

Course Title:	**Data Storage Technologies & Networks Lab**	**Semester VI**	
Course Code	**BTITSEL609B**	**Course Type**	**Elective**
Pre-requisite	**Computer Networks, Operating Systems**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credits**	**1**

Lab Experiments Objective:

1. Understand the functionalities of storage network administration.
2. Set up a NAS server to support file level data access via the NSF and the CIFS protocols.
3. Set up a SAN server to support the iSCSI protocol for block level data access.
4. Demonstrate ability to design and build a small-scale data center and a small-scale cloud computing environment.
5. Be hand-on with data and network management software.

Lab Experiments List:

1. Install a hard disk on a Linux machine covering all the below activities:
a. Connecting the disk to an HBA (Host Bus Adapter) and BIOS setup for the disk;
b. Partitioning the disk;
c. Creating file systems within disk partitions;
d. Mounting the files systems;
e. Setting up automatic mounting;
f. Labeling disk partitions;
g. Setting up swapping on swap partitions.
2. Use “smartmontools” to monitor the disk performance monitoring and testing:
a. Use “smartctl” to enable S.M.A.R.T. support and offline data collection on the disk;
b. Check the overall health of the disk;
c. Run a self-test on the disk;
d. Set up “smartd” to do tests automatically.
3. Use “hdparm”, “iostat”, and “iometer” tools to measure the performance of different storage devices, such as SATA drive, SCSI drive, and USB drives.
a. Plot graphs to compare read/write and sequential/random access rates among different storage devices.
4. Use Navisphere Manager Simulator to perform management on SAN disk array systems:
a. Configure storage pools and LUNs (Logical Unit Number) for storage groups;
b. Configure snapshots and clones;
c. Create SANCopy full and incremental sessions;
d. Create MirrorView synchronous and asynchronous images;
e. Expand a LUN to create metaLUNs;
f. Migrate a LUN to another LUN.
5. Use Openfiler for network storage configuration management:
a. Configure the Openfiler to support locally attached USB drives;
b. Set up a NAS server to support NSF and CIFS protocols;
c. Set up a SAN server to support an iSCSI protocol.
6. Configure Openfiler as a NAS Server:
a. Configure access control rules and NFS/CIFS shares for the NAS server;
b. Configure the Linux client machine to access the NFS shares on the NAS server;

c. Configure a Windows VM on the Linux client machine to access the CIFS shares on the NAS server;
d. Use Openfiler to set up a SAN server, to supports iSCSI protocol for the block level data access;
e. Configure access control rules for the SAN server and configure iSCSI targets on the server.
7. Use VMware to create virtual disks, Virtual Machine File Systems and provisioning.
a. Use thin and thick provisioning concepts.

Course Title:	**Service Oriented Architecture Lab**	**Semester VI**	
Course Code	**BTITSEL609C**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credits**	**1**

Lab Experiments Objective:

1. To learn to create web services and web service clients.
2. To learn SOAP, UDDI and WSDL platforms.

Lab Experiments List:

1. Write a simple web application program in Java to create web services incorporating:
   a. Development of web service.
   b. Testing the web service.
   c. Developing the client.
   d. Deploying the application.
2. Write a factorial application program in Java to create web services.
3. Implement a Calculator program and calculate Simple and Compound Interest using .Net.
4. Develop an invoice order processing system.
5. Invoke EJB components as Web Service.

Course Title:	**Network Programming Lab**	**Semester VI**	
Course Code	**BTITSEL609D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C**	**L – T – P**	**0 – 0 – 2**
Stream	**Network**	**Credits**	**1**

Lab Experiments Objective:

1. To develop TCP Socket Programming, UDP applications and to implement File Transfer Protocols.
2. To utilize RMI and Routing Algorithms.

Lab Experiments List:

1. Write a socket Program for Echo/Ping/Talk commands.
2. Create a socket (TCP) between two computers and enable file transfer between them.
3. Create a socket (UDP) between two computers and enable file transfer between them.
4. Write a program to implement Remote Command Execution. (Two M/Cs may be used)
5. Write a code simulating ARP /RARP protocols.
6. Create a socket for HTTP for web page upload and download.
7. Write a program for TCP module implementation.(TCP services)
8. Write a program for File Transfer in client-server architecture using following methods.
    a. (a) RS232C (b) TCP/IP
9. Write a program to implement RMI (Remote Method Invocation)
10. Perform a case study about the different routing algorithms to select the network path with its optimum and economical during data transfer.
    a. Shortest path routing
    b. Flooding
    c. Distance vector
11. Implement client in C and server in Java and initiate communication between them.
12. Using OPNET
    a. Create a scenario with the following specifications.
        i. No of subnets – 2
        ii. No. of nodes – 40
        iii. Traffic
            1. FTP - 11 to 21
            2. FTP - 30 to 40
            3. UDP - 5 to 7
        iv. Routing Protocol – AODV
        v. 802.16, Show the throughput using different bandwidths i.e., 10 Mbps and 100 Mbps respectively.
    b. Create a scenario as described below.

No of students – 2
SN -1 Nodes – 15
SN -2 Nodes - 10
Generate FTP Traffic & HTTP traffic between Nodes 1 to 11 (FTP)
14 to 7 (HTTP / Gen FTP)

- · Trace the packet within the Simulation time and display the Trace file.

Course Title:	**Advanced Database Technology Lab**	**Semester VI**	
Course Code	**BTITSEL609E**	**Course Type**	**Elective**
Pre-requisite	**SQL**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credits**	**1**

Lab Experiments Objective:

1. To learn the various types of databases and their advanced applications.
2. To understand how and where databases are used in industry.
3. To examine the requirements on special databases.
4. To learn complex queries and interface them with applications.

Lab Experiments List:

1. A University wants to track persons associated with them. A person can be an Employee or Student. Employees are Faculty, Technicians and Project associates. Students are Full time students, Part time students and Teaching Assistants.

a. Design an Enhanced Entity Relationship (EER) Model for university database. Write OQL for the following

1. Insert details in each object.
2. Display the Employee details.
3. Display Student Details.
4. Modify person details.
5. Delete person details.

b. Extend the design by incorporating the following information.

Students are registering for courses which are handled by instructor researchers (graduate students). Faculties are advisors to graduate students. Instructor researchers' class is a category with super class of faculty and graduate students. Faculty is having sponsored research projects with a grant supporting instruction researchers. Grants are sanctioned by different agencies. Faculty belongs to different departments. Department is chaired by a faculty. Implement for the Insertion and Display of details in each class.

2. Consider the application for University Counseling for Engineering Colleges. The college, department and vacancy details are maintained in 3 sites. Students are allocated colleges in these 3 sites simultaneously. Implement this application using parallel database [State any assumptions you have made].
3. There are 5 processors working in a parallel environment and producing output. The output record contains college details and students mark information. Implement parallel join and parallel sort algorithms to get the marks from different colleges of the university and publish 10 ranks for each discipline.
4. Create triggers and assertions for Bank database handling deposits and loan and admission database handling seat allocation and vacancy position. Design the above relational database schema and implement the following triggers and assertions.

a. When a deposit is made by a customer, create a trigger for updating customers account and bank account

b. When a loan is issued to the customer, create a trigger for updating customer's loan account and bank account.

c. Create assertion for bank database so that the total loan amount does not exceed the total balance in the bank.

d. When an admission is made, create a trigger for updating the seat allocation details and vacancy position.

5. Construct a knowledge database for kinship domain (family relations) with facts. Extract the following relations using rules.

   Parent, Sibling, Brother, Sister, Child, Daughter, Son, Spouse, Wife, husband, Grandparent, Grandchild, Cousin, Aunt and Uncle.

6. Work with Weka tool classification and clustering algorithms using the given training data and test with the unknown sample. Also experiment with different scenarios and large data set

7. Design XML Schema for the given company database, Department (deptName, deptNo, deptManagerSSN, deptManagerStartDate, deptLocation), Employee (empName, empSSN, empSex, empSalary, empBirthDate, empDeptNo, empSupervisorSSN, empAddress, empWorksOn), Project (projName, projNo, projLocation, projDeptNo, projWorker)

a. Implement the following queries using XQuery and XPath
   - i. Retrieve the department name, manager name, and manager salary for every department’
   - ii. Retrieve the employee name, supervisor name and employee salary for each employee who works in the Research Department.
   - iii. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project.
   - iv. Retrieve the project name, controlling department name, number of employees and total hours worked per week on the project for each project with more than one employee working on it.

b. Implement a storage structure for storing XML database and test with the above schema.

Teaching and Evaluation Scheme Final year B. Tech. (Information Technology)

Sr. No	Code	Course title	Weekly Teaching hours			Evaluation Scheme			Credit	Total Hours
			L	T	P	MSE	CA	ESE		
Semester VII										
1	BTIT701	Cloud Computing and Storage Management	2	-	-	20	20	60	2	2
2	BTITDE702	Open / Departmental Elective - Group 3	3	-	-	20	20	60	3	3
3	BTIT DE703	Open / Departmental Elective - Group 4	3	-	-	20	20	60	3	3
4	BTIT SE704	Stream Elective - Group 3	3	-	-	20	20	60	3	3
5	BTITL705	Cloud Computing and Storage Management Lab	-	-	2		25	25	1	2
6	BTITDEL706	Open / Departmental Elective - Group 3 Lab	-	-	2	-	25	25	1	2
7	BTITSEL707	Stream Elective - Group 3 Lab	-	-	2	-	25	25	1	2
8	BTITP708	Project Phase I	-	-	8	-	50	50	4	8
9	BTIT709	Industrial Training Assessment	-	-	-	-	-	50	2	-
Summary of Semester Assessment Marks, Credit & Hours			**11**	**-**	**14**	**80**	**205**	**415**	**20**	**25**
Semester VIII										
1	BTIT DE801	Open/Departmental Elective - Group 5	3	-	-	20	20	60	3	3
2	BTITSE802	Stream Elective - Group4	3	-	-	20	20	60	3	3
3	BTIT SE803	Stream Elective - Group 5	3	-	-	20	20	60	3	3
4	BTITSE804	Stream Elective - Group 6	3	-	-	20	20	60	3	3
5	BTITDEL805	Open/Departmental Elective - Group 5 Lab	-	-	2		25	25	1	2
7	BTITSEL806	Stream Elective - Group 4 Lab	-	-	2	-	25	25	1	2
8	BTITSEL807	Stream Elective - Group 6 Lab	-	-	2	-	25	25	1	2
9	BTITP808	Project Phase II	-	-	12		50	50	5	12
Summary of Semester Assessment Marks, Credit & Hours			**12**	**-**	**18**	**80**	**205**	**365**	**20**	**30**

List of Open/Departmental Electives – Group 3

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE702A	Pattern Recognition	Nil
2	BTITDE702B	Soft Computing	Nil

List of Open/Departmental Electives – Group 4

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE703A	Natural Language Processing	Nil
2	BTITDE703B	Artificial Intelligence	Nil

List of Stream Electives – Group 3

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE704A	Real Time Systems	Operating Systems, Design and Analysis of Algorithms
2	BTITSE704B	Information Security	Internetworking Protocols
3	BTITSE704C	Management Information Systems	Decision Support Systems
4	BTITSE704D	Distributed Computing	Operating Systems
5	BTITSE704E	Data Warehousing and Data Mining	Database Management Systems

List of Open/Departmental Electives – Group 5

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITDE801A	Internet of Things	Microprocessor & Microcontrollers
2	BTITDE801B	E-commerce Systems	Nil

List of Stream Electives – Group 4

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE802A	Mobile Computing	Internetworking Protocols, Operating Systems
2	BTITSE802B	Cryptography	Computer Architecture and Organization
3	BTITSE802C	Information Retrieval	Design and Analysis of Algorithms
4	BTITSE802D	Network Security	Internetworking Protocols, Network Programming
5	BTITSE802E	Big Data Analytics	Database Management Systems

List of Stream Electives – Group 5

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE803A	User Experience Design	Software Engineering
2	BTITSE803B	Infrastructure Auditing & Implementation	IT Service Management
3	BTITSE803C	Cyber Law and IPR	Nil
4	BTITSE803D	Optical Networks	Internetworking Protocols
5	BTITSE803E	Web & Text Mining	Data Mining

List of Stream Electives – Group 6

Sr. No.	Course Code	Title of the Course	Prerequisite
1	BTITSE804A	Multimedia Applications	Nil
2	BTITSE804B	Ethical Hacking	Operating Systems
3	BTITSE804C	CRM & SCM	Enterprise Resource Planning
4	BTITSE804D	Wireless Networking	Internetworking Protocols
5	BTITSE804E	Machine Learning	Engineering Mathematics

Course Title:	**Cloud Computing and Storage Management**	**Semester VII**	
Course Code	**BTIT701**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**2 – 0 – 0**
Stream	**Core**	**Credits**	**2**

Course Objectives:

1. To learn the concept of cloud computing.
2. To understand the trade-off between deploying applications in the cloud over local infrastructure.
3. To identify different storage virtualization technologies and their benefits.
4. To understand and articulate business continuity solutions including backup and recovery technologies, local and remote replication solutions.

Course Outcomes:

After learning the course the student will be able:

1. To understand the key dimensions of the challenge of Cloud Computing.
2. To assess the economics, financial and technological implications for selecting cloud computing for organization.
3. To describe and apply storage technologies.
4. To identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers.
5. To describe important storage technology features such as availability, replication, scalability and performance.

Course Content:

UNIT I

Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, Deployment models and service models.

UNIT II

Virtualization: Issues with virtualization, Virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, Virtualization of data centers and Issues with Multi-tenancy.

UNIT III

Implementation: Study of Cloud computing Systems like Amazon EC2 and S3, Google App Engine and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from inside and outside a Cloud Architecture, MapReduce and its extensions to Cloud Computing, HDFS and GFS.

UNIT IV

Storage virtualization: Fixed Content and Archives, Types, Features, Benefits, CAS Architecture, Object storage and retrieval, Examples: Storage Virtualization-forms of virtualization, SNIA Taxonomy – Storage virtualization configurations, Challenges, Types of storage virtualization - Business

Continuity- Overview of emerging technologies such as Cloud storage, Virtual provisioning, Unified Storage, FCOE, FAST.

UNIT V

Business Continuity and Recovery: Information Availability, BC Terminology, Life cycle, Failure analysis: Backup and Recovery- Backup purpose, considerations, Backup Granularity, Recovery considerations- Backup methods, Process, backup and restore operations, Overview of emerging technologies: Duplication, Off site backup.

UNIT VI

Storage security and Management: Storage security framework, Securing the Storage infrastructure, Risk triad: Managing the storage infrastructure, Monitoring the storage infrastructure, identify key parameters and components to monitor in a storage infrastructure, List key management activities and examples, Define storage management standards and initiative-Industry trend.

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, ***"Cloud Computing Principles and Paradigms"***, Wiley Publishers, 2011.
2. Barrie Sosinsky, ***"Cloud Computing Bible"***, Wiley Publishers 2010.
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, ***"Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance"***, O'Reilly 2010.
4. EMC Corporation, ***"Information Storage and Management"***, 1st Edition, Wiley India 2009..

Reference Books:

1. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, ***"Mastering Cloud Computing"***, McGraw Hill, 2013
2. Michael Miller, ***"Cloud Computing : Web-based Applications that change the way you work and collaborate online"***, Pearson Education, 2008
3. IBM, ***"Introduction to Storage Area Networks and System Networking"***, 5th Edition, November 2012.
4. Robert Spalding, ***"Storage Networks: The Complete Reference"***, Tata McGraw Hill, Osborne, 6th reprint 2003.
5. Marc Farley, ***"Building Storage Networks"***, Tata McGraw Hill, Osborne, 1st Edition, 2001.

Course Title:	**Pattern Recognition**	**Semester VII**	
Course Code	**BTITDE702A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To study pattern recognition topics and be exposed to recent developments in pattern recognition research.
2. To provide in-depth design concepts and implementation techniques of pattern recognitions.

Course Outcomes:

1. Identify and explain detailed aspects of internal structures of pattern recognitions.
2. Compare and contrast design issues for statistical pattern recognition.
3. Develop implementation skills for building pattern recognition.

Course Content:

UNIT I

Introduction: Machine Perception, Definition of Pattern Recognition (PR), Pattern Recognition system: Sensing, Segmentation & grouping, Feature extraction, Classification and Post processing, Design cycle: Data collection, Feature choice, Model choice, Training, Evaluation and computational complexity. Learning and adaptation: Supervised learning, Unsupervised learning and Reinforcement learning. Examples of PR Applications, Pattern Recognition Extensions. Machine learning : Components of learning, Learning models, Geometric models, Probabilistic models, Logic models, Grouping and grading, Learning versus design, Theory of learning, Feasibility of learning, Error and noise, Training versus testing, Theory of generalization, Generalization bound, Approximation-generalization tradeoff, Bias and variance, Learning curve.

UNIT II

Statistical Pattern Recognition (StatPR): Introduction to StatPR, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal costs of error, Estimation of error rates, Characteristic curves, Estimating the composition of populations, Introduction to supervised parametric approaches and unsupervised approaches. Cluster analysis: Clustering techniques, Cluster analysis, Cluster validity. Feature selection & extraction: Feature selection criteria, Feature set search algorithm, Feature selection.

UNIT III

Tree Classifiers: (a) Decision Trees: CART, C4.5, ID3, (b) Random Forests, Linear Discriminants, Discriminative Classifiers: the Decision Boundary, (a) Separability, (b) Perceptrons, (c) Support Vector Machines.

UNIT IV

Parametric Techniques: Generative methods grounded in Bayesian Decision Theory (a) Maximum Likelihood Estimation (b) Bayesian Parameter Estimation (c) Sufficient Statistics. Non-Parametric Techniques :(a) Kernel Density Estimators (b) Parzen Window (c) Nearest Neighbor Methods.

UNIT V

Syntactic (Structural) Pattern Recognition (Syntpr): Introduction to SyntPR, Syntactic PR: primitive selection & pattern grammars, Higher dimensional grammars, Syntactic recognition, Automata, Error – correcting parsing, Shape & texture analysis, Image database management. Structural analysis using constraint satisfaction and structural matching, The Formal Language-based approach to SyntPR, Learning/Training in the Language-based Approach (Grammatical Inference). Problem solving methods for PR: Problem solving models, Problem solving algorithms.

UNIT VI

Unsupervised Methods : Exploring the Data for Latent Structure :(a) Component Analysis and Dimension Reduction: i. The Curse of Dimensionality, ii. Principal Component Analysis, iii. Fisher Linear Discriminant, iv. Locally Linear Embedding, (b) Clustering: i. K-Means, ii. Expectation Maximization, iii. Mean Shift. Classifier Ensembles : (a) Bagging, (b) Boosting / AdaBoost, Algorithm Independent, Topics Theoretical Treatments in the Context of Learned Tools: (a) No Free Lunch Theorem, (b) Ugly Duckling Theorem, (c) Bias-Variance Dilemma, (d) Jacknife and Bootstrap Methods.

Text Books:

1. Duda, R.O., Hart, P.E., Stork, D.G. ***"Pattern Classification",*** Wiley, 2nd Edition, 2001.
2. Eart Gose, Richard Johnsonburg and Steve Joust, ***"Pattern Recognition and Image Analysis"***, Prentice-Hall of India-2003.

Reference Books:

1. Bishop, C. M. ***"Pattern Recognition and Machine Learning"*** Springer, 2nd Edition, 2007.
2. Marsland, S., ***"Machine Learning: An Algorithmic Perspective"***, CRC Press. 2009.
3. Theodoridis, S. and Koutroumbas, K., ***"Pattern Recognition"***, 4th Edition, Academic Press, 2008.
4. Russell, S. and Norvig, N., ***"Artificial Intelligence: A Modern Approach",*** Prentice Hall, Series in Artificial Intelligence, 2003.

Course Title:	**Soft Computing**	**Semester VII**	
Course Code	**BTITDE702B**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To introduce a relatively new computing paradigm for creating intelligent machines useful for solving complex real world problems.
2. To gain insight into the tools that make up the soft computing technique: fuzzy logic, artificial neural networks and hybrid systems
3. To create awareness of the application areas of soft computing technique
4. To learn alternative solutions to the conventional problem solving techniques in image/signal processing, pattern recognition/classification, control system

Course Outcomes:

After learning the course the student will be able:

1. To use a new tool /tools to solve a wide variety of real world problems
2. To find an alternate solution, more adaptable, resilient and optimum
3. To apply knowledge of soft computing domain to real world problems

Course Content:

UNIT I

Artificial Neural Network: Biological neuron, Artificial neuron model, Concept of bias and threshold, McCulloch Pits Neuron Model, Implementation of logical AND, OR, XOR functions. Soft Topologies of neural networks, Learning paradigms: Supervised, Unsupervised, Reinforcement, Linear neuron model: Concept of error energy, Gradient descent algorithm and application of linear neuron for linear regression, Activation functions: Binary, Bipolar (linear, signup, log sigmoid, tan sigmoid) Learning mechanisms: Hebbian, Delta Rule of Perceptron and its limitations.

UNIT II

Artificial Neural Network: Multilayer perceptron (MLP) and back propagation algorithm, Application of MLP for classification and regression of self organizing Feature Maps, Clustering of Learning vector quantization. Radial Basis Function networks: Cover’s theorem,Mapping functions (Gaussian, Multi-quadrics, Inverse multiquadrics, Application of RBFN for classification and regression of Hopfield network, Associative memories.

UNIT III

Fuzzy Logic: Concept of Fuzzy number, Fuzzy set theory (continuous, discrete) of operations on fuzzy sets, Fuzzy membership functions (core, boundary, support), Primary and composite linguistic terms, Concept of fuzzy relation, Composition operation (T-norm, T-conorm) of Fuzzy if-then rules.

UNIT IV

Fuzzy Logic: Fuzzification, Membership value assignment techniques, De-fuzzification (Maxmembership principle, Centroid method, Weighted average method), Concept of fuzzy inference, Implication rules: Dienes-Rescher Implication, Mamdani Implication, Zadeh Implication, Fuzzy Inference systems: Mamdani fuzzy model, Sugeno fuzzy model, Tsukamoto fuzzy model, Implementation of a simple two-input single output FIS employing Mamdani model Computing.

UNIT V

Fuzzy Control Systems: Control system design, Control (Decision) Surface, Assumptions in a Fuzzy Control System Design, Fuzzy Logic Controllers, Comparison with traditional PID control, Advantages of FLC, Architecture of a FLC: Mamdani Type, Example Aircraft landing control problem.

UNIT VI

Adaptive Neuro-Fuzzy Inference Systems (ANFIS): ANFIS architecture, Hybrid Learning Algorithm, Advantages and Limitations of ANFIS Application of ANFIS/CANFIS for regression.

Text Books:

1. Laurene Fausett, ***“Fundamentals of Neural Networks: Architectures, Algorithms And Applications”***, Pearson Education, 2008.
2. Timothy Ross, “***Fuzzy Logic With Engineering Applications”***, 3rd Edition, John Wiley & Sons, 2010.
3. J.S. Jang, C.T. Sun, E. Mizutani, ***“Neuro- Fuzzy and Soft Computing”***, PHI Learning Private Limited.
4. S. N. Sivanandam, S. N. Deepa, ***“Principles of Soft Computing”***, John Wiley & Sons, 2007.

Reference Books:

1. John Hertz, Anders Krogh, Richard Palmer, ***“Introduction to the theory of neural computation”***, Addison –Wesley Publishing Company, 1991.
2. Simon Haykin, ***“Neural Networks A comprehensive foundation”***, Prentice Hall International Inc-1999.
3. José C. Principe Neil R. Euliano , W. Curt Lefebvre, ***“Neural and Adaptive Systems: Fundamentals through Simulations”***, John-Wiley & Sons, 2000.
4. Peter E. Hart, David G. Stork Richard O. Duda, ***“Pattern Classification”***, 2nd Edition, 2000.
5. Sergios Theodoridis , Konstantinos Koutroumbas, ***“Pattern Recognition”***, 4th Edition, Academic Press, 2008.
6. Hung T. Nguyen, Elbert A. Walker, ***“A First Course in Fuzzy Logic”***, 3rd Edition, Taylor & Francis Group, LLC, 2008.
7. S. N. Sivanandam , S. Sumathi, S. N. Deepa, ***“Introduction to Fuzzy Logic using MATLAB”***, Springer Verlag, 2007.

Course Title:	**Natural Language Processing**	**Semester VII**	
Course Code	**BTITDE703A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Open/Departmental**	**Credits**	**3**

Course Objectives:

1. To learn the leading trends and systems in natural language processing.
2. To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
3. To recognize the significance of pragmatics for natural language understanding.
4. To describe simple system based on logic and demonstrate the difference between the semantic presentation and interpretation of that presentation.
5. To describe application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing.

Course Outcomes:

After learning the course the student will be able:

1. To understand the models, methods and algorithms of statistical Natural Language Processing.
2. To implement probabilistic models in code, estimate parameters for such models and run meaningful experiments to validate such models.
3. To apply core computer science concepts and algorithms, such as dynamic programming.
4. To understand linguistic phenomena and explore the linguistic features relevant to each NLP task.
5. To identify opportunities and conduct research in NLP.
6. To analyze experimental results and write reports.

Course Content:

UNIT I

Introduction to NLP: Definition, Issues and strategies, Application domain, Tools for NLP, Linguistic organization of NLP, NLP vs. PLP.

UNIT II

Word Classes: Review of Regular Expressions, CFG and different parsing techniques. Morphology: Inflectional, derivational, Parsing and parsing with FST, Combinational Rules.

UNIT III

Phonology: Speech sounds, Phonetic transcription,Phoneme and phonological rules, Optimality theory, Machine learning of phonological rules, Phonological aspects of prosody and speech synthesis. Pronunciation, Spelling and N-grams: Spelling errors, Detection and elimination using probabilistic models, Pronunciation variation (lexical, allophonic, dialect), Decision tree model, Counting words in Corpora, Simple N-grams, smoothing (Add One, Written-Bell, Good-Turing), N-grams for spelling and pronunciation.

UNIT IV

Syntax: POS Tagging: Tagsets, Concept of HMM tagger, Rule based and stochastic POST, Algorithm for HMM tagging, Transformation based tagging. Sentence level construction & unification: Noun phrase, Co-ordination, Sub-categorization, Concept of feature structure and unification.

UNIT V

Semantics: Representing Meaning: Unambiguous representation, Canonical form, Expressiveness, Meaning structure of language, Basics of FOPC. Semantic Analysis: Syntax driven, Attachment & integration, Robustness. Lexical Semantics: Lexemes (homonymy, polysemy, synonymy, hyponymy), WordNet, Internal structure of words, Metaphor and metonymy and their computational approaches. Word Sense Disambiguation: Selectional restriction based, Machine learning based and dictionary based approaches.

UNIT VI

Pragmatics: Discourse: Reference resolution and phenomena, Syntactic and semantic constraints on coreference, Pronoun resolution algorithm, Text coherence, Discourse structure. Dialogues: Turns and utterances, Grounding, Dialogue acts and structures. Natural Language Generation: Introduction to language generation, Architecture, Discourse planning (text schemata, rhetorical relations).

Text Books:

1. D. Jurafsky & J. H. Martin, ***"Speech and Language Processing – An introduction to Language processing, Computational Linguistics, and Speech Recognition"***, Pearson Education.
2. Allen, James, ***"Natural Language Understanding"***, 2nd Edition, Benjamin/Cummings, 1996.

Reference Books:

1. Bharathi, A., Vineet Chaitanya and Rajeev Sangal, ***"Natural Language Processing-A Pananian Perspective",*** Prentice Hall India, 1995.
2. Eugene Cherniak, ***"Statistical Language Learning"***, MIT Press, 1993.
3. Manning, Christopher and Heinrich Schütze, ***"Foundations of Statistical Natural Language Processing",*** MIT Press, 1999.

Course Title:	**Artificial Intelligence**	**Semester VII**	
Course Code	**BTITDE703B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To acquaint the students with the theoretical and computational techniques in Artificial Intelligence.
2. To use various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
3. To use different logical systems for inference over formal domain representations and trace how a particular inference algorithm works on a given problem specification.
4. To understand the conceptual and computational trade-offs between the expressiveness of different formal representations.

Course Outcomes:

After learning the course the students should be able:

1. To find appropriate idealizations for converting real world problems into AI search problems formulated using the appropriate search algorithm.
2. To analyze, formalize and write algorithmic methods for search problem.
3. To explain important search concepts, the definitions of admissible and consistent heuristics and completeness and optimality.
4. To implement and execute by hand alpha-beta search.
5. To design good evaluation functions and strategies for game playing.
6. To carry out proofs in first order and propositional logic using techniques such as resolution, unification, backward and forward chaining.
7. To choose and implement learning algorithms such as decision trees, support vector machines, and boosting.

Course Content:

UNIT I

Introduction: Overview of Artificial intelligence- Problems of AI, AI techniques, Tic - Tac - Toe problem. Intelligent Agents: Agents & environment, Nature of environment, Structure of agents, Goal based agents, Utility based agents, Learning agents.

UNIT II

Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, Production system, Problem characteristics and issues in the design of search programs. Search techniques: Solving problems by searching: problem solving agents, Searching for solutions; uniform search strategies: Breadth first search, Depth first search, Depth limited search, Bidirectional search, Comparing uniform search strategies.

UNIT III

Heuristic search strategies: Greedy best-first search, A* search, Memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, Simulated annealing search, Local beam search, Genetic algorithms; Constraint satisfaction problems, Local search for constraint satisfaction problems. Adversarial search: Games, optimal decisions & strategies in games, The minimax search procedure, Alpha-beta pruning, Additional refinements, Iterative deepening.

UNIT IV

Knowledge & reasoning: Knowledge representation issues, Representation & mapping, Approaches to knowledge representation, Issues in knowledge representation. Using predicate logic: Representing simple fact in logic, Representing instant & ISA relationship, Computable functions & predicates, Resolution, Natural deduction. Representing knowledge using rules: Procedural verses declarative knowledge, Logic programming, Forward verses backward reasoning, Matching, Control knowledge.

UNIT V

Probabilistic reasoning: Representing knowledge in an uncertain domain, The semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics, Planning: Overview, Components of a planning system, Goal stack planning, Hierarchical planning and other planning techniques.

UNIT VI

Natural Language processing: Introduction, Syntactic processing, Semantic analysis, Discourse & pragmatic processing. Learning: Forms of learning, Inductive learning, Learning decision trees, explanation based learning, Learning using relevance information, Neural net learning & genetic learning. Expert Systems: Representing and using domain knowledge, Expert system shells and knowledge acquisition.

Text Books:

1. Rich, E. and Knight K., ***“Artificial Intelligence”***, Tata McGraw- Hill.
2. Russell, S. and Norvig P., ***“Artificial Intelligence: A Modern Approach”***, Pearson Education.
3. Patterson, Dan W. , ***“Introduction to Artificial Intelligence & Expert Systems”***, PHI, 2005.

Reference Book:

1. Nilsson, N. J., Morgan Kaufmann, ***“Artificial Intelligence: A New Synthesis”***,Tata McGraw-Hill.

Course Title:	**Real Time Systems**	**Semester VII**	
Course Code	**BTITSE704A**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems, Design and Analysis of Algorithms**	**L – T – P**	**3 – 0 – 0**
Stream	**Software Application and Development**	**Credits**	**3**

Course Objectives:

1. To introduce students to the fundamental problems, concepts and approaches in the design and analysis of real-time systems.
2. To study issues related to the design and analysis of systems with real-time constraints.
3. To learn real-time scheduling and schedulability analysis.
4. To understand formal specification and verification of timing constraints and properties.
5. To design methods for real-time systems.
6. To learn new techniques of state-of-the-art real-time systems research.

Course Outcomes:

After learning the course the student will be able:

1. To characterize real-time systems and describe their functions.
2. To analyze, design and implement a real-time system.
3. To apply formal methods to the analysis and design of real-time systems.
4. To apply formal methods for scheduling real-time systems.
5. To characterize and debug a real-time system.

Course Content:

UNIT I

Introduction: Hard vs. Soft real time systems, A reference model of real time system. Real-time scheduling: Clock driven approach, Weighted Round-robin approach, Priority driven approach, Dynamic vs. static system, Effective Release Times and Deadlines, EDF and LST algorithm, Optimality and Non-Optimality of the EDF and LST algorithms, Off line vs. online Scheduling.

UNIT II

Clock-Driven Scheduling: Static, Time-Driven scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of a-periodic Jobs, Scheduling Sporadic Jobs.

UNIT III

Priority Driven Scheduling of Periodic Tasks: Fixed priority vs. Dynamic priority algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM algorithms, A Schedulability test for fixed-priority tasks with short response times, Sufficient Schedulability conditions for the RM and DM algorithms.

UNIT IV

Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumptions and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth and Weighted Fair-Queuing Servers.

UNIT V

Resources and Resource Access control: Resource contention, Resource access control, Nonpreemptive critical section, Basic Priority-Inheritance protocol, Basic Priority Ceiling Protocol, Stack based, Priority-ceiling protocol, preemption ceiling protocol.

UNIT VI

Multiprocessor scheduling, Resource Access Control, and Synchronization: Model of multiprocessor & distributed systems, task assignment, multiprocessor Priority-ceiling protocol, Elements of Scheduling Algorithms for End-to-End Periodic Tasks- IPS protocols, PM protocols, MPM protocol.

Text Books:

1. Jane W. S. Liu, ***"Real-Time System"***, Pearson Education.
2. C. M. Krishna and K. G. Shin, ***"Real-Time Systems"***, McGraw Hill.

Reference Books:

1. Laplante, ***"Real Time System Design and Analysis: An Engineer Handbook"***, PHI.
2. Dr. K. V. K. Prasad, ***"Embedded Real Time System Concept Design and Programming"***, Wiley India.

Course Title:	**Information Security**	**Semester VII**	
Course Code	**BTITSE704B**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure and Security Management**	**Credits**	**3**

Course Objectives:

1. To understand information security's importance in the increasingly computer-driven world.
2. To master the key concepts of information security and its working.
3. To develop a security mindset.
4. To learn to critically analyze situations of computer and network security usage.
5. To identify the salient issues, viewpoints and trade-offs of information security.

Course Outcomes:

After learning the course the student will be able:

1. To explain the challenges and scope of information security.
2. To explain security concepts as confidentiality, integrity and availability.
3. To explain the importance of cryptographic algorithms used in information security .
4. To identify and explain symmetric algorithms for encryption-based security of information.
5. To describe the access control mechanism used for user authentication and authorization.
6. To describe Secure Sockets Layer (SSL), Internet Protocol (IP) communications by using Internet Protocol Security (IPSec).
7. To explain the use of security tools as firewalls and intrusion prevention systems.
8. To explain malicious software issues introduced by software-based viruses and worms.
9. To describe the process of risk assessment in the context of IT security management.

Course Content:

UNIT I

Introduction to Information Systems: Security concepts, Computer security concepts, Threats, Attacks and Assets, Security functional requirements, A security architecture for Open Systems, Computer security trends, Computer security strategy.

UNIT II

Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Practical Application: Encryption of Stored Data.

UNIT III

Models, Frameworks, Standards & Legal Framework: A structure and framework of compressive security policy, policy infrastructure, policy design life cycle and design processes, PDCA model, Security policy standards and practices - ISO 27001, SSE-CMM, IA-CMM, ITIL & BS 15000, BS7799, Understanding Laws for Information Security: Legislative Solutions, Contractual Solutions, Evidential Issues, International Activity, Indian IT Act, Laws of IPR, Indian Copyright Act.

UNIT IV

Controls: Access control principles, Subjects, Objects and access rights, Discretionary access control, Role-based access control, Case study.

UNIT V

Virus and Malware: Introduction & types of Malicious Software (Malware), Propagation–Infected Content–Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM E-mail, Trojans, Payload–System Corruption, Payload–Attack, Agent–Zombie, Bots, Payload–Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealthing–Backdoors, Rootkits, Countermeasures.

UNIT VI

Security issues: Database security challenge in the modern world, Federated Databases, securing Mobile databases, Network Security, Trusted and untrusted networks, Network attacks, Network security dimensions, Network attack – the stages; using firewalls effectively; Privacy – Privacy invasion due to direct marketing, Outsourcing using data masking ; privacy issues in smart card applications, Ethical Hacking ;Role of Cryptography in information security, digital signatures.

Text Books:

1. Nina Gobole, ***"Information Systems Security: Security Management, Metrics, Frameworks And Best Practices"***, Wiley, 2008.
2. Mark Rhodes –Ousley, ***"Information Security: The Complete Reference"***, McGraw-Hill Education, 2nd Edition, 2013.
3. Dhiren R Patel, ***"Information Security Theory and Practices"***, PHI Learning, 2008.
4. Mark Stamp, ***"Information Security: Principles and Practice"***, 2nd Edition, , Wiley, 2011.

Reference Books:

1. Gary R. McGraw, ***"Software Security: Building Security In"*** Addison Wesley, 2006.
2. Ankit Fadia, ***"Network Security: A Hacker's Perspective"***, 2006.

Course Title:	**Management Information Systems**	**Semester VII**	
Course Code	**BTITSE704C**	**Course Type**	**Elective**
Pre-requisite	**Decision Support Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To create interest and awareness about the proliferation of the Information Systems in today's organizations.
2. To understand categories of MIS: Operations Support System, Management Support System and Office automation system, Functional management system.
3. To learn Information Systems for strategic management and strategic role of information systems.
4. To plan for information systems: Identification of Applications, Business Application Planning, Systems and Critical Success Factors, Method of Identifying Applications.
5. To understand System Development Process and Approaches, System Implementation, System maintenance, Introduction to MIS Risks, System Evaluation, IT Procurement Options. Change management in IT Projects.

Course Outcomes:

After learning the course the student will be able:

1. To understand the usage and constituents of MIS in organizations.
2. To understand the classifications, understanding and the different functionalities of these MIS.
3. To explain the functions and issues at each stage of system development.
4. To identify emerging trends in MIS technologies.
5. To identify and assess MIS in real-life organization.

Course Content:

UNIT I

Management & organizational support systems for digital firm: Definition of MIS; Systems Approach to MIS: Report writing s/w, MIS and Human factor considerations, concept of organizational information sub-system, MIS & problem solving.

UNIT II

Information systems & business strategy: Information Management, Who are the users? Manager & Systems, Evolution of Computer based information system (CBIS), Model of CBIS. Information services organization: Trend to End-User computing, Justifying the CBIS, Achieving the CBIS, Managing the CBIS, Benefits & Challenges of CBIS implementation. Strategic Information System, Business level and Firm level Strategy.

UNIT III

Information systems in the enterprise: Systems from Management and functional perspective and their relationship: Executive Information System, Decision support system sales and Marketing Information System, Manufacturing Information System, Human-Resource Information System. Finance and Account Information System.

UNIT IV

Information technology for competitive advantage: Firm in its environment, What are the information resources? Who manages the information resources? Strategic planning for information resources. End-User Computing as a strategic issue, Information resource management concept.

UNIT V

E-commerce and international information system: Introduction to E-Commerce, Business Intelligence. E-Commerce strategy, Electronic Data Interchange, E-commerce methodology, E-commerce technology, Business application of the Internet. Electronic Business success strategies.

UNIT VI

Managing International Information Systems: IIS architecture, Global business Drivers, Challenges, Strategy: divide, conquer and appease, Cooptation, Business organization, Problems in implementing global information systems, Computer crime, ethics and social issues.

Text Book:

1. Kelkar, S.A., ***"Management Information Systems"***, Prentice Hall of India, 2003.

Reference Books:

1. Mark G. Simkin, ***"Introduction to computer Information System for Business"***, 1996.
2. James A. Senn, ***"Analysis & Design of Information Systems"***, McGraw-Hill.

Course Title:	**Distributed Computing**	**Semester VII**	
Course Code	**BTITSE704D**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To understand the major tools and techniques that allow programmers to effectively program the parts of the code that require substantial communication and synchronization.
2. To study the core ideas behind modern coordination and communication paradigms and distributed data structures
3. To introduce a variety of methodologies and approaches for reasoning about concurrent and distributed programs.
4. To realize basic principles and best practice engineering techniques of concurrent and distributed computing.
5. To study the safety and progress properties of concurrent and distributed algorithms.
6. To understand the performance of current multi-core and future many-core systems.

Course Outcomes:

After learning the course the student will be able:

1. To identify the core concepts of distributed systems.
2. To learn orchestration of multiple machines to correctly solve problems in an efficient, reliable and scalable way.
3. To examine concepts of distributed systems in designing large systems.
4. To apply distributed computing concepts to develop sample systems.

Course Content:

UNIT I

Introduction: Historical background, Key characteristics, Design goals and challenges, Review of networking and internetworking, Internet protocols.

UNIT II

Processes and Inter process Communication: Processes and threads, Virtualization, Code migration, The API for the Internet protocols, External data representation, Client-server communication, Multicast communication, Message oriented communication, Network virtualization, Overlay networks, RPC and MPI.

UNIT III

Naming: Name services and Domain Name System, Directory services, Case study: X.500 directory service.

UNIT IV

Time, Global States and Synchronization: Physical and logical clocks, Global states, Mutual exclusion, Election algorithms, Consistency and Replication: Consistency models, Replica management, Consistency protocols, Case studies of highly available services: the gossip architecture and Coda.

UNIT V

Fault Tolerance and Security: Distributed Commit, Recovery, Security Issues, Cryptography. Distributed File Systems: File service architecture, Case study: Sun Network File System, The Andrew File System.

UNIT VI

Peer to peer Systems: Introduction, Napster, Peer-to-peer middleware, Routing overlays, Case studies: Pastry, Tapestry. Distributed Object Based Systems: Distributed objects, Java beans, CORBA.

Text Books:

1. Tanenbaum A.S, ***"Distributed Systems: Principles and Paradigms"***, 2nd Edition, Pearson Education, 2006.
2. Coulouris G., Dollimore J., Kindberg T. and Blair G., ***"Distributed Systems: Concepts and Design"***, 5th Edition, Addison Wesley, 2011.
3. Mahajan S., Shah S., ***"Distributed Computing"***, 1st Edition, Oxford University Press, 2010.

Reference Books:

1. Hwang K., Dongarra J., Geoffrey C. Fox, ***"Distributed and Cloud Computing: From Parallel Processing to the Internet of Things"***, Morgan Kaufmann, 2011.
2. Comer D.E. and Droms, R.E., ***"Computer Networks and Internets"***, 4th Edition, Prentice-Hall, 2004.

Course Title:	**Data Warehousing and Data Mining**	**Semester VII**	
Course Code	**BTITSE704E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. Introduce the concepts, techniques, design and applications of data warehousing and data mining.
2. Enable students to understand and implement classical algorithms in data mining and data warehousing.
3. Enable students to learn how to analyze the data, identify the problems and choose the relevant algorithms to apply.

Course Outcomes:

After learning the course the student will be able:

1. Understand the functionality of the various data mining and data warehousing components.
2. Appreciate the strengths and limitations of various data mining and data warehousing models.
3. Compare the various approaches to data warehousing and data mining implementations.
4. Describe and utilize a range of techniques for designing data warehousing and data mining systems for real-world applications.

Course Content:

UNIT I

Introduction to data warehousing, Evolution of decision support systems, Modeling a data warehouse, granularity in the data warehouse, Data warehouse life cycle, building a data warehouse, Data Warehousing Components, Data Warehousing Architecture.

UNIT II

On Line Analytical Processing, Categorization of OLAP Tools, Introduction to Data mining and knowledge discovery, Relation to Statistics, Databases, Data Mining Functionalities, Steps In Data Mining Process, Architecture of a Typical Data Mining Systems, Classification of Data Mining Systems.

UNIT III

Overview of Data Mining Techniques, Data Preprocessing, Data Cleaning, Data Integration, Data Transformation and Data Reduction, Data Generalization and Summarization Based Characterization, Mining Association Rules In Large Databases.

UNIT IV

Classification and Prediction, Issues Regarding Classification and Prediction, Classification By Decision Tree Induction, Bayesian Classification, Other Classification Methods.

UNIT V

Prediction, Clusters Analysis, Types of Data In Cluster Analysis, Categorization of Major Clustering Methods, Partitioning methods, Hierarchical Methods.

UNIT VI

Applications of Data Mining, Social Impacts of Data Mining, Case Studies, Mining WWW, Mining Text Database, Mining Spatial Databases.

Text Books:

1. Adriaans, **“ *Data mining*”**, Addison- Wesley, 1996.
2. Margaret Dunham, ***“Data Mining: Introductory and Advanced Topics”***, Published by Prentice Hall.
3. Weiss, Sholom M.,***”Predictive data mining : a practical guide”,*** Kaufmann Publishers, 1998.

Reference Books:

1. Pang-Ning Tan, Michael Steinback, Vipin Kumar, ***“Introduction to Data Mining”***, Pearson Education, 2008.
2. M.Humphires, M.Hawkins, ***“Data Warehousing: Architecture and Implementation”***, Pearson Education, 2009.
3. Anahory, Murray, ***“Data Warehousing in the Real World”***, Pearson Education, 2008.
4. Kargupta, Joshi, etc., ***“Data Mining: Next Generation Challenges and Future Directions”***, Prentice Hall of India Pvt. Ltd, 2007.

Course Title:	**Cloud Computing and Storage Management Lab**	**Semester VII**	
Course Code	**BTITL705**	**Course Type**	**Compulsory**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**0 – 0 – 2**
Stream	**Core**	**Credit**	**1**

Lab Experiments Objectives:

Learner will be able to...

1 Appreciate cloud architecture.
2 Create and run virtual machines on open source OS.
3 Implement Infrastructure, storage as a Service.
4 Install and appreciate security features for cloud.

Lab Experiments List:

1 Study of Cloud Computing & Architecture.
2 Study and implementation of Infrastructure as a Service.
3 Implementation of Private cloud using Eucalyptus or Open stake.
- Working with KVM to create VM.
- Installation and configuration of Private cloud.
- Bundling and uploading images on a cloud.
- Creating web based UI to launch VM.
- Working with Volumes – Attached to the VM.

Course Title:	**Pattern Recognition Lab**	**Semester VII**	
Course Code	**BTITDEL706A**	**Course Type**	**Elective**
Pre-requisite	**NIL**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objectives:

1. To study pattern recognition topics and be exposed to recent developments in pattern recognitions research.
2. To provide in-depth design concepts and implementation techniques of pattern recognitions.

Lab Experiments List:

1. Feature Representation.
2. Mean and Covariance.
3. Linear Perceptron Learning.
4. Generation of Random Variables.
5. Bayesian Classification.
6. MLE: Learning the classifier from data.
7. Data Clustering: K-Means, MST-based.

Course Title:	**Soft Computing – Lab**	**Semester VII**	
Course Code	**BTITDEL706B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objectives:

1. To utilize Soft computing algorithms to solve engineering problems.
2. To compare results and provide a analysis of algorithms efficiency.
3. To apply soft computing thought process for solving issues.

Lab Experiments List:

1. Implement simple logic network using MP neuron model.
2. Implement a simple linear regression with a single neuron model.
3. Implement and test MLP trained with back-propagation algorithm.
4. Implement and test RBF network.
5. Implement SOFM for character recognition.
6. Implement fuzzy membership functions (triangular, trapezoidal, gbell, PI, Gamma, Gaussian)
7. Implement defuzzyfication (Max-membership principle, Centroid method, Weighted average method).
8. Implement FIS with Mamdani Inferencing mechanism.
9. A small project: may include classification or regression problem, using any soft computing technique studied earlier.

Course Title:	**Real Time Systems Lab**	**Semester VII**	
Course Code	**BTITSEL707A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Software Application and Development**	**Credit**	**1**

Lab Experiments Objectives:

1. To design and write programs to demonstrate various real time system concepts of scheduling processes.
2. To demonstrate how real time principles can be applied to business problems by simulating business processes.

Lab Experiments List:

1. Execute a program to demonstrate real time scheduling EDF vs. LST to show a comparative result.
2. Demonstrate clock driven scheduler system.
3. Develop a random generator to set priority and demonstrate a priority driven scheduler system.
4. Simulate a manufacturing process to demonstrate resource and resource control scheduling system in real time.
5. Simulate a logistics service provider scheduling of product delivery system using the principles of real-time system learned in the course.

Course Title:	**Information Security – Lab**	**Semester VII**	
Course Code	**BTITSEL707B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure and Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. To be familiar with the algorithms of data mining,
2. To be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
3. To be exposed to web mining and text mining.

Lab Experiments List:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
    a. Caesar Cipher
    b. Playfair Cipher
    c. Hill Cipher
    d. Vigenere Cipher
    e. Rail fence – row & Column Transformation.
2. Implement the following algorithms
    a. DES
    b. RSA Algorithm
    c. Diffiee-Hellman
    d. MD5
    e. SHA-1
3. Implement the SIGNATURE SCHEME - Digital Signature Standard.
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor).
6. Installation of rootkits and study about the variety of options.
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler).
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w).

Course Title:	**Management Information Systems - Lab**	**Semester VII**	
Course Code	**BTITSEL707C**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To prepare organizational data for MIS reports and dashboards.
2. To learn what data should be used to prepare MIS reports.
3. To write programs to produce MIS reports.
4. To depict data in a MIS report to support decision making.

Lab Experiments List:

1. Prepare a MIS report for HR system to depict the various grades of employee in an organization by years of service.
2. Prepare a EIS report of Sales of an organization.
3. Prepare a graphical EIS dashboard of the Sales over a period of 1 year.
4. Prepare a manufacturing MIS report of all orders fulfilled, in progress and pending for management.
5. Prepare a monthly MIS profit and loss dashboard from financial data.
6. Prepare an EIS for reporting population demographic.

Course Title:	**Distributed Computing-Lab**	**Semester VII**	
Course Code	**BTITSEL707D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Networking**	**Credit**	**1**

Lab Experiments Objective:

1. To implement distributed systems paradigms practically to understand impact on resources and processes.

Lab Experiments List:

1. Load Balancing Algorithm.
2. Scalability in Distributed Environment.
3. Client/server using RPC/RMI.
4. Inter-process communication.
5. Election Algorithm.
6. Distributed Deadlock.
7. Name Resolution protocol.
8. Clock Synchronization algorithms.
9. Mutual Exclusion Algorithm.
10. Group Communication.
11. CORBA architecture.
12. Parallel Algorithms.
13. Message Passing Interface.

Course Title:	**Data Warehousing and Data Mining-Lab**	**Semester VII**	
Course Code	**BTITSEL707E**	**Course Type**	**Elective**
Pre-requisite	**SQL**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objectives:

1. To be familiar with the algorithms of data mining.
2. To be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
3. To be exposed to web mining and text mining.

Lab Experiments List:

1. Creation of a Data Warehouse.
2. Apriori Algorithm.
3. FP-Growth Algorithm.
4. K-means clustering.
5. One Hierarchical clustering algorithm.
6. Bayesian Classification.
7. Decision Tree.
8. Support Vector Machines.
9. Applications of classification for web mining.
10. Case Study on Text Mining or any commercial application.

Course Title:	**Project Phase – I**	**Semester VII**	
Course Code	**BTITP708**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0–0 – 8**
Stream	**Core**	**Credits**	**4**

The project should enable the students to combine the theoretical and practical concepts studied in his/her academics. The project work should enable the students to exhibit their ability to work in a team, develop planning and execute skills and perform analyzing and trouble shooting of their respective problem chosen for the project. The students should be able to write technical report, understand the importance of teamwork and group task. The students will get knowledge about literature survey, problem definition, its solution, and method of calculation, trouble shooting, costing, application and scope for future development.

Project work

The project work is an implementation of learned technology. The knowledge gained by studying various subjects separately supposed to utilize as a single task. A group of 03/04 students will have to work on assigned work. The topic could be a product design, specific equipment, live industrial problem etc. The project work involves experimental/theoretical/computational work. It is expected to do necessary literature survey by referring current journals belonging to Information Technology reference books and internet. After finalization of project, requisites like equipments, data, tools etc. should be arranged.

Project Activity

The project groups should interact with guide, who in turn advises the group to carry various activities regarding project work on individual and group basis. The group should discuss the progress every week in the project hours and follow further advice of the guide to continue progress. Guide should closely monitor the work and help the students from time to time. The guide should also maintain a record of continuous assessment of project work progress on weekly basis.

Phase I

1. Submission of project/problem abstract containing problem in brief, requirements, broad area, applications, approximate expenditure if required etc.
2. Problem definition in detail.
3. Literature survey.
4. Requirement analysis.
5. System analysis (Draw DFD up to level 2, at least).
6. System design, Coding/Implementation (20 to 30%).

Course Title:	**Industrial Training Assessment**	**Semester VII**	
Course Code	**BTIT709**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 0**
Stream	**Core**	**Credits**	**2**

The students receive theoretical knowledge of the basic engineering and applied engineering in first six semesters. They have to do in plant training of four weeks at least during vacation after sixth semester. The training enables the students to expose to industry during their training, provides orientation and improves their prospects for employment. The students should prefer industrial training in the domain of Information Technology.

Training report and Assessment

During the industrial training he/she will observe layout, working environment, various equipments, tools, instruments etc. under the supervision of supervisor and engineer of the company. Students are required to submit a printed report of industrial training in the seventh semester. The report should contain information about the major field of company, particularly about the section/department where he/she have undergone the training giving the details of equipments, product, tools their detailed specification, use etc. The training report and field work done by students will be assessed by internal examiner(s) and appropriate grade will be awarded.

Course Title:	**Internet of Things**	**Semester**	**VIII**
Course Code	**BTITDE801A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessor & Micro-controllers**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To understand the vision of IoT.
2. To understand IoT market perspective.
3. To study the data and knowledge management and use of devices in IoT technology.
4. To understand state of the art – IoT Architecture.
5. To study the real world IoT design constraints, industrial automation and commercial building automation in IoT.

Course Outcomes:

After learning the course the students should be able:

1. To interpret the vision of IoT from a global context.
2. To determine the market perspective of IoT.
3. To compare and contrast the use of devices, gateways and data management in IoT.
4. To implement state of the art architecture in IoT.
5. To illustrate the application of IoT in industrial automation and identify real world design constraints.

Course Content:

UNIT I

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing characteristics.

UNIT II

M2M to IoT: A Market Perspective– Introduction, Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies, M2M to IoT. An architectural overview: Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, Standards considerations.

UNIT III

M2M and IoT Technology Fundamentals - Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

UNIT IV

IoT Architecture: State of the Art, Introduction, State of the art, Architecture Reference Model - Introduction, Reference model and architecture, IoT reference model.

UNIT V

IoT Reference Architecture: Introduction, Functional view, Information view, Deployment and operational View, Other relevant architectural views. Real-World Design Constraints - Introduction, Technical design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT VI

Industrial Automation: Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things, Commercial Building Automation: Introduction, Case study: phase one-commercial building automation today, Case study: phase two- commercial building automation in the future.

Text Book:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,***"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence"***, Academic Press, 1st Edition, 2014.

Reference Books:

1. Vijay Madisetti, Arshdeep Bahga, ***"Internet of Things (A Hands-on-Approach)"***, VPT, 1st Edition, 2014.
2. Francis da Costa, ***"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything"***, 1st Edition, Apress Publications, 2013.

Course Title:	**E-commerce Systems**	**Semester**	**VIII**
Course Code	**BTITDE801B**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Departmental**	**Credits**	**3**

Course Objectives:

1. To learn the importance of E-commerce and its impact on business.
2. To understand the various E-commerce business models and its uses.
3. To learn the various E-commerce technologies and IT requirements for a successful E-commerce business.
4. To discover factors required for good E-commerce systems.

Course Outcomes:

After learning the course the students should be able:

1. To explain E-commerce systems construct limitations and benefits.
2. To design E-commerce applications.
3. To discuss security and IT requirements to deploy E-commerce systems.
4. To explain the critical success factors of good E-commerce applications.

Course Content:

UNIT I

Introduction to E-commerce: Meaning, Nature and scope; channels of E-commerce, Business applications of E-commerce, Traditional commerce vs. E-commerce and Business model of E-commerce: B2B, B2C, C2C, B2G and other models of E-commerce.

UNIT II

Mobile commerce: Introduction to M-Commerce, History and key benefits & limitations, Critical success factors, Wireless Application Protocol (WAP), Mobile banking. Electronic payment system: Type of payment systems: E-cash and currency servers, E-cheques, Credit card, Smart card, Electronic purses and debit cards, Operational, Credit and legal risks of e-payments, Risk management options for e-payment system, Order fulfillment for E-commerce.

UNIT III

E-commerce strategy: Overview, Strategic methods for developing E- commerce.

UNIT IV

The Four C's of E-commerce: (Convergence, Collaborative Computing, Content Management & Call Center). Convergence: Technological Advances in Convergence: Types, Convergence and its implications, Convergence and Electronic Commerce, Collaborative Computing: Collaborative product development, contract as per CAD, Simultaneous Collaboration, Security. Content Management: Definition of content, Authoring Tools and Content Management, Content: partnership, repositories, convergence, providers, Web Traffic and Traffic Management; Content Marketing. Call Center: Definition, Need, Tasks Handled, Mode of Operation, Equipment, Strength & Weaknesses of Call Center, Customer Premises Equipment (CPE).

UNIT V

E-commerce Technologies: Relationship Between E-Commerce and Networking, Different Types of Networking for E-Commerce, Internet, Intranet and Extranet, EDI Systems.

UNIT VI

Security issues in e-commerce: Security risk of e-commerce, Type and sources of threats, Protecting the electronic commerce assets and intellectual property, Firewalls, Client server network security, Data and message security, Digital identification and electronic signature, Encryption approach to e-commerce security.

Text Books:

1. C.S.V. Murthy, ***"E-Commerce Concept-model-strategies"***, Himalaya Publication House.
2. Nidhi Dhawan, ***"E-Commerce Concepts and Applications"***, International book house Pvt. Ltd.
3. Kalkota and Whinston, ***"Frontiers of Electronic Commerce"***, Pearson publication.

Reference Books:

1. Elias M. Awad., ***"Electronic Commerce"***, PHI.
2. Joseph, ***"E-commerce"***, PHI, 2nd Edition.
3. Bhaskar Bharat, ***"Electronic Commerce - Technologies & Applications"***, TMH
4. Chris Bates, ***"Web Programming"***, Wiley publication, 3rd Edition, 2009.
5. B.V. Kumar, S.V. Subrahmanya, ***"Web Services: An Introduction"***, Tata McGraw Hill, 2008.

Course Title:	**Mobile Computing**	**Semester**	**VIII**
Course Code	**BTITSE802A**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols , Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To describe the basic concepts and principles in mobile computing.
2. To understand the concept of Wireless LANs, PAN, Mobile Networks, and Sensor Networks.
3. To explain the structure and components for Mobile IP and Mobility Management.
4. To understand positioning techniques and location-based services and applications.
5. To describe the important issues and concerns on security and privacy.
6. To design and implement mobile applications to realize location-aware computing.
7. To design algorithms for location estimations based on different positioning techniques and platforms.
8. To acquire the knowledge to administrate and to maintain a Wireless LAN.

Course Outcomes:

After learning the course the students should be able:

1. To describe wireless and mobile communications systems.
2. To choose an appropriate mobile system from a set of requirements.
3. To work around the weaknesses of mobile computing.
4. To interface a mobile computing system to hardware and networks.
5. To program applications on a mobile computing system and interact with servers and database systems.

Course Content:

UNIT I

Fundamental of Wireless and basics of wireless network: Digital communication, Wireless communication system and limitations, Wireless media, Frequency spectrum, Technologies in digital wireless communication, Wireless communication channel specification, Wireless network, Wireless switching technology, Wireless communication.

UNIT II

Mobile Communications and Computing: An Overview Mobile Communication, Mobile Computing, Mobile Computing Architecture, Mobile Devices, Mobile System Networks, Data Dissemination, Mobility Management, Security, Mobile Devices and Systems, Mobile Phones, Digital Music Players, Hand-held Pocket Computers, Hand-held Devices: Operating Systems, Smart Systems, Limitations of Mobile Devices, Automotive Systems.

UNIT III

GSM and other architectures: GSM-Services and System Architectures, Radio Interfaces, Protocols Localization, Calling, Handover, Security, New Data Services, modulation, Multiplexing, Controlling the medium access, Spread spectrum, Coding methods, CDMA, IMT 2000, WCDMA and CDMA 2000, 4G Networks.

UNIT IV

Mobile Network and Transport Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route optimization, Dynamic Host Configuration Protocol, Mobile Transport Layer, Conventional TCP/IP Transport Layer Protocol, Indirect TCP, Snooping TCP, Mobile TCP, Mobile Ad-hoc Networks (MANET), Routing and Routing Algorithms in MANET, Security in ad-hoc networks.

UNIT V

Data Dissemination and Data Synchronization in Mobile Computing: Communication Asymmetry, classification of data delivery mechanism, data dissemination broadcast models, selective tuning and indexing techniques, synchronization, synchronization software for mobile devices, synchronization protocols.

UNIT VI

Mobile Devices and Mobile Operating System: Mobile agent, Applications framework, Application server, Gateways, Service discovery, Device management, Mobile file system, Mobile Operating Systems, Characteristics, Basic functionality of Operating Systems: Window 8, iOS, Android OS.

Text Books:

1. Raj Kamal, "Mobile Computing", Oxford University Press-New Delhi, 2nd Edition.
2. Dr. Sunil kumar S. Manavi, Mahabaleshwar S. Kakkasageri, ***"Wireless and Mobile Networks, Concepts and Protocols"***, Wiley, India.

Reference Books:

1. Mark Ciampa, ***"Guide to Designing and Implementing wireless LANs"***, Thomson learning, Vikas Publishing House, 2001.
2. Ray Rischpater, ***"Wireless Web Development"***, Springer Publishing,
3. Sandeep Singhal, ***"The Wireless Application Protocol"***, Pearson Publication.
4. P.Stavronlakis, ***"Third Generation Mobile Telecommunication Systems"***, Springer Publishers.

Course Title:	**Cryptography**	**Semester**	**VIII**
Course Code	**BTITSE802B**	**Course Type**	**Elective**
Pre-requisite	**Computer Architecture & Organization**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To learn cryptography in information security implementation.
2. To know the methods of conventional encryption.
3. To understand the concepts of public key encryption and number theory.
4. To understand authentication and Hash functions.
5. To know the network security tools and applications.
6. To understand the system level security used.

Course Outcomes:

After learning the course the students should be able:

1. To compare and contrast a range of different cryptosystems.
2. To list and elaborate the differences between secret key and public key cryptosystems.
3. To identify the different approaches to quantifying secrecy.
4. To recognize the different modes of operation for block ciphers and their applications.
5. To explain the role of hash functions in Information Security.
6. To discuss the place of ethics in the Information Security Area.

Course Content:

UNIT I

Introduction: What is cryptology: (cryptography + cryptanalysis), Overview of cryptology: How cryptography works, how to break a cryptographic system, Classical conventional encryption, Modern conventional encryption, Public key encryption, Hashing algorithm, OSI security architecture, Cryptanalysis of classical cryptosystems, Shannon’s theory.

UNIT II

Symmetric Cipher: Classical Encryption Techniques, Symmetric Cipher Model, Block Cipher principles, DES, Triple DES, Cryptanalysis of symmetric key ciphers: Differential and Linear Cryptanalysis, Block cipher design principle, The Euclidean algorithm, Finite field of form GP(p), Advance Encryption Standard (AES), AES cipher, Multiple encryption and triple DES, Stream Cipher and RC4, Placement of encryption function, Traffic confidentiality, Key distribution, Random number generation. System security: Intrusion detection, Password management, Virus countermeasure, Denial of service attack, Firewall design principles, Trusted System.

UNIT III

Public Key Cryptography: Key Management - The Discrete Logarithm Problem (DLP) and the Diffie Hellman Key Exchange algorithm, Cryptanalysis of DLP, Elliptic Curve Architecture and Cryptography : Confidentiality using Symmetric Encryption, Public Key Cryptography, RSA, Primality Testing, Factoring algorithms, Other attacks on RSA and semantic security of RSA ElGamal cryptosystems.

UNIT IV

Authentication and Hash Function: Authentication requirements, Authentication functions, Message Authentication codes, Hash functions, Security of hash functions, Hash functions: The Merkle Damgard Construction and MACs, MD5 message Digest algorithm - Secure Hash Algorithm, RIPEMD, HMAC, CMAC, Whirlpool and Comparative analysis. Digital Signatures, Authentication Protocols, Digital Signature Standard.

UNIT V

Network Security: Authentication Applications: Kerberos - X.509 Authentication Service, Electronic Mail Security - PGP - S/MIME - IP Security - Web security.

UNIT VI

System Level Security: Intrusion detection, Password management, Viruses and related Threats, Virus Counter measures, Firewall Design Principles, Trusted Systems. Cryptanalysis: Differential Cryptanalysis, Linear Cryptanalysis, Truncated differential cryptanalysis, etc. Assignments (not limited to this): including Cryptographic standards, application of cryptosystems, network security (IPSEC, VPN, Web Security), privilege management infrastructure (PMI) and Access Control, e-Commerce and Smart IC cards).

Text Book:

1. William Stallings, ***"Cryptography and Network Security - Principles and Practices"***, Prentice Hall of India, 3rd Edition, 2003.

Reference Books:

1. Atul Kahate, ***"Cryptography and Network Security"***, Tata McGraw-Hill, 2003.
2. Bruce Schneier, ***"Applied Cryptography"***, John Wiley & Sons Inc, 2001.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, ***"Security in Computing"***, Pearson Education, 3rd Edition, 2003.

Course Title:	**Information Retrieval**	**Semester**	**VIII**
Course Code	**BTITSE802C**	**Course Type**	**Elective**
Pre-requisite	**Design and Analysis of Algorithms**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To learn the techniques used to retrieve useful information from repositories such as the Web.
2. To understand the concepts in information retrieval such as documents, queries, collections and relevance.
3. To learn approaches for efficient indexing for quick identification of candidate answer documents
4. To learn modern techniques for crawling data from the web.

Course Outcomes:

After learning the course the students should be able:

1. To apply information retrieval principles to locate relevant information in large collections of data.
2. To understand and deploy efficient techniques for the indexing of document objects that are to be retrieved.
3. To implement features of retrieval systems for web-based and other search tasks.
4. To analyze the performance of retrieval systems using test collections.
5. To make practical recommendations about deploying information retrieval systems in different search domains, including considerations for document management and querying.

Course Content

UNIT I

Introduction to the Course: Information retrieval problem, First take at building an inverted index, Processing of Boolean queries, Extended Boolean model vs. ranked retrieval. Term vocabulary and postings lists: document delineation and character sequence decoding, Determining vocabulary of terms, Faster postings list intersection via skip pointers, Positional postings and phrase queries.

UNIT II

Dictionaries, Tolerant Retrieval and Indexing: Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction; Index construction, Blocked sort-based indexing, Single-pass in-memory indexing, Distributed indexing, Dynamic indexing and other types; Index compression: Heaps' and Zipf's law, Dictionary compression and postings file compression.

UNIT III

Scoring and IR System Evaluation: Parametric and zone indexes, Term frequency and weighing, Vector space model for scoring, Variant tf-idf functions, Efficient scoring and ranking, Components of an IR system, Vector space scoring and query operator interaction, IR system evaluation, Standard test collections, Evaluation of unranked and ranked retrieval results, Assessing relevance, System quality and user utility; Relevance feedback and pseudo relevance feedback, Global methods for query reformulation.

UNIT IV

XML and Probabilistic Information Retrieval: Basic concepts of XML retrieval and challenges, vector space model for XML retrieval, Text-centric vs. data centric XML retrieval, Probability ranking principal, Binary independence model, Appraisal and some extensions, Language models for information retrieval, Query likelihood model, Language modeling vs. other approaches in IR.

UNIT V

Document Classification: Text classification problem, Naïve Bayes text classification, Bernoulli model, Feature selection, Evaluation of text classification; Vector space classification: Document representations and measure of relatedness in vector spaces, Rocchio classification, k nearest neighbor, Linear vs. Non-linear classifiers, Bias-variance tradeoff; Support vector machines, Extensions to SVM models, Issues in the classification of text documents, Machine learning methods in ad hoc information retrieval.

UNIT VI

Document Clustering and Matrix Decomposition: Flat clustering, Cardinality, Evaluation of clustering, K-means, Model based clustering, Hierarchical Agglomerative clustering, Singlelink and complete-link clustering, Group-average agglomerative clustering, Centroid clustering, Optimality of HAC, Divisive clustering, Cluster labeling; Matrix decompositions, Term document matrices and singular value decomposition, Low-rank approximations, Latent semantic indexing.

Web Search: Basics concepts, Web graph, Spam, Search user experience, Index size and estimation, Near-duplicates and shingling, Web crawling and indexes: Overview, Crawler architecture, DNS resolution, URL frontier, Distributing indexes and connectivity servers; Link analysis: Anchor text and web graph, Page Rank, Hubs and Authorities.

Text Books:

1. Manning, C. D., Raghavan, P., Schütze, H. ***"Introduction to Information Retrieval",*** Cambridge University Press, 2008.
2. Witten, I. H., Moffat, A., Bell, T. C. ***"Managing Gigabytes: Compressing and Indexing Documents and Images.",*** Morgan Kaufmann, 1999.
3. Grossman, D. A., ***"Information Retrieval: Algorithms and Heuristics"***, Springer, 2004.

Reference Books:

1. Baeza-Yates, R., Ribeiro-Neto, B. ***"Modern information Retrieval"***, ACM press, 1999
2. Belew, R. K. ***"Finding Out About: A Cognitive Perspective on Search Engine Technology and the WWW"***, Cambridge University Press, 2000.
3. Chakrabarti S. ***"Mining the Web: Discovering Knowledge from Hypertext Data"***, Morgan Kaufmann, 2003.
4. Manning, C. D. ***"Foundations of Statistical Natural Language Processing"***, H. Schütze (Ed.). MIT press, 1999.

Course Title:	**Network Security**	**Semester VIII**	
Course Code	**BTITSE802D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols, Network Programming**	**L – T – P**	**3 – 0 – 0**
Stream	**Networks**	**Credits**	**3**

Course Objectives:

1. To understand the number theory used for network security.
2. To understand the design concept of cryptography and authentication.
3. To understand the design concepts of internet security.
4. To develop experiments on algorithm used for security.

Course Outcomes:

After learning the course the students should be able:

1. To describe network security awareness and a clear understanding of its importance.
2. To explain how threats to an organization are discovered, analyzed and dealt with.
3. To explain protocols for security services.
4. To describe network security threats and countermeasures
5. To explain network security designs using available secure solutions (such as PGP, SSL, IPSec, etc).
6. To demonstrate advanced security issues and technologies (such as DoS attack detection and containment, and anonymous communications).

Course Content

UNIT I

Model of network security, Security attacks, services and attacks, OSI security architecture, Classical encryption techniques, SDES, Block cipher Principles, DES, Strength of DES, Block cipher design principles, Block cipher mode of operation, Evaluation criteria for AES, RC4 - Differential and linear cryptanalysis, Placement of encryption function, traffic confidentiality.

UNIT II

Number Theory, Prime number, Modular arithmetic, Euclid’s algorithm, Fermat’s and Euler’s theorem, Primality, Chinese remainder theorem, Discrete logarithm, Public key cryptography and RSA Key distribution, Key management, Diffie Hellman key exchange, Elliptic curve cryptography.

UNIT III

Authentication requirement, Authentication function, MAC, Hash function, Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS.

UNIT IV

Security Services for E-mail-establishing keys-privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME.

UNIT V

SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL-Attacks fixed in v3- Exportability-Encoding-Secure Electronic Transaction (SET).

UNIT VI

Firewall Design Principles- Packet Filters- Application level Gateways-Tunnels-DoS attacks-Intrusion Detection-Password Management-Malicious Software.

Text Book:

1. William Stallings, ***"Cryptography & Network Security"***, Pearson Education, 4th Edition, 2010.

Reference Books:

1. Charlie Kaufman, Radia Perlman, Mike Speciner, ***"Network Security, Private Communication in Public World"***, PHI, 2nd Edition, 2002.
2. Bruce Schneier, Neils Ferguson, ***"Practical Cryptography"***, Wiley Dreamtech India Pvt. Ltd, 1st Edition, 2003.
3. Douglas R Simson ***"Cryptography – Theory and Practice"***, CRC Press, 1st Edition, 1995.

Course Title:	**Big Data Analytics**	**Semester**	**VIII**
Course Code	**BTITSE802E**	**Course Type**	**Elective**
Pre-requisite	**Database Management Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To understand the concept of Big Data.
2. To learn Big Data file systems and their storage methods.
3. To learn to process Big Data information for analytics.
4. To discuss and understand Big Data implementations within large corporations like Google and Facebook.

Course Outcomes:

After learning the course the students should be able:

1. To model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. To analyze methods and algorithms to compare and evaluate them with respect to time and space requirements and make appropriate design choices when solving real-world problems.
3. To explain trade-offs in big data processing techniques.
4. To explain the Big Data Fundamentals including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.
5. To apply non-relational databases techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.
6. To apply the novel architectures and platforms introduced for Big data in particular Hadoop and MapReduce.

Course Content

UNIT I

Introduction to Big Data: Introduction to Big Data, The four dimensions of Big Data: Volume, Velocity, Variety, Veracity, Drivers for Big Data, Introducing the Storage, Query Stack, Revisit useful technologies and concepts, Real-time Big Data Analytics.

UNIT II

Distributed File Systems: Hadoop Distributed File System, Google File System, Data Consistency.

UNIT III

Big Data Storage Models: Distributed Hash-table, Key-Value Storage Model (Amazon's Dynamo), Document Storage Model (Facebook's Cassandra), Graph storage models.

UNIT IV

Scalable Algorithms: Mining large graphs with focus on social networks and web graphs. Centrality, Similarity, All-distances sketches, Community detection, Link analysis, Spectral techniques. Map-reduce, Pig Latin, and NoSQL, Algorithms for detecting similar items, Recommendation systems, Data stream analysis algorithms, Clustering algorithms, Detecting frequent items.

UNIT V

Big Data Applications: Advertising on the Web, Web Page Quality Ranking, Mining Social-Networking Group, Human Interaction with Big-Data. Recommendation systems with case studies of Amazon's Item-to-Item recommendation and Netfix Prize, Link Analysis with case studies of the PageRank algorithm and the Spam farm analysis, Crowd Sourcing.

UNIT VI

Big Data Issues: Privacy, Visualization, Compliance and Security, Structured vs. Unstructured Data.

Text Book:

1. Anand Rajaraman and Jeffrey Ullman, ***"Mining of Massive Datasets"***, Cambridge University Press, 2012.

Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, ***"An Introduction to Information Retrieval"***, Cambridge University Press, 2008.
2. Jimmy Lin and Chris Dyer, ***"Data-Intensive Text Processing with MapReduce"***, Morgan and ClayPool Publishers, 2010.

Course Title:	**User Experience Design**	**Semester**	**VIII**
Course Code	**BTITSE803A**	**Course Type**	**Elective**
Pre-requisite	**Software Engineering**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To understand user experience design principles
2. To understand the various elements and how the elements of user experience work together.
3. To understand strategy, structure, skeleton and scope as an element of user experience.
4. To identify business goals, user needs, content requirements.
5. To create a functional specification and an effective information design.
6. To learn to prioritize specs and requirements.
7. To architect information effectively and navigation.
8. To learn resources available to assist with User Experience Design Process.

Course Outcomes:

After learning the course the students should be able:

1. To design applications and web pages with effective and easy to use user experience.
2. To utilize tools and techniques for research and build user screens based on best practices.
3. To collect and document business, user and information specification.
4. To implement user screens and package information with ease of navigations.

Course Content:

UNIT I

UX Introduction: User Interaction with the products, Applications and services, Cognitive Model/Mental Model; Necessity of User Experience Design; Definition of User Experience (UX) Design.

UNIT II

Elements of UX Design: Core elements of User Experience, Working of elements, UX Design Process: Defining the UX Design Process and Methodology.

UNIT III

UX Design Process: Research and define: importance of research, Research methods and tools, Understanding the User needs and goals, Understanding the business goals, Deliverables of the research and define phase-Insight on User goals and business goals, Hands-on assignments and Quiz.

UNIT IV

UX Design Process: IDEATE/DESIGN - Visual design principles, Information design and data, Visualization: Interaction design, Information architecture, Wire-framing and story-boarding, UI elements and widgets, Screen design and layouts, Hands-on assignments and quiz.

UNIT V

UX Design Process: PROTOTYPE and TEST: Necessity of testing your design, Usability testing, Types of usability testing, Usability testing process, Plan for the usability tests, Prototype your design to test, Introduction of prototyping tools, Conduction and preparation of usability test results.

UNIT VI

UX Design Process: iterate/improve: Understanding the Usability test findings, Applying the Usability test feedback in improving the design. UX Design Process: Communication with implementation team UX Deliverables to be given to implementation team.

Text Books:

1. Jesse James Garrett, ***"The Elements of User Experience: User-Centered Design for the Web and Beyond"***, New Riders Publishing, 2nd Edition, 2002.
2. Steve Krug, ***"Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability"***, 3rd Edition, 2014.
3. Thomas Tullis, Willaim Albert, ***"Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics"***, Morgan Kaufman, 1st Edition, 2008.

Reference Books:

1. Jeff Gothelf, Josh Seiden, ***"Lean UX: Applying Lean Principles to Improve User Experience"***, O'Reilly, 1st Edition, 2013.
2. Kevin Mullet, Darrell Sano, ***"Designing Visual Interfaces: Communication Oriented Techniques"***, Soft Press, 1995.
3. Wilbert O. Galitz, ***"The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques"***, Wiley, 2002.

Course Title:	**Infrastructure Auditing & Implementation**	**Semester**	**VIII**
Course Code	**BTITSE803B**	**Course Type**	**Elective**
Pre-requisite	**IT Service Management**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To know the goals and objectives of IT audit and its role in internal control system.
2. To learn the techniques of audit planning and audit performance, gathering of audit related information and audit evidence.
3. To understand how to audit and evaluate effectiveness of the IT internal controls system.
4. To learn the fundamentals of information risk management and audit of information security.

Course Outcomes:

After learning the course the students should be able:

1. To describe the need for information security audit.
2. To define the requirements of IT risks, security and policies required for organizations.
3. To explain the mandatory items that need to be checked.

UNIT I

Fundamentals of infrastructure audit: meaning and definition, Overview, Choice of correct methods, Need, Scope and objectives.

UNIT II

Introduction to risk assessment: Entity area, strategies and policies in operation, support, External Drivers, User Interaction, Consequences-Importance of demonstrating control over network and security staffs, Risk of operator access controls over device and server settings.

UNIT III

Checklist for IT audit: Alignment with business strategy, Long term IT strategy, Short range IT plans, Information system security policy, Implementation of security policy, Information system audit guidelines, Acquisition and implementation of packaged software.

UNIT IV

Requirement identification and analysis Configuration audits: Need for an audit trail, A real-time live-network change review, Automatically verify compliance with both external best practices and internal standards.

UNIT V

Vendor selection criteria and process: Tracking the vendor selection criteria, Contracting- The issues of site licenses, Usage of open sources software, Annual maintenance contracts.

UNIT VI

Implementation: Importance of regulations and standards such as Sarbanes-Oxley, ISO 17799 and Visa's Cardholder Information Security Program (CISP), On-demand historical reports, Governance and

Cobit as a model for IT compliance. Benefits of infrastructure audit, Strong change management process.

Text Books:

1. Richard E. Cascarino, ***“Auditor's Guide to Information Systems Auditing”***, Wiley, 2007.
2. Chris Jackson, ***“Network Security Auditing”***, Cisco Press, 2010.

References:

1. www.netwrix.com
2. www.rbi.org

Course Title:	**Cyber Law and IPR**	**Semester**	**VIII**
Course Code	**BTITSE803C**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management & Quality Control**	**Credits**	**3**

Course Objectives:

1. To understand cyber laws and its applicability in India.
2. To learn the basic concepts of technology and law, digital contracts, rights of netizens and E-governance. To study cyber space and the cyber laws and regulating them through relevant Acts.
3. To learn the comparative study of national and international laws keeping in view international scenario in a no-barrier world.
4. To be aware about IPR in scientific and technical community for protecting their inventions.
5. To understand IPR from a non-lawyers perspective like senior managers, administrators etc.
6. To experience practices and procedures in various government offices administering IPR Laws.

Course Outcomes:

After learning the course the students should be able:

1. To describe the cyber world and cyber law in general.
2. To explain about the various facets of cyber crimes.
3. To explain the problems arising out of online transactions and provoke them to find solutions.
4. To clarify the Intellectual Property issues in the cyber space and the growth and development of the law in this regard.
5. To educate about the regulation of cyber space at national and international level.

Course Content

UNIT I

Introduction to Cyber crimes: Definition, Cybercrime and information security, Classes of cybercrime and categories, Cyber offences, Cybercrimes with mobile and wireless devices.

UNIT II

Jurisdiction in the cyber world across the world: Cybercrime law in Asia, Cybercrime and federal laws, Legal principles on jurisdiction and jurisdictional disputes w.r.t. the internet in United States of America, Cybercrime legislation in African region, Foreign judgments in India.

UNIT III

Indian IT act: Information Technology Act, 2000(Complete including digital signature, certifying authorities and E-governance), Positive aspects, Weak areas, Amendments to the Information Technology Act, 2008. Challenges to Indian law and cyber crime scenario in India. Protection of cyber consumers in India.

UNIT IV

Emerging Electronic System: E – commerce; E – governance; Concept of Electronic Signature; Credit Cards; Secure Electronic Transactions.

UNIT V

Intellectual property Rights: Intellectual Property law basics, Types of Intellectual Property, Agencies responsible for Intellectual Property registration. International organizations, Agencies and Treaties. Increasing importance of Intellectual Property Law.

UNIT VI

Copyright issues in Cyberspace: Relevant provisions under Copyright Act, 1957, regulating copyright issues in Cyberspace; Online Software Piracy – legal issues involved; Analysis of sufficiency of provisions of Copyright Act to deals with Online Software.

Piracy: Trademark issues in Cyberspace – Domain Name; Cyber squatting as a form of Domain Name dispute; Case law.

Case studies: Highlight the cybercrimes, cyber laws and Intellectual property Rights with the help of minimum 5 cases with reference to Indian IT act for better understanding.

Text Books:

1. Herman T. Tavani, ***"Ethics & Technology, Ethical Issues in an Age of Information and Communication Technology"***, John Wiley & Sons, 3rd Edition, 2011.
2. Syed Shakil Ahmed, Reheja Rajiv, ***"A Guide to Information Technology (Cyber Laws & E-commerce)"***, Capital Law House, 2001.
3. Kamath Nandan, ***"Law Relating to Computers Internet & E-commerce (A guide to Cyber Laws & the Information Technology Act, 2000 with Rules & Notification)"***, Universal Book Traders, 2nd Edition, Reprint: 2002.

Reference Books:

1. Ahmad Tabrez, "***Cyber law , E-commerce & M-Commerce"***, A. P. H. Publishing Corporation, 2003.
2. Bakshi P.M and Suri R.K, ***"Cyber and E-commerce Laws"***, Bharat Publishing House, 1st Edition, 2002.
3. Vishwanathan Suresh T, ***"The Indian Cyber Law"***, Bharat Law House, 2nd Edition, 2001.
4. Prasad T.V.R. Satya, ***"Law Relating to Information Technology (Cyber Laws)"***, Asia Law House , 1st Edition, 2001.
5. Reed Chris, ***"Computer Law"***, 3rd Edition, Universal Law Publishing Co. Pvt. Ltd., 1996 (First Indian Reprint 2000).
6. P. Narayanan, ***"Intellectual Property (Trade Marks & the Emerging concepts of Cyber property rights (HB)"***, 3rd Edition. (HB), 2002.

Course Title:	**Optical Networks**	**Semester**	**VIII**
Course Code	**BTITSE803D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors.
3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes.
4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
5. To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM to acquire knowledge about fault and congestion management.

Course Outcomes:

The student will be able to:

1. Design a system, component or process as per needs and specification.
2. Gain knowledge on optical network architectures ranging from optical access networks to backbone optical transport networks.
3. Gain the knowledge on methodologies of optical network design optimization.
4. Explore techniques of optical network survivability.
5. Solve the Problems in the discipline of optical networks.

Course Content

UNIT I

Optical Layer: SONET/SDH: Multiplexing, CAT and LCAS, Sonnet/SDH Layers, SONET Frame Structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure, Optical Transport Network: Hierarchy, Frame Structure, Multiplexing, Generic framing procedure Ethernet: Frame structure, Switches, Ethernet Physical layer, Carrier transport IP: Routing and forwarding, Quality of service. Multiprotocol label switching: Labels and forwarding, Quality of service, Signaling and routing, Carrier transport, Resilient packet ring: Quality of service, Node structure, Fairness storage area networks: Fiber channel.

UNIT II

WDM Network Elements: Optical line terminals, Optical line amplifiers, Optical Add/Drop Multiplexers: OADM Architectures, Reconfigurable OADMs, Optical cross connects: All-Optical OXC configurations.

UNIT III

Control and Management: Network management functions: Management framework, Information model, Management protocols. Optical layer services and interfacing, Layers within the Optical layer, Multi vendor Interoperability.

UNIT IV

Performance and Fault Management: The Impact of transparency, BER measurement, Optical trace, Alarm management, Data Communication Network (DCN) and Signaling, Policing, Optical layer overhead, Client layers. Configuration management: Equipment management, Connection management, Adaptation management. Optical Safety: Open Fiber Control protocol.

UNIT V

Protection in SONET/SDH: Point-to-Point links, Self-healing rings, Unidirectional line-switched rings, Bidirectional line-switched rings, Ring Interconnection and dual homing. Protection in the client layer: Protection in Resilient Packet Rings, Protection in Ethernet, Protection in IP, Protection in MPLS, Why Optical Layer protection: Service classes based on protection. Optical Layer protection schemes: 1+1 OMS Protection, 1:1 OMS Protection, OMS-DPRing, OMS-SPRing, 1:N Transponder Protection, 1+1 OCh Dedicated Protection, OCh-SPRing, OCH-Mesh Protection, GMPLS Protection, Interworking between layers.

UNIT VI

WDM Network Design: Cost Trade-OFFS: A detailed ring network example LTD and RWA problems, Light path topology design, Routing and wavelength assignment, Wavelength conversion. Dimensioning, Wavelength- routing networks, Statistical dimensioning models: First-passage model, Blocking model, Maximum load dimensioning models: Offline light path requests, Online RWA in rings.

Text Book:

1. Rajeev Ramaswamy, Kumar N Sivarajan, "***Optical Networks***" , Elsevier Publication, 3rd Edition, 2009.

Reference Book:

1. Uyless Black," ***Optical Networks-Third generation transport system***" Pearson Publication, 2013.

Course Title:	**Web & Text Mining**	**Semester**	**VIII**
Course Code	**BTITSE803E**	**Course Type**	**Elective**
Pre-requisite	**Data Warehouse and Data Mining**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.
2. To learn the essential techniques of data and text mining.
3. To understand data mining standard predictive methods to unstructured text.
4. To discuss the standard techniques of preparation and handling methods to transform that can be mined.

Course Outcomes:

After learning the course the students should be able:

1. To examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
2. To explore DWH and OLAP and devise efficient and cost effective methods for maintaining DWHs.
3. To discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes.
4. To comprehend the roles that data mining plays in various fields and manipulate different data mining techniques.
5. To evaluate systematically supervised and unsupervised models and algorithms w.r.t. their accuracy.

Course Content

UNIT I

Introduction to Information Retrieval: Inverted indices and Boolean queries, Query optimization, The nature of unstructured and semi-structured text.

UNIT II

Text encoding: Tokenization, Stemming, Lmmatization, Stop words, Phrases, Further optimizing indices for query processing, Proximity and phrase queries, Positional indices.

UNIT III

Index compression: Lexicon compression and postings lists compression, Gap encoding, Amma codes, Zipf's Law. Blocking. Extreme compression, Query expansion: spelling correction and synonyms. Wild-card queries, Permuterm indices, N-gram indices. Edit distance, Soundex, Language detection. Index construction. Postings size estimation, Merge sort, Dynamic indexing, Positional indexes, N-gram indexes, Real-world issues.

UNIT IV

Parametric or fielded search: Document zones, The vector space retrieval model, Scoring documents, Vector space scoring, The cosine measure, Efficiency considerations, Nearest neighbor techniques, Reduced dimensionality approximations, Random projection. Results summaries: Static and dynamic, Evaluating search engines.

User happiness, Precision, Recall, F-measure, Creating test collections: kappa measure, interjudge agreement. Relevance, approximate vector retrieval.

UNIT V

Feedback: Relevance feedback, Pseudo relevance feedback, Query expansion, Automatic thesaurus generation, Sense-based retrieval, Experimental results of performance effectiveness.

Probabilistic models for text problems, Classical probabilistic IR, Language models, Introduction to text classification, Naive Bayes models, Spam filtering, Probabilistic language models for IR, Bayesian nets for IR.

UNIT VI

Introduction to the problem: Partitioning methods, K-means clustering, Mixture of Gaussians model, Clustering versus classification, Hierarchical agglomerative clustering, Clustering terms using documents, Labelling clusters, Evaluating clustering, Text-specific issues, Reduced dimensionality/spectral methods, Latent semantic indexing (LSI), Applications to clustering and to information retrieval.

Vector space classification using hyperplanes, centroids, k Nearest Neighbors, Support Vector machine classifiers, Kernel functions, Text classification, Exploiting text-specific features, Feature selection, Evaluation of classification, Micro- and macro averaging, Comparative results.

Text Books:

1. Michael Geatz and Richard Roiger, ***“Data Mining: A Tutorial Based Primer”***, Pearson Education.
2. Thomas W. Miller, ***“Data and Text Mining: A Business Applications Approach”***, Pearson Education.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, ***“Introduction to Data Mining”***, Pearson Education.

Reference Books:

1. R. Baeza-Yates and B. Ribeiro-Neto, ***“Modern Information Retrieval”***, Pearson Education, 1999.
2. D.A. Grossman, O. Frieder, ***“Information Retrieval: Algorithms and Heuristics”***, Springer, 2004.
3. W. Frakes and R. Baeza-Yates, ***“Information Retrieval: Data Structures and Algorithms”***, 1st Edition, Pearson Education.

Course Title:	**Multimedia Applications**	**Semester**	**VIII**
Course Code	**BTITSE804A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**Software and Application Development**	**Credits**	**3**

Course Objectives:

1. To understand the overview of basic topics in multimedia.
2. To learn the software technologies of non-traditional interfaces.
3. To learn the development of interactive multimedia applications.

Course Outcomes:

After learning the course the students should be able:

1. To understand basic concepts related to MM including data standards, algorithms and softwares.
2. To experience development of multimedia software by utilizing existing libraries and descriptions of algorithms.
3. To demonstrate cutting-edge multimedia topics through independent study and presentations in class.

Course Content:

UNIT I

Introduction: Components of Multimedia, Multimedia and Hypermedia multimedia building blocks, Communication and information transfer model, Multimedia information systems, Application purposes of multimedia, Electronics performance support systems. Interaction Technologies and devices: Human Computer Interface, Input/output technologies, Combined I/O device, Storage technologies, Processing technologies.

UNIT II

Multimedia Authoring and data representation: Multimedia Authoring: Production, Presentation and auto authoring, Image data types, Image representation, Image acquisition, Picture display, Working with image.

UNIT III

Compression Technologies for multimedia: Need for data compression, Compression basics, Llossless and lossy compression, Image compression standards, Video compression standards, Basic audio compression standards.

UNIT IV

Text, Hypertext and Hypermedia, and Digital audio: Visual representation of text, Digital representation of characters, Formatting aspect text, Hypertext and hypermedia, Producing digital audio, Psychoacoustics, Processing sound, Representation of audio files, Digitization of sound, MIDI, Quantization and transmission of audio.

UNIT V

Designing multimedia: Development phases and teams, Analysis phase, Design phase, Development phase, Implementation phase, Evaluation and testing.

UNIT VI

Multimedia networks and communication: Multimedia in the Internet, Streaming stored audio/video, Streaming live audio/video, real-time interactive audio/video, Real-time interactive protocols: RTP, RTCP, Session Initialization protocol (SIP), H.323, SCTP. QoS: Data flow, Flow classes, Flow control, Integrated services, Differentiated services. Multimedia content management systems, Multimedia indexing, Multimedia retrieval.

Text Books:

1. Li. Z., Drew M., ***"Fundamentals of Multimedia"***, Pearson Education publishers, 2004.
2. Chow V. W. S., ***"Multimedia Technology and Applications"***, Springer.

Reference Books:

1. Banerji A., and Ghosh A.M., ***"Multimedia Technologies"***, McGraw Hill International, 2009.
2. Stamou G., and Kollias S., ***"Multimedia Contents and the Semantic Web"***, John Wiley & Sons., 2005.

Course Title:	**Ethical Hacking**	**Semester**	**VIII**
Course Code	**BTITSE804B**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Infrastructure & Security Management**	**Credits**	**3**

Course Objectives:

1. To understand how intruders escalate privileges.
2. To understand Intrusion Detection, Policy Creation, Social Engineering, Buffer Overflows and different types of attacks and their protection mechanisms.
3. To learn about ethical laws and tests.

Course Outcomes:

After successful completion of the course, the student will be able:

1. To understand the core concepts related to malware, hardware and software vulnerabilities and their causes.
2. To understand ethics behind hacking and vulnerability disclosure.
3. To appreciate the Cyber Laws and impact of hacking.
4. To exploit the vulnerabilities related to computer system and networks using state of the art tools and technologies.

Course Content:

UNIT I
Types of data stolen from the organizations, Elements of Information Security, Authenticity and non-repudiation, Security challenges, Effects of hacking, Types of hacker, Ethical hacker.
UNIT II
Hacktivism - role of security and penetration tester, Penetration testing methodology, Networking and computer attacks – Malicious software (Malware), Protection against malware, Intruder attacks on networks and computers, Addressing physical security, Key loggers and Back doors.
UNIT III
Web tools for foot printing, Conducting competitive intelligence, Google hacking, Scanning, Enumeration, Trojans and backdoors, Virus and worms, Proxy and packet filtering, Denial of service, Sniffer, Social Engineering: Shoulder surfing, Dumpster Diving, Piggybacking.
UNIT IV
Physical Security: Attacks and protection, Steganography: Methods, Attacks and measures, Cryptography : Methods and types of attacks, Wireless hacking, Windows hacking, Linux hacking.
UNIT V
Routers, Firewall and Honeypots, IDS and IPS, Web filtering, Vulnerability, Penetration testing, Session hijacking, Web server, SQL Injection, Cross site scripting, Exploit writing, Buffer overflow, Reverse engineering, Email hacking, Incident handling and response, Bluetooth hacking, Mobiles phone hacking.

UNIT VI

An introduction to the particular legal, Professional and ethical issues likely to face the domain of ethical hacking, Ethical responsibilities, Professional integrity and making appropriate use of the tools and techniques associated with ethical hacking, Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

Text Books:

1. Michael T. Simpson, Kent Backman, James E., ***"Corley, Hands-On Ethical Hacking and Network Defense"***, CENGAGE Learning, 2nd Edition, 2010.
2. Patrick Engebretson, ***"The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy"***, Syngress Basics Series – Elsevier, August 4, 2011.

Reference Books:

1. Steven DeFino, Barry Kaufman, Nick Valenteen, ***"Official Certified Ethical Hacker Review Guide"***, CENGAGE Learning, 2009-11-01.
2. Whitaker, Newman, ***"Penetration Testing and Network Defense"***, Cisco Press, Indianapolis, IN, 2006.

Course Title:	**CRM & SCM**	**Semester**	**VIII**
Course Code	**BTITSE804C**	**Course Type**	**Elective**
Pre-requisite	**Enterprise Resource Planning**	**L – T – P**	**3 – 0 – 0**
Stream	**Information Management and Quality Control**	**Credits**	**3**

Course Objectives:

1. To make students understand the how IT is an enabler for SCM and CRM.
2. To understand supply chain strategy framework and supply chain strategies.
3. To comprehend the functionalities of CRM in service sector.

Course Outcomes:

After learning the course the students should be able:

1. To understand the concept of logistics and supply chain management.
2. To appreciate the importance of logistics function in overall success of any business/industrial sector.
3. To understand the interrelationship between logistics and supply chain management.
4. To understand the importance and dynamics of supply chain management in any business/industrial sector.
5. To know the world class best practices being carried out in supply chain management.
6. To understand the procurement and outsourcing strategies.
7. To understand the impact of customer relationship management in effective supply chain management.
8. To know how to measure the performance of supply chain operations.

Course Content:

UNIT I

Introduction to CRM: What is CRM? Why we need CRM? Definition of CRM, Architecture of CRM, Technology considerations of CRM, Technology components of CRM, Customer life cycle, Customer lifetime value computation, Implications of globalization on customer relationship management.

UNIT II

Introduction to e-CRM: Definition of e-CRM, Its need, Features, Framework of e-CRM, Six e’s of e-CRM, CRM Vs e-CRM, Architecture of e-CRM, Implementing a technology based CRM solution.

UNIT III

Introduction to Supply Chain: What is SCM?, Why SCM? Generic types of supply chain, Major drivers of Supply chain, Supply Chain strategies, Value in Supply Chain- quality, Delivery, Flexibility, Core competencies in Supply Chain.

UNIT IV

Source management in Supply Chain: Insourcing, outsourcing, Partner selection, Sourcing strategies, Procurement strategies, Managing Inventory in Supply chain, Definition of inventories, Selective inventory control, Vendor managed inventory systems, Inventory performance measures- financial, operational & inventory turnover ratio (ITR), Transportation decisions in a Supply Chain – Transportation Strategy, Transportation selection, Mode of transportation, Transportation management system (TMS).

UNIT V

e- SCM: Information technology in Supply Chain: Typical IT solutions- EDI, Intranet, Extranet, Data Warehousing, E- commerce, E-procurement, Bar coding technology, GPS, RFID.

UNIT VI

Information Systems in Supply Chain Case Study – A live case of use of IT, Case Studies for SCM & CRM, For SCM: Mumbai Tiffinwala, For CRM: Sales Force.

Text Books:

1. Bowersox, Closs & Cooper , ***"Supply Chain & Logistic Management"***, Tata McGraw Hill 2nd Edition.
2. Paul Greenberg, ***"CRM at the speed of light"***, YMH 2nd Edition.

Reference Book:

1. Kristin Anderson and Carol Kerr, ***"Customer Relationship Management"***, Tata McGraw Hill.

Course Title:	**Wireless Networking**	**Semester**	**VIII**
Course Code	**BTITSE804D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**3 – 0 – 0**
Stream	**Networking**	**Credits**	**3**

Course Objectives:

1. To study the evolving wireless technologies and standards.
2. To understand the architectures of various access technologies such as 3G, 4G, WiFi etc.
3. To understand various protocols and services provided by next generation netwoks.

Course Outcomes:

After learning the course the students should be able:

1. To keep himself updated on latest wireless technologies and trends in the communication field.
2. To understand the transmission of voice and data through various networks..

Course Content:

UNIT I

Introduction, Technology and service trends of emerging Wireless technologies, The amazing growth of Mobile Communications, A little history, Mobile Communications fundamentals, Mobile data, WiFi, Bluetooth, Cable systems, Wireless migration options, Harmonization process.

UNIT II

WiFi (802.11), 802.11 Standards, WiFi protocols, Frequency allocation, Modulation and coding schemes, Network architecture, Typical WiFi configurations, Security, 802.11 Services, Hot spots, Virtual Private Networks (VPNs), Mobile VPN, VPN types, WiFi Integration with 3G/4G, Benefits of convergence of WiFi and Wireless Mobile.

UNIT III

Introduction, Universal mobile telecommunications service (UMTS), UMTS services, The UMTS air interface, Overview of the 3GPP release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5, All-IP Network Architecture, Overview CDMA2000, TD-CDMA, TD-SCDMA, Commonality among WCDMA, CDMA2000, TD-CDMA, and TD-SCDMA.

UNIT IV

LTE Ecosystem, Standards, Radio spectrum, LTE architecture, User Equipment (UE), Enhanced Node B (eNodeB), Core network (EPC), Radio channel components, TD-LTE, Multiple Input Multiple Output, LTE scheduler, Carrier aggregation, Cell search, Cell reselection, Attach and default bearer activation, Handover (X2, S1, Inter-MME), Self-Organizing Networks (SONs), Relay cells, Heterogeneous Network (HetNET), Remote radio heads (RRH), VoLTE, LTE advanced.

UNIT V

Introduction, Standards, Generic WiMAX Architecture, Core network, Radio network, WiMAX Spectrum, Modulation, Channel structure, Mixed mode, Interference Mitigation techniques, Frequency planning, Features and applications, Security, QoS, Profiles, Origination, Handover, Femto and SON.

UNIT VI

Why VoIP?, The Basics of IP transport, VoIP challenges, H.323, The Session Initiation Protocol (SIP), Distributed architecture and media gateway control, VoIP and SS7, VoIP Quality of Service.

Text Books:

1. Clint Smith, P.E., Daniel Collins, ***“Wireless Networks: Design and Integration for LTE, EVDO, HSPA, and WiMAX”***, McGraw Hill 3rd Edition,
2. Eldad Perahia, Robert Stacey, ***“Next Generation Wireless LANs”***, Cambridge University Press, 2nd Edition.

Reference Books:

1. Yi-Bang Lin, Imrich Chlamtac, ***“Wireless and Mobile Network Architecture”***, Wiley India Edition.
2. Dipankar Ray chaudhary, Maria Gerla, ***“Emerging Wireless Technologies and the Future Mobile Internet”***, Cambridge University Press.

Course Title:	**Machine Learning**	**Semester VIII**	
Course Code	**BTITSE804E**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics III**	**L – T – P**	**3 – 0 – 0**
Stream	**Data Science**	**Credits**	**3**

Course Objectives:

1. To understand the basic concepts and methods of machine learning.
2. To make use of some elementary machine learning techniques in the design of computer systems.
3. To develop a broad perspective about the applicability of ML algorithms in different fields.
4. To understand the major machine learning algorithms, the problem settings and assumptions that underlies them.
5. To possess insights, concerning the relative strengths and weaknesses of various common machine learning methods.

Course Outcomes:

After learning the course the student will be able:

1. To demonstrate knowledge of the machine learning literature.
2. To describe how and why machine learning methods work.
3. To demonstrate results of parameter selection.
4. To explain relative strengths and weaknesses of different machine learning methods.
5. To select and apply appropriate machine learning methods to a selected problem.
6. To implement machine learning algorithms on real datasets.
7. To suggest ways to improve results.

Course Content:

UNIT-I

Introduction: Well-posed learning problems, Designing a Learning System, Perspectives and Issues in Machine learning, Concept Learning and General-to-specific Ordering: A concept learning task, Concept learning as Search, Finding a maximally specific hypothesis, Version Spaces and Candidate elimination algorithm, Inductive Bias.

UNIT-II

Decision Tree Learning: Decision tree learning algorithm, Hypothesis space search in decision tree Evaluating Hypothesis: Estimating Hypothesis accuracy, Basics of sampling theory, Deriving confidence intervals, Hypothesis testing, comparing learning algorithms.

UNIT-III

Bayesian Learning: Bayes theorem and concept learning, Maximum likelihood and least square error hypotheses, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, Computational Learning Theory: Probably learning an approximately correct hypothesis, PAC learnability, The VC dimension, the mistake bound model for learning.

UNIT-IV

Linear Models for Regression: Linear basis function models, The Bias-Variance decomposition, Bayesian Linear Regression, Bayesian Model comparison

Kernel Methods: Constructing kernels, Radial basis function networks, Gaussian Processes

UNIT-V

Approximate Inferencing: Variational inference, Variational mixture of Gaussians, Variational linear regression, Variational logistic regression, Hidden Markov Models: Learning algorithms for HMM, the Viterbi algorithm, Linear Dynamical Systems.

UNIT-VI

Reinforcement Learning: The learning task, Q learning, Non-deterministic rewards and action, Temporal difference learning, Generalizing from examples.

Text Books:

1. Mitchell, Tom. M., *"Machine Learning"*, McGraw-Hill Education, 1st Edition, May 2013.
2. Segaran, Toby. ***"Programming Collective Intelligence- Building Smart Web 2.0 Applications"***, O'Reilly Media, August 2007.

Reference Books:

1. Miroslav, Kubat. ***"An Introduction to Machine Learning"***, Springer Publishing.
2. Bishop, C. M., ***"Pattern Recognition and Machine Learning"***, Springer Publishing.
3. Conway, Drew and White, John Myles, ***"Machine Learning for Hackers"***, O'Reilly Media, February 2012.

Course Title:	**Internet of Things Lab**	**Semester VIII**	
Course Code	**BTITDEL805A**	**Course Type**	**Elective**
Pre-requisite	**Microprocessors and Microcontrollers Lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objective:

1. To implement M2M programs using ARM/Raspberry Pi boards.
2. To interface real-world devices with Internet and display data and information collected.

Lab Experiments List:

1. Write program for creating different LED patterns and use ARM/Raspberry Pi boards, on-board LEDs for checking output.
2. Write program for interfacing LEDs and push to on switch with ARM/Raspberry Pi board at different GPIO pins.
3. Write program for interfacing 16x2 LCD with ARM/Raspberry Pi board at different GPIO pins.
4. Write program to read the onboard temperature and display on cloud.

Course Title:	**E-commerce Systems Lab**	**Semester VIII**	
Course Code	**BTITDEL805B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Web Technologies**	**L – T – P**	**0 – 0 – 2**
Stream	**Departmental**	**Credit**	**1**

Lab Experiments Objective:

1. To design an E-commerce website.
2. To develop the various modules for a B2C E-commerce business.
3. To program and implement various web pages and workflows to deploy a B2C ecommerce business.
4. To develop the various web forms and page panels for an ecommerce.

List of Lab Experiments:

1. Students can choose any online retail business on the B2C model of e-commerce business.
2. Creating the Website Layout for E-Commerce.
3. Inserting & Displaying the Products & Categories.
4. Creating the Shopping Cart.
5. Creating the User Registration & Login Systems.
6. Creating the Checkout System.
7. Creating the Payment Integration System.
8. Creating the Admin Panel for E-commerce.
9. Uploading the E-Commerce to Online Server.

Course Title:	**Mobile Computing - Lab**	**Semester VIII**	
Course Code	**BTITSEL806A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java**	**L – T – P**	**0 – 0 – 2**
Stream	**Software and Application Development**	**Credit**	**1**

Lab Experiments Objectives:

1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.

List of Lab Experiments:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock.

Course Title:	**Cryptography Lab**	**Semester VIII**	
Course Code	**BTITSEL806B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. Understand how to work with various mobile application development frameworks.
3. Learn the basic and important design concepts and issues of development of mobile applications.
4. Understand the capabilities and limitations of mobile devices.

List of Lab Experiments:

1. Encryption using binary/byte addition.
2. Encryption using binary Exclusive-OR (XOR).
3. Triple DES with CBC mode and Weak DES keys.
4. RSA Encryption and Factorization Attacks.
5. Attack on RSA encryption with short RSA modulus
6. Hash generation and sensitivity of hash functions to plaintext modifications.
7. Digital Signature Visualization.
8. RSA Signature.
9. Study of Attack on Digital Signature/Hash Collision.

Course Title:	**Information Retrieval- Lab**	**Semester VIII**	
Course Code	**BTITSEL806C**	**Course Type**	**Elective**
Pre-requisite	**Design and Analysis of Algorithms lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To implement various information retrieval (IR) algorithms across data and web successfully.
2. To compare results and discuss the merits and demerits of various algorithms.

Lab Experiments List:

1. Representation of a Text Document in Vector Space Model and Computing Similarity between two documents.
2. Pre-processing of a Text Document: stop word removal and stemming.
3. Construction of an Inverted Index for a given document collection comprising of at least 50 documents with a total vocabulary size of at least 1000 words.
4. Classification of a set of Text Documents into known classes (You may use any of the Classification algorithms like Naive Bayes, Max Entropy, Rochio’s, Support Vector Machine). Standard Datasets will have to be used to show the results.
5. Text Document Clustering using K-means. Demonstrate with a standard dataset and compute performance measures- Purity, Precision, Recall and F-measure.
6. Crawling/ Searching the Web to collect news stories on a specific topic (based on user input). The program should have an option to limit the crawling to certain selected websites only.
7. To parse XML text, generate Web graph and compute topic specific page rank.
8. Matrix Decomposition and LSI for a standard dataset.
9. Mining Twitter to identify tweets for a specific period (and/or from a geographical location) and identify trends and named entities.
10. Implementation of PageRank on Scholarly Citation Network.

Course Title:	**Network Security - Lab**	**Semester VIII**	
Course Code	**BTITSEL806D**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / C++**	**L – T – P**	**0 – 0 – 2**
Stream	**Networks**	**Credit**	**1**

Lab Experiments Objectives:

1. To highlight the issues with computer and network security by giving the hands on knowledge of various things like monitoring and analyzing network traffic.
2. To install and configure different tools like Wireshark, SNORT, NMAP and Port Scanners etc.

Lab Experiments List:

1. Perform An Experiment To Grab A Banner With Telnet And Perform The Task Using Netcat Utility.
2. Perform An Experiment For Port Scanning With Nmap, Superscan Or Any Other Software.
3. Using Nmap.
4. Find Open Ports On A System.
5. Find The Machines Which Are Active.
6. Find The Version Of Remote Os On Other Systems.
7. Find The Version Of S/W Installed On Other System.
8. Perform An Experiment On Active And Passive Finger
9. Printing Using Xprobe2 and Nmap.
10. Perform an experiment to demonstrate how to sniff for Router Traffic by Using the Tool Wireshark.
11. Perform an experiment How To Use Dumpsec.
12. Perform a Wireless Audit Of An Access Point / Router And Decrypt WEP And WPA.
13. Perform an Experiment To Sniff Traffic Using Arp Poisoning.
14. Install Jcrypt Tool (Or Any Other Equivalent) And Demonstrate Asymmetric, Symmetric Cryptography Algorithm, Hash And Digital/PKI Signatures.
15. Demonstrate Intrusion Detection System (Ids) Using Any Tool e.g. Snort Or Any Other S/W.
16. Install Rootkits And Study Variety Of Options.
17. Generating Password Hashes With Openssl.
18. Setup A Honey Pot And Monitor The Honeypot On Network.

Course Title:	**Big Data Analytics - Lab**	**Semester VIII**	
Course Code	**BTITSEL806E**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / C++ / Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objective:

1. To learn the concepts of Big data processing techniques by writing programs in Hadoop and MapReduce algorithms.

Lab Experiments List:

1. Study of Hadoop ecosystem.
2. Two programming exercises on Hadoop.
3. Two programming exercises in No SQL.
4. Implementing simple algorithms in MapReduce: Matrix multiplication, Aggregates, joins, sorting, searching.
5. Implementing any one frequent item set algorithm using MapReduce.
6. Implementing any one clustering algorithm using MapReduce.
7. Implementing any one data streaming algorithm using MapReduce.
8. Mini Project: one real life large data application to be implemented (use standard datasets available on the web).

Course Title:	**Multimedia Applications-Lab**	**Semester VIII**	
Course Code	**BTITSEL807A**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java / C / Python**	**L – T – P**	**0 – 0 – 2**
Stream	**Software and Application Development**	**Credit**	**1**

Lab Experiments Objectives:

1. To write programs to edit and modify multimedia files into different formats.
2. To write programs to service multimedia information on demand through streaming.
3. To transfer multimedia data from one system to other.

Lab Experiments List:

1. Assignment on: Image editing using Photoshop (or other image editing software).
2. Audio editing using Sound Forge or Audacity (or other sound editing software).
3. Animation using Flash Video editing using Premier or Adobe.
4. Write a program to convert audio files from one format to other.
5. Write a program to convert video files from one format to other.
6. Write a program to embed multimedia files on a webpage and stream them.
7. Write programs to transfer multimedia files from one device to another.

Course Title:	**Ethical Hacking- Lab**	**Semester VIII**	
Course Code	**BTITSEL807B**	**Course Type**	**Elective**
Pre-requisite	**Operating Systems lab**	**L – T – P**	**0 – 0 – 2**
Stream	**Infrastructure & Security Management**	**Credit**	**1**

Lab Experiments Objectives:

1. To understand the different kinds of hacker attacks to information and computer systems.
2. To simulate hacker attacks.
3. To change system parameters to prevent hacker attacks.
4. To write programs to prevent attacks and make system more resilient.

Lab Experiments List:

1. Use any 2 of the following hacking tools to expose system vulnerability (Nmap, Nessus, John the Ripper, Cain & Abel, Netstumbler, SQLMap).
2. Conduct and experiment to crack a password of an Application using the Cain & Abel tool.
3. Simulate a Denial of Service attack.
4. Execute a network sniffing exercise using Wireshark.
5. Discover vulnerabilities in a web server.
6. Create a simple website and write programs protect it from hacks such as (SQL injection, DoS, Cross Site Scripting XSS, Cookie/Session Poisoning, Form Tampering, Code injection and Defacement).

Course Title:	**CRM & SCM – Lab**	**Semester VIII**	
Course Code	**BTITSEL807C**	**Course Type**	**Elective**
Pre-requisite	**Enterprise Resource Planning**	**L – T – P**	**0 – 0 – 2**
Stream	**Information Management & Quality Control**	**Credit**	**1**

Lab Experiments Objectives:

1. To understand CRM and SCM as candidates to understand ERP applications deployed in organization.
2. To demonstrate the workings of various sub functions of CRM and SCM as learned in theory.

Lab Experiments List:

Students can download any open source CRM and SCM systems available to conduct the lab assignments

1. Set up an organizations customers, sales, product/services, departments and markets in the CRM/SCM system
2. Enter data for orders, customers, products, orders, quotes, invoices, payments in the CRM/SCM
3. Generate various CRM reports and alert with all the data entered

Course Title:	**Wireless Networking – Lab**	**Semester VIII**	
Course Code	**BTITSEL807D**	**Course Type**	**Elective**
Pre-requisite	**Internetworking Protocols**	**L – T – P**	**0 – 0 – 2**
Stream	**Networking**	**Credit**	**1**

Lab Experiments Objectives:

1. To give the practical exposure on wireless networks.
2. To configure and understand real issues in maintaining wireless networks.
3. To understand administrator functions.

Lab Experiments List:

1. Wireless Component and Media Identification.
2. Install a WLAN Adapter Card.
3. Wireless Mathematics.
4. Topology Design with Cisco Network Designer (CND).
5. Configuring Basic AP Settings.
6. Resetting the Bridge.
7. Antenna Setup.
8. Wireless Attacks and Countermeasures.
9. WLAN Design.
10. Site Survey Active Mode.

Course Title:	**Machine Learning – Lab**	**Semester VIII**	
Course Code	**BTITSEL807E**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics**	**L – T – P**	**0 – 0 – 2**
Stream	**Data Science**	**Credit**	**1**

Lab Experiments Objective:

1. To implement various machine learning techniques to solve problems.

Lab Experiments List:

1. Learn the data preprocessing steps to start a machine learning method for a practical.
2. Solve a stated problem using the simple linear regression method.
3. Use the multiple linear regression method for a stated issue.
4. Implement a polynomial regression solution.
5. Use the support vector regression to implement a ML solution.
6. Solve a stated problem using the decision tree regression method.
7. Implement a random forest regression solution.
8. Implement a reinforcement learning program to demonstrate ML concepts.

Course Title:	**Project Phase - II**	**Semester VIII**	
Course Code	**BTITP808**	**Course Type**	**Mandatory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 12**
Stream	**Core**	**Credits**	**5**

This is continuous work to the project phase I. Every students will have to submit a completed report (3 copies)* of the project work. Report preparation guidelines should be followed as per given format. The students will prepare a power point presentation of the work. Panel of examiners comprising of guide, internal examiner, senior faculty, external examiner, etc. will assess the performance of the students considering their quality of work.

Phase II

1. Coding/Implementation.
2. Use cases.
3. Testing/Trouble shooting.
4. Data dictionary/ Documentation.
5. Finalization of project in all respect.

*(For guide, Personal copy, Departmental library.)

In a presentation, the students should focus to clarify problem definition and analysis of the problem.