JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
An Autonomous Institute, with NAAC "A" Grade
Department Of Electrical Engineering
"Igniting minds to illuminate the world"
2020-21 (Odd Sem)

Education to Eternity

VISION	MISSION
"To be the eminent department known for producing globally proficient electrical graduates possessing finest human values, to achieve sustainable socio-economic development"	1. To transform students into academically and technically sound electrically sound engineers. 2. To enhance teaching learning process by dedicated qualified professionals. 3. To promote research and development with current techniques through well developed educational environment.

Teaching Scheme

Branch code: EE

I Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	HU1T002	Introduction to Computer programming	2	0	0	20	20	60	100	2
2	BSC	MA1T001	Engineering Mathematics- I	3	1	0	20	20	60	100	4
3	BSC	EE1T005	Engineering Physics	3	1	0	20	20	60	100	4
4	ESC	EE1T006	Energy and Environment Engineering	3	0	0	20	20	60	100	3
5	HSMC	HU1L002	Introduction to Computer programming Lab	0	0	4	60	0	40	100	2
6	ESC	WS1L001	Workshop Practices	0	0	4	60	0	40	100	2
7	BSC	EE1L005	Engineering Physics Lab	0	0	2	60	0	40	100	1
8			Induction Programme	3 Weeks							
9	ESC	EE1T007	Basic Electrical and Electronics Engineering	2	0	0	10	15	25	50	Audit
				13	**2**	**10**					**18**

II Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	HU2T001	Communication Skills	2	0	0	60	0	40	100	2

2	BSC	MA2T001	Engineering Mathematics- II	3	1	0	20	20	60	100	4
3	BSC	EE2T002	Engineering Chemistry	3	1	0	20	20	60	100	4
4	ESC	EE2T003	Engineering Graphics	1	0	0	20	20	60	100	1
5	HSMC	HU2L001	Communication Skills Lab.	0	0	4	60	0	40	100	2
6	BSC	EE2L002	Engineering Chemistry Lab	0	0	2	60	0	40	100	1
7	ESC	EE2L003	Engineering Graphics Lab	0	0	4	60	0	40	100	2
8			Societal Internship/ Field Training	Credit to be given in III Sem.							
9	ESC	EE2T004	Basic Civil and Mechanical Engineering	2	0	0	10	15	25	50	Audit
				11	**2**	**10**					**16**
				23							

III Semester

Sr. No	Subject Category	Subject Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	TOTAL	
1	HSMC	EE3T001	Engineering Economics	2	0	0	20	20	60	100	2
2	BSC	EE3T002	Engineering Mathematics –III	3	1	0	20	20	60	100	4
3	ESC	EE3T003	Theory of electrical engineering	3	1	0	20	20	60	100	4
4	PCC-EE	EE3T004	Network Analysis and synthesis	3	0	0	20	20	60	100	3
5	PCC-EE	EE3T005	Electrical Machine I	2	1	0	20	20	60	100	3
6	PCC-EE	EE3T006	Measurement and Instrumentation	2	1	0	20	20	60	100	3
7	PCC-EE	EE3L004	Network Analysis and synthesis Lab	0	0	2	60	0	40	100	1
8	PCC-EE	EE3L005	Electrical Machine I Lab	0	0	2	60	0	40	100	1
9	PCC-EE	EE3L006	Measurement and Instrumentation Lab	0	0	2	60	0	40	100	1
10	PROJ-EE	EE3P001	Field trainning/ Internship/ industrial visit	0	0	0	0	0	50	50	1
11	MC	EE3T007	Innovation and entrepreneurship Development	2	0	0	10	15	25	50	Audit
				17	**4**	**6**	**310**	**135**	**555**	**1000**	
								Total Credits			**23**

IV Semester

Sr. No	Subject Category	Subject Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	**TOTAL**	
1	HSMC	EE4T001	Constitution of India	2	0	0	20	20	60	100	2
2	BSC	EE4T002	Numerical method and probability	2	1	0	20	20	60	100	3
3	ESC	EE4T003	Power Station Practice	4	0	0	20	20	60	100	4
4	PCC-EE	EE4T004	Electronic Devices and circuits	3	0	0	20	20	60	100	3
5	PCC-EE	EE4T005	Power System I	2	1	0	20	20	60	100	3
6	PCC-EE	EE4T006	Electrical Machine II	3	0	0	20	20	60	100	3
7	BSC	EE4L002	Numerical method and probability Lab	0	0	2	60	0	40	100	1

8	PCC-EE	EE4L005	Power System I Lab	0	0	2	60	0	40	100	1
9	PCC-EE	EE4L006	Electrical Machine II Lab	0	0	2	60	0	40	100	1
10	PROJ-EE	EE4P002	Field trainning/ Internship/ industrial visit	0	0	0	0	0	50	50	1
11	MC	EE4T007	Universal Human Values	2	0	0	10	15	25	50	Audit
				18	**2**	**6**	**310**	**135**	**555**	**1000**	
								Total Credits			**22**

Dr.S.R.Vaishnav
Chairman
Board of Studies, EE Dept

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

An Autonomous Institute, with NAAC "A" Grade

At: Khandala, Post- Valni, Kalmeshwar Road, Nagpur

Department Of Electrical Engineering

"Igniting minds to illuminate the world"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

B. Tech. Electrical Engineering Programme

VISION AND MISSION OF INSTITUTE

VISION
To be a centre of excellence imparting professional education satisfying societal and global needs.

MISSION
Transforming students into lifelong learners through quality teaching, training and exposure to concurrent technologies. Fostering conducive atmosphere for research and development through well-equipped laboratories and qualified personnel in collaboration with global organizations.

VISION AND MISSION OF THE DEPARTMENT

VISION
To be the eminent department known for producing globally proficient electrical graduates possessing finest human values, to achieve sustainable socio-economic development

MISSION
To transform students into academically and technically sound electrically sound engineers.
To enhance teaching learning process by dedicated qualified professionals.
To promote research and development with current techniques through well developed educational environment.

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEOs	ATTRIBUTES
PEO 1	To prepare the graduates for professional careers with strong fundamental knowledge in science, mathematics, English and Engineering sciences and capable to develop core competency in electrical engineering domain or enable to pursue higher education.
PEO 2	The graduates can comprehend, analyze, design and create novel ideas and provide solutions to electrical engineering problems that are technically sound, economically feasible and socially acceptable.
PEO 3	The graduates will be leaders with strong communication and interpersonal skills, capability to work efficiently in multidisciplinary teams, understanding of ethical and environmental concerns in engineering practices and deal with social and safety issues along with respect for intellectual property.

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PROGRAM OUTCOMES (PO's)

POs	ATTRIBUTES
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/ development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life -long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOS):

At the end of Electrical Engineering program the student will have following Program specific outcomes.

PSO1: Interpret, identify and analyze problems in electrical domain and demonstrate this knowledge to develop, control and assess electrical systems.

PSO2: Solve ethically and professionally various Electrical Engineering problems in societal and environmental context and communicate effectively.

PSO3: Apply modern software tools for design, simulation and analysis of electrical systems to engage in life-long learning and to successfully adapt in multi disciplinary environments

Recommendations for conducting one theory course of curriculum through online Teaching / Learning

1. Only Swayam / NPTEL platform is allowed.

2. One defined subject per semester in online mode and BOS should declare that one subject for online mode based on availability of NPTEL offering before commencement of the semester.

3. Student will be allowed to appear for NPTEL / Institute level / University Examination as applicable.

4. In order to ensure learning, NPTEL lectures to be telecast in the class by including it in regular time table if required.

5. 75% assignment submission is mandatory for these online classes also like regular lecture attendance.

6. One faculty to be allotted for this subject, who will discuss and solve student's doubts. Allot 3 hrs/week load to teacher who is allotted to work as facilitator of online course.

7. For Autonomy Students: For online mode the student should submit all assignment given by nptel then his/her score has weightage of 40% for CA & MSE. And if student clear the nptel final exam and producing certificate then 60% weghtage should be given as ESE, otherwise he/she has to appear for Makeup exam of Institute.

If student cannot enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II and End sem exams of the Institute.

8. For DBATU students: For online mode he has to appear for CA-I, CA-II, Mid sem exam of the institute and End sem exam of University.

If student can't enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II of the institute and End sem exams of the University.

10. If the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

This system will ensure real learning; avoid any problem arising due to cancellation of NPTEL exam as it happened in this semester. At least for first year and in the unpredictable situation of covid pandemic these provisions will avoid any last moment chaos.

Course Structure and Syllabus

For

B. Tech. Electrical Engineering Programme

Curriculum for Semester- I [First Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
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2	BSC	MA1T001	Engineering Mathematics- I	3	1	0	20	20	60	100	4
3	BSC	EE1T005	Engineering Physics	3	1	0	20	20	60	100	4
4	ESC	EE1T006	Energy and Environment Engineering	3	0	0	20	20	60	100	3
5	HSMC	HU1L002	Introduction to Computer programming Lab	0	0	4	60	0	40	100	2
6	ESC	WS1L001	Workshop Practices	0	0	4	60	0	40	100	2
7	BSC	EE1L005	Engineering Physics Lab	0	0	2	60	0	40	100	1
8			Induction Programme	3 Weeks							
9	ESC	EE1T007	Basic Electrical and Electronics Engineering	2	0	0	10	15	25	50	Audit
				13	**2**	**10**					**18**

HU1T002	Introduction to Computer Programming	4 Credit

COURSE OBJECTIVES:

1. To understand the importance of Programming
2. To understand the application of C Programming.
3. To investigate the key concepts of C Programming.
4. To enable students build a applications based on C programming

COURSE OUTCOME:

CO1: Define the algorithms, flowcharts, array, pointer, structure, function, and python.

CO2: Discuss and differentiate between variables, operators, statements, loops, array dimensions.

CO3: Demonstrate working programs using functions, loops, conditional statements, array, pointer, structure and files in C and python language.

CO4:Distinguish between different steps of programming and prioritize levels of programming.

CO5:Find errors and predict outcome in C and python programming.

CO6:Compose and develop any application using C and python programming.

Unit I: Basic of Programming Language (6 Hrs)

HLL, LLL, Language translator, Error checking, Debugging, Programming processes, Flowcharts, Algorithms along with asymptotic notation.

Unit II: Types, Operators and Expressions in C language (6 Hrs)

Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Unit III: Control Flow: (6 Hrs)

Statements and Blocks. If-else, else-if, switch, Loops: while and for, do-while break and continue go to and Labels. Initializing arrays, Initializing character arrays, multidimensional arrays, Introduction to pointers.

Unit IV: Functions and Pointers in Python (6 Hrs)

Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules.

Pointers in Python: Pointers to integers, characters, floats, arrays.

Unit V: **(6 Hrs)**

Structures in Python: Basics of structures, structures with functions, arrays of structures.

File handling in Python: Basics of file handling.

Text Books

1. Let Us C by Yashavant Kanetkar.
2. Let Us C Solutions by Yashavant Kanetkar
3. Data Structure through C by Yashavant Kanetkar.

Reference Books

1. C Programming: A Modern Approach (2nd Edition) - K. N. King (2008). A good book for learning C.
2. Programming in C (4th Edition) - Stephen Kochan (2014). A good general introduction and tutorial.
3. C Primer Plus (5th Edition) - Stephen Prata (2004)
4. A Book on C - Al Kelley/Ira Pohl (1998).
5. The C Book (Free Online) - Mike Banahan, Declan Brady, and Mark Doran (1991).

HU1L002	Introduction to Computer Programming Lab	2 Credit

List of Practical:-

1. A simple program to display a message “Hello World” on screen.
2. Write a Program to print addition, subtraction Multiplication and Division of a entered number.
3. Write a Program to LCM of the entered number..
4. Write a program to find GCD of the entered number.
5. Write a program to find the greatest among three number.
6. Write a any menu driven program using if…else statement.
7. Write a any menu driven program using Switch case statement.
8. Write a program to find count of even no ,count of odd number , sum of even no and sum of odd number between 1 to 50.
9. Write a Program to generate prime number up to inputted number.
10. Write a program to check entered no is Armstrong no or not.
11. Write a program to find transpose of a matrix.
12. Write a Program to find multiplication of a two matrix elements.
13. Write a Program to find length of a string.(with and without using a library function)
14. Write a Program to find addition of two numbers using pointer.
15. Open ended Program. (How to execute C program on Linuxoperating system)
16. Write a Python program to print “Hello World”.
17. Write a Python program to display the current date and time.
18. Write a Python program which accepts the radius of a circle from the user and compute the area.
19. Write a Python program to find reverse of the entered number.
20. Write a Python program to get the Python version you are using

MA1T001	Engineering Mathematics-1	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyse a problem

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe rank, Bernoulli's theorem, Taylor's and Maclaurin's theorems for functions of two variables, , Euler's Theorem for functions containing two and three variables, Lagrange's theorem
2. Illustrate the examples of ordinary differential equation, partial differential equation, matrices.
3. Solve questions related to ordinary differential equation, partial differential equation, matrices and their applications.
4. Apply the knowledge of matrices, ordinary differential equation, partial differential equation, and their applications to real world problems.
5. Interpret the results of matrices, ordinary differential equation, partial differential equation and their applications.
6. Design a method or modal on matrices, ordinary differential equation, and partial differential equation.

Unit 1: Linear Algebra- Matrices [09 Hours]

Determinants & Matrix, Inverse of Matrix by adjoint method, Inverse by partitioning method, solution of system of linear equations, Rank of Matrix, Consistency of linear system of equation.

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications [09 Hours]

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations; Applications to orthogonal trajectories, mechanical systems and electrical systems.

Unit3: Linear Differential Equations with Constant Coefficients [09 Hours]

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and

Legendre's linear equations.

Unit 4:Partial Differentiation **[09 Hours]**

Partial derivatives of first and higher orders; Homogeneous functions , Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 5:Applications of Partial differentiation **[09 Hours]**

Jacobians - properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.

Text Books

1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.

2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.

3)A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware,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. RajnishVerma, 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.

ET1T005	Engineering Physics	4 Credit

COURSE OBJECTIVES:-

1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
2. To understand and study the Physics principles behind the developments of Engineering materials.

COURSE OUTCOMES

At the end of the course students will be able to

1. Define the concept of laser, optical fiber, Hall effect, electron Ballistics, Bethe's law, Brewster law, polarization, electromagnetic wave.
2. Illustrate different types of laser, and optical fiber, Band-theory, Effect of electric and magnetic fields, Electric and Magnetic focusing, Interference in thin films, Interference in Wedge shape thin film and electromagnetic wave.
3. Apply the concept of Three and four level laser, pumping, population inversion, Numerical aperture, Attenuation and dispersion, V-I characteristics of PN-junction diode, CRO, Interference in thin films and electromagnetic waves.
4. Analyze the different types of laser and optical fiber, semiconductors, Motion of charged particles in uniform electric and magnetic fields, polarization, relation between electric and magnetic fields of an electromagnetic wave.
5. Interpret different types of laser, and optical fiber, PN- junction diode, Bipolar Transistor action, Velocity filter, polarization, wave plate.
6. Develop models based on laser, optical fiber.

Unit-I: Laser & Optical Fibre **[08 Hrs]**

Interaction of radiation with matter, Population Inversion and Optical resonance cavity , Three and four level laser, Ruby laser, He-Ne laser, Semiconductor laser , Properties and engineering applications of laser.

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.. Applications: I) As a Sensors - i) Temperature Sensor ii)

Pollution / Smoke detector iii) Liquid level sensor. II) As a Detectors- i) PIN detector ii) Avalanche Detector.

Unit-II: Semiconductor Physics **[09Hrs]**

Band-theory based classification of solids into insulators, semiconductors and conductors, Fermi-Dirac distribution Function, Intrinsic semiconductors: Germanium and silicon; Fermi- energy, Typical energy band diagram of an intrinsic semi-conductor, Extrinsic semiconductors, Current conduction in semiconductors.

PN- junction diode; Unbiased, Forward biased& Reverse biased mode with Energy band diagram , Diode rectifier equation, Bipolar Transistor action, Hall effect, Hall coefficient & Hall Angle

Unit-III: Electron Ballistics **[08 Hrs]**

Lorentz force, Motion of changed particles in uniform electric and magnetic fields (parallel, perpendicular and at an acute angle), Effect of electric and magnetic fields on kinetic energy of charged particle, Crossed electric and magnetic field configurations, Velocity filter, Electrostatic and magneto static deflection.

Bethe's law, Electric and Magnetic focusing, Construction & working of Electrostatic lens, Devices: CRT, CRO, Block Diagram, Function & working of each block.

Unit-IV: Wave Optics **[08 Hrs]**

Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating, advanced applications of interference in thin film.

Polarization by reflection, Brewster's law, polarization by double refraction, Nicol prism, elliptically and circularly polarized light, Quarter wave plate and half wave plate.

Unit-V: Electromagnetic waves **[06 Hrs]**

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples.

Text Books:

1. Fundamentals of Physics: David Halliday, Robert Resnick and Jerle Walker, John-WileyIndia (8e, extended)
2. A text book of Engineering Physics: M. N. Avadhanulu, S. Chand & Co.
3. Nano the Essentials: Understanding Nanoscience and Nanotechnology, T.Praddep; TMH Publications.

4. Introduction to Nanotechnology:Pooly& Owens; Willey Publication
5. Text Book of Optics: Brijlal and Subramanyam (S. Chand and Company)
6. Laser: M. N. Avadhanulu, S. Chand & Co.

Reference Books:

1. LASERS: Theory and Applications: Thyagarajan K and Ghatak A.K.
2. Nanomaterials& Nanotechnologies and Design:M.F.Ashby, Paulo Ferreira and Daniel L.Schodek, Elsevier Publications.
3. University Physics: Young and Freedman (Pearson Education).
4. Optics: Jenkins and White (Tata Mcgraw Hill)

ET1L005	**Engineering Physics Lab**	**1 Credit**

List of Experiment

2. Newton's rings - Determination of radius of curvature of Plano convex lens / wavelength of light
3. Wedge Shaped film - Determination of thickness of thin wire
4. Laser - Determination of wavelength of He-Ne laser light
5. Magnetron Tube - Determination of 'e/m' of electron
6. Hall Effect - Determination of Hall Coefficient
7. Measurement of Band gap energy of Semiconductors
8. Study of I-V characteristics of P-N junction diode
9. Experiment on fibre optics
10. Input, output and current transfer characteristics of PNP/NPN transistor in CB and CE mode
11. Study of Cathode Ray Oscilloscope

ET1T006	Energy and Environment Engineering	3 Credit

COURSE OBJECTIVES

1. To understand the importance of Energy and Environment
2. To understand the application of energy saving tool in real life.
3. To investigate the key concepts of Energy and Environment

COURSE OUTCOMES

At the end of the course students will be able to

1) Describe different kind of pollution eg. Water pollution, air pollution, soil pollution etc.
2) Understand the importance of ecosystem for human beings..
3) Discover innovative method of power generation.
4) Correlate the cost of various method of power generation.
5) Judge the quality of air.

Unit 1 **[4 hrs]**

Air Pollution: Environment and Human health - Air pollution, Particulate emission: sources- effects- control measures -, air quality standards, and measurement of air pollution. Disposal of solid wastes, Bio-medical wastes effects- control measures

Unit 2 **[4 hrs]**

Water Pollution and Conservation: Water pollution- types of pollutants, effects- control measures, Water conservation and its methods, rainwater harvesting,methods of rainwater harvesting Surface runoff harvesting, Rooftop rainwater harvesting, Noise pollution ,effects and control measures, - Thermal pollution , Soil pollution ,Nuclear hazard.

Unit 3 **[4 hrs]**

Conventional Power Generation: Steam power station, Nuclear power plant , Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants.

Unit 4 **[4 hrs]**

Renewable Power Generation: Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Geothermal energy, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages.

Unit 5 **[4 hrs]**

Energy conservation: Scope for energy conservation and its benefits Energy conservation Principle , Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, refrigerator, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers, lighting techniques. Triffs and economic aspects in power generation.

Reference/Text Books:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System Engineering, DhanpatRai Publication.

2. Rai. G. D., Non-Conventional Energy Sources, Khanna Publishers, Delhi, 2006.

3. Rao S., Parulekar B.B., Energy Technology-Non conventional, Renewable and Conventional, Khanna Publishers, Delhi, 2005.

4. Glynn Henry J., Gary W. Heinke, Environmental Science and Engineering, Pearson Education, Inc, 2004.

5. J. M. Fowler, Energy and the Environment, McGraw-Hill, 2 nd Edition, 1984.

6. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

WS1L001	Workshop Practices	2 Credit

Instructions to the student:

Each student is required to maintain a „workshop journal‟ consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

Contents:

a**) Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.

b) Welding: Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

c) Fitting: Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation.

e) Machine shop: Lathe machine, types of lathes, major parts, cutting tool, turning operations (Demo), safety precautions

List of Practical:

1. Wood sizing exercises in planning, marking, sawing, chiselling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. Exercise in Arc welding (MMAW) to make a square butt joint.
4. A demo job on turning of a Mild Steel cylindrical job using centre lathe.

Electrical workshop:-

1) To wire for a stair case arrangement using a two-way switch.

2) To measure electrical quantities-voltage current, power & power factor in RLC circuit.

ET1T007	Basics of Electrical and Electronics Engineering	Audit

COURSE OBJECTIVES

1. To provide a basic information and use of electrical and electronics components.
2. To understand and study the materials used for the preparation of electrical and electronics components.
3. To provide basic knowledge of operation and functionality of electrical and electronics components.

COURSE OUTCOMES:

CO1: Define fundamentals of electrical system and choose measuring instruments for measurement of electrical quantities & describe the concept PN junction diode and its characteristics.

CO2: Classify wiring system and compare energy resources for electrical energy generation & elaborate the transistor configuration in CE, CB & CC mode.

CO3: Plan and organize the utilization of energy resources of electrical system & apply transistor characteristics to construct Amplifier devices.

CO4: Compare different sources of electrical system & distinguish various logic gates and simplify the Boolean's equations.

CO5: Justify the utilization of various electrical and electronics components into electrical and electronics circuitries.

CO6: Construct various circuits using Resistors, capacitors, inductors, PN junction diode, Zener diode, transformers, transistors and logic gates.

Unit 1: Elementary Electrical Concepts and Circuit Components (8 Hrs)

Fundamental of Electrical system: Potential difference, Ohm's law, Effect of temperature onresister, resistance temperature coefficient, **Electrical wiring system**: Study of different wire gauges and their applications in domestic and industry.

Resistors: colour code, type of resistors, material used for resistors, resistance wires, resistance standards, frequency errors in resistors.

Capacitors: Capacitance standards, variable capacitors, frequency errors in capacitors. Loss angle and power factor of capacitors.

Inductors: standards of inductance, mutual inductance, self-inductance, variable inductance, inductors for high and low frequency work, frequency errors in inductors.

Unit 2: Measurement of Electrical Quantities, Measuring Instruments & Energy Resources (7 Hrs)

Measurement of Voltage, Current, and Power (1ph and 3ph), Introduction to PMMC instrument, Ohmmeter, galvanometer, potentiometers, power factor meter and frequency meters. Study of circuit breakers & Actuators (MCB & Fuse, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays). **Energy Resources and Utilization**: Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Concept of Supply Demand, Power Factor, Need of unity factor.

Unit3: Introduction to diodes, diode circuit and Transducers (8 Hrs)

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDC VDC VRMS, IRMS, Efficiency and Ripple Factor for each configuration. Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode. Introduction to transducer, Classification of transducers, characteristics and choice of transducers.

Unit 4: Semiconductor Devices and Applications: (7 Hrs)

Transistors: Introduction, Classification, CE, CB, and CC configurations, α, β, concept of gain and bandwidth. Operation of **BJT** in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean Postulates, De-Morgan Theorems

Reference/Text Books:

1. V. N. Mittal and Arvind Mittal, Basic Electrical Engineering, McGraw-Hill Publication.
2. Brijesh Iyer and S. L. Nalbalwar, A Text book of Basic Electronics, Synergy Knowledgeware Mumbai, 2017. ISBN:978-93-8335-246-3
3. Vincent DelToro, Electrical engineering Fundamentals, PHI Publication, 2nd Edition, 2011.
4. A Textbook of Basic Electrical and Electronics Engineering, J.B.Gupta, Katson Publication.
5. A Textbook of Basic Electrical Engineering by S.B. Bodkhe, N.M.Deskar, Professional Publishing House Pvt. Ltd
6. D. P. Kothari and Nagrath, Theory and Problems in Electrical Engineering, PHI Publication, 2011.

7. B. L. Theraja, Basic Electronics, S. Chand Limited, 2007.
8. Millman Halkias, Integrated Electronics-Analog and Digital Circuits and Systems, McGraw-Hill Publication, 2000.
9. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
10. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
11. Printed Circuit Boards Design & Technology, Walter C. Bosshart, McGraw-Hill Publication.

Note: Students are advised to use internet resources whenever required

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	HU2T001	Communication Skills	2	0	0	60	0	40	100	2
2	BSC	MA2T001	Engineering Mathematics-II	3	1	0	20	20	60	100	4
3	BSC	EE2T002	Engineering Chemistry	3	1	0	20	20	60	100	4
4	ESC	EE2T003	Engineering Graphics	1	0	0	20	20	60	100	1
5	HSMC	HU2L001	Communication Skills Lab.	0	0	4	60	0	40	100	2
6	BSC	EE2L002	Engineering Chemistry Lab	0	0	2	60	0	40	100	1
7	ESC	EE2L003	Engineering Graphics Lab	0	0	4	60	0	40	100	2
8			Societal Internship/ Field Training	Credit to be given in III Sem.							
9	ESC	EE2T004	Basic Civil and Mechanical Engineering	2	0	0	10	15	25	50	Audit
				11	**2**	**10**					**16**
				23							

Curriculum for Semester- II [First Year]

HU2T001	Communication Skills	2 Credit

COURSE OBJECTIVES:

The main objective of the subject is to enhance the employability skills of engineering studentsas well as communication skills at work place.

The sub-objectives are:

1) To develop students' reading skills and pronunciation.
2) To develop technical communication skills through drafting, letter writing, and précis writing.
3) To develop literary skills through essay writing.
4) To develop public speaking skills of the students.
5) To expose the students to the ethics of English language by teaching grammar

COURSE OUTCOMES:

At the end of the course students will be able to

1) Better reading comprehension, pronunciation, and functional English grammar.
2) Write letters and resumes
3) Organize their thoughts for effective presentation and writing.
4) Learn skills to present themselves well in an interview, and handle a Group Discussion

Unit 1: Communication and Communication Processes (06 hrs)

Introduction to Communication, Types and functions of Communication, Barriers to Communication and overcoming them, Role of Communication Skills in Society

Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Intensive and Extensive, Strategies for Reading Comprehension.

Listening: Importance of Listening, Types of Listening, and Barriers to Listening.

Unit 2: Study of Sounds in English and Vocabulary Building (06 hrs)

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation ofDifferent Sounds in English.

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Use of prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations

Unit 3: English Grammar (06 hrs)

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation,Common Errors. Misplaced modifiers

Unit 4: Professional Verbal Communication (06 hrs)

Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

Unit 5: Developing Business Writing Skills, Styles and Practice (06 hrs)

Writing Emails, Report Writing: Format, Structure and Types, Letter Writing**:** Types, Parts, Layouts, Writing Job Application Letter and Resume.

Nature and Style of sensible Writing and Practice: Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion, Writing Practices: Comprehension, Précis Writing, Essay Writing

Text book:

Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill

Reference Books:

1) Sanjay Kumar, PushpLata, Communication Skills, Oxford University Press, 2016

2) Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017

3) Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010

4) Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.

5) Aswalthapa, K. Organisational Behaviour, Himalayan Publication, Mumbai (1991).

6) Atreya N and Guha, Effective Credit Management, MMC School of Management, Mumbai (1994).

7) Balan,K.R. and Rayudu C.S., Effective Communication, Beacon New Delhi (1996).

8) Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.

9) Bhasker, W. W. S &Prabhu, N. S.: English through Reading, Vols. 1 and 2. Macmillan, 1975.

10) Black, Sam. Practical Public Relations, E.L.B.S. London (1972).

11) Blass, Laurie, Kathy Block and Hannah Friesan. Creating Meaning. Oxford: OUP, 2007.

12) BoveeCourtland,L and Thrill, John V. Business Communication, Today McGraw Hill, New York, Taxman Publication (1989).

HU2L001	Communication Skills Lab	2 Credit

List of Practical Sessions (Any 10 PR sessions can be conducted):

1) Pronunciation, Intonation, Stress and Rhythm(02 hrs)
2) Introduction to Phonemic symbols (02 hrs)
3) Articulation of sounds in English with proper manner (02 hrs)
4) Practice and exercises on articulation of sounds (02 hrs)
5) Read Pronunciations/transcriptions from the dictionary (02 hrs)
6) Practice and exercises on pronunciations of words (02 hrs)
7) Introduce yourself (02 hrs)
8) Importance of Business Communication with the help of a case study.(02hrs)
9) Listening Skills/ Comprehension(02 hrs)
10) Common Everyday Situations: Conversations and Dialogues(02 hrs)
11) Communication at Workplace(02 hrs)
12) Rapid reading sessions (02 hrs)
13) Draft Email(02 hrs)
14) Resume Writing(02hrs)
15) Drafting Business Letter(02 hrs)
16) Preparing technical paper using IEEE format(02 hrs)
17) Extempore (02 hrs)
18) Elocution (02 hrs)
19) Group discussion (02 hrs)
20) Participating in a debate (02 hrs)
21) Presentation techniques (02 hrs)
22) Interview techniques , Job Interviews, Telephonic Interviews(02hrs)
23) Mock interviews and practice sessions(02 hrs)

MA2T001	Engineering Mathematics-II	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyse a problem

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus.
2. Illustrate the concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus by using examples.
3. Apply the knowledge of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
4. Analyse the problems and results of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
5. Evaluate the problems by using complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
6. Create the methods or model by using complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.

Unit 1: Complex Numbers **[09 Hours]**

Definition and geometrical representation; De-Moivre'stheorem (without proof); Roots of Complex numbers by using De-Moivre'stheorem; Circular functions of complex variable ,definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and Imaginary parts of circular and hyperbolic functions; Logarithm of Complex quantities.

Unit 2: Integral calculus & Multiple Integrals **[09 Hours]**

Beta, Gamma functions; tracing of the curves given in Cartesian, parametric & polar forms. Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral

Unit3: Fourier Series & Transform[09 Hours]

Fourier Series , Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equations.

Unit4: Vector Differential Calculus [09 Hours]

General rules of vector Differentiation; Scalar and vector fields: Gradient, divergence and curl; Solenoidal and irrotational vector fields; Vector identities

Unit5: Vector Integral Calculus [09 Hours]

Vector Integration: line integral, surface integral and volume integral; Green's lemma, Gauss' divergence theorem and Stokes' theorem (without proofs).

Text Books

1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.

2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.

3)A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, 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. RajnishVerma, 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., NewDelhi.

ET2T002	Engineering Chemistry	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Chemistry
2. To understand the application of Chemistry in engineering and in real life.
3. To investigate the key concepts of Chemistry knowledge
4. To enable students to analyse a Chemistry problem so that appropriate problem solving techniques may be applied

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe various properties of water, fuel, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, polymer and batteries
2. Illustrate the various types of water, Ostwald's theory of acid-base indicator, polymer, various batteries, and fuel cell.
3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various batteries and fuel cell.
4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime ,Soda process, acid base concept, fuel cell and batteries..
5. Develop a Modal on softening of water, standardization of acid and base by various instruments, polymers, fuel cell and batteries..
6. Organize water as per quality, and fuel, types of electrodes, polymers and fuel cell and batteries.

Unit1: Water Treatment **6 Hrs**

Introduction, hard and soft water, softening of water , Zeolite process, Ion exchange process, Hot Lime ,Soda process, water characteristics- Hardness, Domestic water treatment

Unit2: Fuels **6 Hrs**

Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel-Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum.

Unit3: Electrochemistry **8 Hrs**

Introduction-basic concepts, Transport number and its determination by Moving Boundary method, Debye-Hückel theory, Conductometric titrations, Ostwald's theory of acid-base indicator, Quinonoid theory, Electrodes , Glass electrode, Quinhydrone electrode.

Unit4: Advanced Polymeric Materials: **8 Hrs**

Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications

Unit5: Battery Technology: **6 Hrs**

Classification of batteries: Primary, Secondary- Electricity storage density, power density, energy efficiency, cycle life, shelf life. Rechargeable alkaline storage batteries, Ni-metal hydride,
Lithium ion batteries and H2-O2 Fuel cell.

Text Books:

1. A Text book of Engineering Chemistry, Dr. S. S. Dara, Dr. S. S. Umre,S. Chand and Company Ltd., Twelfth/ 2011
2. Selected Topics in Inorganic Chemistry, Dr. Wahid U. Malik, Dr. G. D. Tuli and Dr. R. D. Madan, S. Chand and Company Ltd., Seventh/2001

Reference Books:

Engineering Chemistry, P. C. Jain and Monika Jain, Dhanpatrai Publishing Company Ltd., 15^{th} Ed/ 2009

Principles of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan S. Pathania, Vishal Publishing Company, First/2002

Chemistry, John E McMurry and Robert C Fay, Pearson, First/2008

EL2L002	Engineering Chemistry Lab	1 Credit

List of Experiments: (Perform any 8, 10 Experiments)

1. Determination of Hardness of water sample by EDTA method.
2. Determination of flash point by Pensky Martin Apparatus
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH , metric Titration (any one type of Acid Base titration)
6. Conductometric Titration (any one type of Acid Base titration)
7. Surface tension: Determination of relative surface tension of liquid with respect to water using drop number method.
8. Viscosity:Determination of relative viscosity of liquid with respect to water using Ostwald's viscometer method.
9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with Na_2CO_3 solution.
10. To find out Morality, Normality and Strength of the given $KMnO_4$ solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.

Reference Books:

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara.

ET2T003	Engineering Graphics	1 Credit

COURSE OBJECTIVES

1. To understand the concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient
2. To understand theory of projection and simple machine parts in first and third angle of projection systems.
3. To understand the key concepts CAD software.
4. To enable students to analyze a 2-dimensional & 3-dimensional problem.

COURSE OUTCOMES:

1. Define various concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient.
2. Interpret drawings of simple machine component in first and third angle of projection systems
3. Apply theory of projections in projection of lines, projection of planes and projection of solid.
4. Classify solid geometry in different positions.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software

Unit I Introduction to Computer Aided Drawing [03 hrs]

Theory of CAD software, Demonstration knowledge, layout of the software, standard tool bar/menus and description of most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation of co-ordinate points, lines, axes, polyline, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, lettering. Line properties, 3D modeling& topology of engineering component.

Unit II Drawing standards & Orthographic Projections: [03 hrs]

Drawing standard SP: 46, type of lines, lettering, dimensioning. Basic geometrical construction, drawing of regular polygon, Theory of projection, introduction to orthographic projection, drawing of orthographic views of objects from their isometric views by using first angle method of projection.

Unit III Projections of Points & Projections of Straight Lines: [03 hrs]

Projection of point lying in four quadrants. Projections of lines parallel and perpendicular to one or both planes, projections of lines inclined to one or both reference planes.

Unit IV Projections of Planes & Projections of Solids: [03 hrs]

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Types of solids, Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes

Unit V Isometric Projections [03 hrs]

Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.
2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, McGraw Hill Education, 2017

Reference Books:

1. K. V. Nataraajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006.
2. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd, 2008.
3.Engineering Drawing, R. K. Dhawan, S. Chand Publication, 1998.
4. Engineering Graphics, A. R. Bapat, Allied Publishers, 2004.
5. Fundamentals of Engineering Drawing, Luzadder& Duff, Eastern Economy, 11th Edition.

ET2L003	Engineering Graphics Lab	2 Credit

COURSE OBJECTIVES:

The objective of the course is to enable students to

1. Provide basic foundation in CAD software.
2. Understand the fundamentals used to create and manipulate geometric models.
3. Get acquainted with the basic CAD software for to design geometric modeling.

COURSE OUTCOMES:

1. Define basic structure of CAD workstation, CAD commands, Memory types, input/output devices and display devices to become professionally efficient to operate CAD software.
2. Explain drawing of simple machine component in CAD software.
3. Acquire the knowledge of geometric modeling in CAD software.
4. Analyze the steps required in CAD software for 2-dimensional and 3-dimensional models.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software.

List of Practical:

1. Introduction of CAD software and to study and practice basic draw commands exists in the CAD software.
2. Lines, lettering and dimensioning. (Drafting work)
   Identify the different types of Lines in the given object, draw lettering and give the Required dimensions in the given object.
3. Geometric Construction. (Drafting work)
4. Orthographic projections first sheet. (Using CAD software)
5. Orthographic projections second sheet. (Using CAD software)
6. Projections of straight lines. (Drafting work)

7. Projections of planes & solids. (Drafting work)
8. Isometric Projections first sheet. (Using CAD software)
9. Isometric Projections second sheet. (Using CAD software)
10. Design of basic hardware components using CAD Software.
11. Design of advance hardware components using CAD Software.
12. Design of assembly drawing using CAD Software.
13. Design of assembly drawing with animation and rendering using CAD Software.

ET2T004	Basic Civil and Mechanical Engineering	Audit

COURSE OBJECTIVES

1. To understand the basic stream of Mechanical engineering and Civil Engineering.
2. To understand the concepts of product manufacturing, Energy engineering, design engineering, Automobile engineering, construction technique and civil surveying.
3. To have basic knowledge of Casting, Machining, Designing, Manufacturing, different materials for building construction and surveying.

COURSE OUTCOMES:

Students would be able to

1. Define basic stream of Mechanical & Civil Engineering.
2. Explain the concepts of product manufacturing, Energy engineering, design engineering, Automobile engineering, construction technique and civil surveying.
3. Apply Basic knowledge of Casting, Machining, Designing, Manufacturing & Civil Construction technique.
4. Analyzed the different mechanical system and properties of construction & surveying material.
5. Interpret the problem in mechanical system and civil structure.
6. Solve the problem in mechanical system and civil structure.

Part I Basic Civil Engineering

Unit 1: Introduction to civil engineering

Various branches introduction to civil engineer in various construction activities basic engineer properties and various materials: earth bricks timber, stone, sand Aggregate cement motor steel bituminous glass FRP composite material.

Unit 2: Building component and planning material

Foundation and superstructure function of foundation type of shallow and deep foundation suitability in different situation plinth wall lintels beam column slab roof staircase floor door window and study of building plans ventilation and basic plumbing and sanitation

Unit 3: Surveying

Principal of surveying element of distance angular measurement plotting of area base line and off set introduction of plane table survey introduction to levelling concept of bench mark reduce level and counting

Part II Basic Mechanical Engineering

Unit 1: Introduction to Mechanical Engineering, Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant, Automobiles: Basic definitions and objectives

Unit 2: Design Basics, Machine and Mechanisms, Factor of safety, Engineering Materials: types and applications, basics of fasteners, machining and machinability. Introduction to lathe machine, drilling machine, milling machine, basics of machining processes such as turning, drilling and milling. Introduction to casting

Text Books:

1. AnuragKandya, “Elements of Civil Engineering”, Charotar Publishing, Anand
2. M. S. Palani Gamy, “Basic Civil Engineering”, Tata Mc-Graw Hill Publication
3. G. K. Hiraskar, “Basic Civil Engineering”, DhanpatRai Publications
4. GopiSatheesh, “Basic Civil Engineering”, Pearson Education

Reference Books:

1. M. G. Shah, C. M. Kale, and S. Y. Patki, “Building Drawing”, Tata McGraw Hill
2. Sushil Kumar, “Building Construction”, Standard Publishers Distributors
3. Kanetkar T. P. and Kulkarni S. V., “Surveying and Levelling”, Vols. I, II and III, Vidyarthi
4. GruhPrakashan, Pune
5. B. C. Punmia, “Surveying”, Vol.- I, Vol.-II, Vol.-III, Laxmi Publications
6. P. K. Nag “Engineering Thermodynamics”, Tata McGraw Hill, New Delhi 3rd ed. 2005
7. A. Ghosh, A K Malik, “Theory of Mechanisms and Machines”, Affiliated East West Press Pvt. Ltd. New Delhi.

8. SeropeKalpakaji and Steven R Schimd “A manufacturing Engineering and Technology” Addison WsleyLaongman India 6th Edition 200
9. V. B. Bhandari, “Design of Machine Elements”, Tata McGraw Hill Publications, New Delhi.

Curriculum for Semester- III [Second Year]

Sr. No.	Subject Category	Subject Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	TOTAL	
1	HSMC	EE3T001	Engineering Economics	2	0	0	20	20	60	100	2
2	BSC	EE3T002	Engineering Mathematics –III	3	1	0	20	20	60	100	4
3	ESC	EE3T003	Theory of electrical engineering	3	1	0	20	20	60	100	4
4	PCC-EE	EE3T004	Network Analysis	3	0	0	20	20	60	100	3
5	PCC-EE	EE3T005	Electrical Machine I	2	1	0	20	20	60	100	3
6	PCC-EE	EE3T006	Measurement and Instrumentation	2	1	0	20	20	60	100	3
7	PCC-EE	EE3L004	Network Analysis Lab	0	0	2	60	0	40	100	1
8	PCC-EE	EE3L005	Electrical Machine I Lab	0	0	2	60	0	40	100	1
9	PCC-EE	EE3L006	Measurement and Instrumentation Lab	0	0	2	60	0	40	100	1
10	PROJ-EE	EE3P001	Field trainning/ Internship/ industrial visit	0	0	0	0	0	50	50	1
11	MC	EE3T007	Innovation and entrepreneurship Development	2	0	0	10	15	25	50	Audit
				17	**4**	**6**	**310**	**135**	**555**	**1000**	
								Total Credits			**23**

EE3T001	Engineering Economics	2 Credit

COURSE OBJECTIVE

1. To learn the basics of Economics.
2. Ability to take Economically Sound Decision.
3. Ability To understand the interaction of World Economy.
4. To be able to work in an Industrial atmosphere.

COURSE OUTCOME

1. Remember and define basics of the Economics
2. Understand Mechanism of Price Fixation
3. Identify Time value of Money.
4. Analyze and classify basic Factors of Production
5. Interpret Indian Economy and Globalization .
6. Plan To become Self Employed

COURSE CONTENTS:

UNIT 1: **[05 hrs]**

Introduction, Micro And Macro Economics .Economics and its relation with other subjects, Nature of Economic laws. Basic Economic problems, Basic Economic terms, Engineering and Economics

UNIT 2: **[05 hrs]**

Meaning of demand ,Factors affecting demand, Law of Elasticity ,Types of elasticity, Practical applications of Laws of Elasticity ,Demand Forecasting, Techniques of Demand forecasting. Law of supply, Role of demand and Supply in Price Fixation.

UNIT 3: **[04 hrs]**

Time value of Money ,Capital Budgeting ,Traditional and modern methods of Payback, IRR, ANR, Case studies

UNIT 4: [05 hrs]

Factors of Production, Concepts of cost, Break even Analysis, Law of variable Proportions ,Internal and External Economies of scale, Depreciation.

UNIT 5: [05 hrs]

ENTERPRISE Meaning and definition, factors required for growth of Enterprise, Institutions to support the growth of MSME's, Sources of finance for MSME's and scope for self Employment Opportunities.

UNIT 6: [04 hrs]

Features of Indian Economy, Fiscal and Monetary policy, LPG, Inflation, Banking,
World Economic bodies

Text Books:

1. Chopra P. N., Principle of Economics, Kalyani Publishers
2. Dewett K. K., Modern economic theory, S. Chand
3. H. L. Ahuja., Modern economic theory, S. Chand
4. Dutt Rudar & Sundhram K. P. M., Indian Economy
5. SMALL-SCALE INDUSTRIES AND ENTREPRENEURSHIP by Vasant DEASAI,

Reference Books:

1. Dewett K.K. Elemntary Economic Theory.
2. Entrepreneurial Development By S.S.Khanka.
3. Financial Management: Theory and Practice: Author: Prasanna Chandra, Mc Graw Hill India .

EE3T002	Engineering Mathematics –III	4 Credit

COURSE OBJECTIVES:

1. The basic concept of Laplace Transform , Fourier Transform, Function of Complex variable.
2. Ability to solve the problem on Laplace transform Fourier integral , Parseval's identity.
3. Apply the knowledge of the Laplace Transform ,Fourier Transform , Partial differential equation, function of complex variable to real life problem.

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to

1.Remember properties of Laplace transform , Convolution Theorem, Fourier integral theorem , Parseval‟s identity , Cauchy's integral theorem , Cauchy's residue theorem

2.Describe properties of Laplace transform , Convolution Theorem, Fourier integral theorem , Parseval‟s identity , Cauchy's integral theorem , Cauchy's residue theorem .

3.Illustrate the examples using Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables, Matrices.

4.Apply the knowledge of Laplace transform ,Z-transform, function of complex variable, Advance partial differential equation.

5.Analyze the question on Laplace transform, Fourier Transform, Partial differential equation , Function of Complex Variables

6.Create a modal using Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables, Matrices.

COURSE CONTENTS

UNIT 1 : Matrices **[07 hrs]**

Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester's theorem [without proof.]

UNIT 2: Laplace Transform **[07 hrs]**

Definition , conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit step function.

UNIT 3: Inverse Laplace Transform **[07 hrs]**

Introductory remarks ; Inverse transforms of some elementary functions ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of differential equations

UNIT 4: Z- Transform **[07 hrs]**

Defination, Convergence of Z-transform and Properties, Inverse Z-transform by Partial Fraction Method, Residue Method (Inversion Integral Method), Solutions of Difference Equations with Constant Coefficients by Z- transform.

UNIT 5: Advance Partial Differential equations **[07 hrs]**

Introduction Partial differential equation, method of separation of variables, Application of partial differential equations .(Heat equation ,wave equation , Laplace Equation)

UNIT 6: Functions of Complex Variables **[07 hrs]**

Analytic functions; Conjugate functions; Cauchy- Riemann equations in Cartesian and polar forms; Harmonic functions in Cartesian form, Cauchy's integral theorem; Bilinear transform Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorem 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.

EET3003	Theory of Electrical Engineering	4 Credit

COURSE OBJECTIVE

Students will learn:

1 Remember fundamental principles of electrical and magnetic circuit

2 Understand simplified methods such as series parallel reductions, voltage and current dividers, and the mesh - node method.

3 To apply laws of electric and magnetic system.

4 To analyze electrical circuit, magnetic circuit and illumination system

5 To utilize various lighting system and electric system and evaluation of same.

6 Design parameters of electrical circuit, magnetic circuit and illumination system.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Remember the basic laws of electric and magnetic circuits also Define various A.C. and D.C Quantities
2. Understand and interpret the sinusoidal electrical quantities mathematically as well as graphically in the form of waveforms/phasors and illustrate the 1-phase/3-phase AC circuits.
3. Apply knowledge to calculate the power loss, voltage drop of electric and magnetic circuit also identify illumination required and the knowledge related with its need.
4. Analyze various electric, magnetic circuit and distinguish between properties.
5. Evaluate lighting system, recommend various lighting as per requirement also able to Explain A.C. fundamentals.
6. Design lighting system and also able to give solutions on single phase, poly phase and magnetic circuit unknown quantities.

Course Contents:

Unit 1: D. C. Circuits (Only Independent sources) [08 hrs]

Ohm's law, resistances in series and parallel, current and voltage division rules, Kirchhoff’s law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Super node and super Mesh excluded). Source transformation. Star delta transformation. Superposition theorem.

Unit 2: Electromagnetism **[10 hrs]**

Magnetic effect of electrical current cross and dot convention, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, concepts of solenoid and torrid. Concepts of m.m.f, flux, flux density, reluctance, permeability and field strength, their units and relationship. Simple series and parallel magnetic circuits. , comparison between electrical and magnetic circuits , force on current carrying conductor placed in magnetic field, Fleming's left hand rule.

Faraday's law of electromagnetic induction, Fleming's right hand rule, statically and dynamically induced EMF's self and mutual inductance coefficient of coupling, energy stored in magnetic field.

Unit 3: A.C. Fundamentals **[12 hrs]**

Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle period, frequency, instantaneous, peak, average, r.m.s. values, peak factor , and form factor, phase difference, lagging, leading and in phase quantities and phasor representation. Rectangular and polar representation of phasors. Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage- current phasor diagrams, voltage , current and power waveforms.

Unit 4: Single phase and poly phase A. C. circuits **[12 hrs]**

Single phase AC Circuits: Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams. Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit. Q- factor and bandwidth.

Polyphase AC circuits: Concept of three phase supply and phase sequence. Balanced and unbalanced loads voltage current and power relations in three phase balance star and delta loads and their phasor diagrams.

Unit 5: Electrostatics **[07 hrs]**

Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and concept of time constant.

Unit 6 : Illumination and Electrical Energy Tariff **[07Hrs]**

Definitions of luminous flux, luminous intensity, candle power, illumination, luminance, luminous efficiency (lumens/watt) of different types of lamps, working principle of Fluorescent/ Sodium Vapour/ Mercury vapour & CFL Lamps. Simple numerical to determine number of lamps to attain a given average lux level in an area.

Types of Tariff, One part (KWH based) tariff with simple numerical: (Students should be able to calculate the domestic electricity charges.)

Text Books:

1. Elements of Electrical sciences: P. Mukhopadhyay, N. Chand & Bros Roorkee (1989).
2. Electrical Technology: B. L. Thareja, S. Chand Publications.
3. Basic Electrical Engineering: S. B. Bodkhe, N. M. Deshkar, P. P. H. Pvt. Ltd.

Reference Books:

1. V. N. Mittal and Arvind Mittal;, " Basic Electrical Engineering" McGraw Hill
2. Vincent DelToro, " Electrical engineering Fundamentals", PHI second edition 2011
3. Bolestaad, :"Electronics Devices and Circuits Theory", Pearson Education India
4. Edward Hughes, " Electrical Technology,", Pearson Education
5. D.P. Kothari and Nagrath " Theory and Problems in electrical Engineering", PHI edition 2011.

EE3T004	Network Analysis	3 Credit

COURSE OBJECTIVE

Students will learn:

1. The fundamental principles of electrical circuit analysis
2. To become adept at using various methods of circuit analysis, including simplified methods such as series parallel reductions, voltage and current dividers, and the mesh - node method.
3. To appreciate the consequences of linearity, in particular the principle of superposition and Thevenin - Norton equivalent circuits.
4. To analyze energy storage elements.
5. To utilize Laplace transforms for circuit analysis.
6. To analyze four terminal networks using two-port parameters.

Course Outcomes:

Students should be able to:

1. Define basic concepts and principles related to Circuit Analysis
2. Identify the super mesh & super nodal problems.
3. Apply a variety of circuit analysis methods including theorems and Laplace transform
4. Solve two port network problems.
5. To design and develop network equations and their solutions.
6. Select best possible method of circuit analysis for a given situation

COURSE CONTENTS

Unit 1: Terminal Element Relationships **[06 Hrs]**

V-I relationship for Inductance and Capacitance - Constant Flux Linkage Theorem and Constant Charge Theorem. Dependent and Independent Sources, Active & Passive Elements, Source Transformation, Duality.

Unit 2: Mesh And Nodal analysis **[08 Hrs]**

Mesh analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. Concept of super mesh, mutual inductance, coefficient of coupling, Dot convention, dot marking in coupled coils. Nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. Concept of super node.

Unit 3: Network Theorems [07 Hrs]

Linearity theorem, Thevinin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem, Tellegen's theorems (Both AC & DC)

Unit 4: Time Domain Analysis of Circuits [07 Hrs]

Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits- Complete Solution for step/impulse/sinusoid voltage/current inputs. Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of D.C. steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method Determination of initial conditions

Unit 5: Laplace Transform & Properties [07 Hrs]

Review of Laplace Transform & Properties Partial fractions, Concept of initial and final condition, Singularity functions, Waveforms synthesis, Steady state and transient state analysis of RL, RC, RLC network with and without initial conditions with Laplace transforms. Network Functions: Driving points and transfer functions, poles, zeros of transfer function, their properties.

Unit 6: Two Port Networks [07 Hrs]

Two port networks, characterizations in terms of impedance, admittance, hybrid and transmission parameters, Conditions for symmetry and Reciprocal, inter relationships among parameter sets Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade connection.

Ref Books:

1. Mac.E Van Valkenburg, "Network Analysis"
2. Franklin Fa-Kun. Kuo, "Network Analysis & Synthesis", John Wiley & Sons.
3. M. L. Soni, J. C. Gupta, "A Course in Electrical Circuits and Analysis"
4. Mac.E Van Valkenburg, "Network Synthesiss"

5. Joseph A. Edminister, Mahmood Maqvi, “Theory and Problems of Electric Circuits”, Schaum's Outline Series
7. Sudhakar Shyammohan Tata Mc Graw Hill 2005, “Circuit and Network Analysis”\

EE3L004	Network Analysis Lab	1 Credit

COURSE OBJECTIVE

Students will learn:

8. The fundamental principles of electrical circuit analysis
9. To become adept at using various methods of circuit analysis, including simplified methods such as series parallel reductions, voltage and current dividers, and the mesh - node method.
10. To appreciate the consequences of linearity, in particular the principle of superposition and Thevenin - Norton equivalent circuits.
11. To analyze energy storage elements.
12. To utilize Laplace transforms for circuit analysis.
13. To analyze four terminal networks using two-port parameters.

COURSE OUTCOMES

Students should be able to:

1. Define basic concepts and principles related to Circuit Analysis
2. Identify the super mesh & super nodal problems.
3. Verifies principles of network
4. Solve two port network problems.
5. To Analyze RLC Circuit

List of Practical

1 To Study & Verify Superpostion theorem
2 To Study & Verify Thevinion’s theorem
3 To Study & Verify Norton’s theorem
4 To Study & Verify maximum power transfer theorem
5 To Study & Verify reciprocating theorem
6 Determination of transient response of current in RL & RC circuits with step voltage input
7 Analysis of RL/ RC and RLC circuits

8 Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values

9 Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.

EE3T005	Electrical Machine-I	3 Credit

COURSE OBJECTIVE

The course objective is to impart knowledge of,

1. The basic principle of transfer of electrical power, operation, construction of Single phase and Three phase transformers, their classification, connections and phasor diagrams.
2. The basic principle, construction, operation, Performance characteristics, steady state analysis and applications of DC generators and motors.
3. The basic principle, construction, operation, Performance characteristics, steady state analysis, Speed control and applications of Single Phase and Three phase Induction motors.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Recall the basic laws and rules of electromagnetic induction, electric and magnetic circuits.
2. Understand constructional features, working principles of electrical machines and explain different types of starting & speed control methods of electric motors.
3. Apply knowledge to calculate the power loss, voltage regulation, efficiency of transformer and operating speed of electric motor and choose type of motor, its starting and speed control methods with respect to applications.
4. Analyse performance indices, vector diagrams of electrical machines and examine the need of parallel operation, O.C. & S.C. test, Polarity test on transformer, and blocked rotor test on induction motors.
5. Evaluate braking methods of DC, and induction motor.
6. Design motoring system able to give solutions for single phase, three phase and DC supply with respect to supply available and load requirements.

COURSE CONTENTS

Unit 1: Single Phase Transformer **[05 Hrs]**

Transformer construction, classification, principle and operation of single phase transformer, Excitation phenomenon in transformers, Ideal and practical transformer, equivalent circuits, NO load and ON load operation, Phasor diagrams, Power and Energy Efficiency, Voltage regulation, Polarity test, Parallel operation, O.C. & S.C. test on single phase transformer, Effect of load on power factor, Applications-Auto transformers, Variable frequency transformer, Voltage and Current transformers, Welding transformers, Pulse transformer and applications.

Unit 2: Three Phase Transformer **[05 Hrs]**

Constructional features, principle and operation of three phase transformer, Regulation, Efficiency, Three winding transformers and its equivalent circuit, Magnetizing current and harmonics, Winding identifications, Various connections with vector group, On load tap changing of transformers, O.C. & S.C. test on three phase transformer, Determination of equivalent circuit parameters calculation using O.C. & S.C. test, Parallel operation of three phase transformer, Scott Connection, Back to Back test, Type and routine tests.

Unit 3: DC Generator **[05 Hrs]**

Construction, Magnetic structure, Principle and operation, Field and Armature systems, Field and Armature windings (Both Lap and Wave Types), EMF Equation,Armature reaction - Demagnetizing and Cross magnetizing mmfs and their estimation; Remedies to overcome the armature reaction, commutation, straight line commutation, inter-poles, compensating winding, Causes of bad commutation and remedies, Building of Emf in D.C. Shunt generator, Characteristics and Applications of Different types of D.C. Generators.

Unit 4: DC Motor **[05 Hrs]**

Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and Applications of various types of D.C. Motors, Starting of DC Motors, Speed control of Series, Shunt and Compound motors, Power flow in DC machines, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses &Applications

Unit 5: Three Phase Induction Motor **[04Hrs]**

Types of 3-Ø induction motor and production of torque. Torque-slip characteristics, Torque-speed characteristics & Applications, NO load blocked rotor test, Losses & efficiency, Double cage motor, Operating characteristics & Influence of machine parameter on the performance of motor, Various methods of starting of 3 phase I.M, Methods of speed control of I.M., Braking Methods-Braking regenerative braking, Plugging, Dynamic braking, Crawling & cogging.

Unit 6: Single Phase Induction Motor **[04Hrs]**

Construction, Double Field revolving theory of Single phase induction motor, Types of IM on the basis of self-starting methods: Split phase induction motor: Capacitor start inductor motor, Capacitor start capacitor run induction motor (two value capacitor method), Permanent split capacitor (PSC) motor; Shaded pole induction motor; Phasor diagrams, Losses and Efficiency, Load characteristics & Applications.

Text Books:

1. Electrical Machines: Dr. P.S. Bimbhra
2. Electrical Machines: Ashfaq Hussain; Dhanpat Rai Publication
3. A Text Book of Electrical Technology: B. L. Theraja (Vol. II)
4. Electrical Machines 2nd -1993 :Dr. P. K. Mukherjee and S. Chakravarti, Dhanpat Rai Publications (P) Ltd
5. Electrical Machines 3rd -2010: J.Nagrath and Dr. D.P.Kothari; Tata McGraw Hill

Reference Books:

1. Performance & Design of A.C. Machine: M. G. Say
2. Laboratory Courses in Electrical Engineering: Tarnekar, Kharbanda, Bodkhe& Naik
3. D.C. Machines: Langsdorf
4. Electrical Machines and Transformers: Nasser Syed
5. Laboratory manual for Electrical machines: Dr. D.P. Kothari and Prof. Umre; S. S.CHAND publications.

EE3L005	Electrical Machine-I Lab	1 Credit

COURSE OBJECTIVE

The course objective is to impart knowledge of,

1. The basic principle of transfer of electrical power, operation, construction of Single phase and Three phase transformers, their classification, connections and phasor diagrams.
2. The basic principle, construction, operation, Performance characteristics, steady state analysis and applications of DC generators and motors.
3. The basic principle, construction, operation, Performance characteristics, steady state analysis, Speed control and applications of Single Phase and Three phase Induction motors.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Define the basic laws and rules of Transformer and Electric machines.
2. Demonstrate the constructional features of Transformer and Electrical Machines and illustrate the different machine parameters for transformer and Electrical Machines.
3. Identify the parameters like power loss, voltage regulation, efficiency of transformer and operating speed of electric motor and select the type of motor, its starting and speed control methods with respect to applications.
4. Examine the performance indices, vector diagrams of different electrical machines and inspect the need of parallel operation, O.C. & S.C. test, Polarity test on transformer, and blocked rotor test on induction motors.
5. Interpret different methods of braking for different electrical motors.
6. Develop the motoring system able to give solutions for single phase, three phase and DC supply with respect to supply available and load requirements.

List of Experiments:

1 To verify turns ratio of Transformer.

2 To perform polarity test on Single Phase Transformer.

3 To determine equivalent circuit diagram of transformer through O.C & S.C Test.

4 To determine efficiency by direct loading test on Single Phase Transformer.

5 To verify V-I relationship & draw Phasor diagram of 1.Star-Star 2.Star-delta 3.delta-star 4.Delta-Delta connection of single phase transformer.

6 To study the construction of field and armature of DC Machine.

7 To determine external characteristics of DC Generator.

8 To perform Load test on DC shunt motor.

9 To perform speed control of DC shunt motor using armature and field control method.

EE3T006	**Measurement And Instrumentation**	**3 Credit**

COURSE OBJECTIVE

Students will learn:

1. Remembering the fundamental principles of electrical instruments and measurements
2. Classification of various electrical measuring instruments
3. Make a use of operating principles of various electrical measuring instruments.
4. To distinguish between variety of measuring instruments available.
5. To utilize various electrical measuring instruments for different measurements.
6. Estimate various parameters of electrical measuring instruments.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Remember the different types of instruments used in electrical measurements.
2. Understand the operating principles of various electrical measuring instruments.
3. Apply knowledge of variety of instruments available for required parameter and identify the appropriate one.
4. Analyze and classify different electrical measuring instruments on basis of type of electrical/ physical quantity to be measured.
5. Evaluate different electrical measuring instruments
6. Test and solve various problems on electrical measuring instruments

UNIT 1: General principles of measurements **[05 hrs]**

Measurement system measurement standards , characteristics - errors in measurement. Calibration of meters- significance of IS standards of Instruments. Classification of meters - operating forces - essentials of indicating instruments - deflecting, damping, controlling torques. Ammeters and voltmeters - moving coil, moving iron, constructional details and operating, principles shunts and multipliers , extension of range.

UNIT 2: Measurement of resistance **[05 hrs]**

Classification of resistance. Measurement of medium resistances , ammeter and voltmeter method, substitution method, Wheatstone bridge method.

Measurement of low resistances , Potentiometer method and Kelvin's double bridge method. Measurement of high resistance: Loss of Charge Method, Direct Deflection Method, Price's Guard wire method. Measurement of earth resistance.

UNIT 3: AC bridges **[05 hrs]**

Generalized treatment of four-arm AC bridges. Sources and detectors. Maxwell's bridge, Hay's bridge Anderson bridge, Owens Bridge for self inductance measurement. Heaviside's bridge for mutual inductance measurement. De Sauty Bridge, Schering bridge for capacitance measurement. Wien's bridge frequency measurements. Sources of error in bridge measurements and precautions. Screening of bridge components.

UNIT 4: Introduction to high voltage and high current measurements **[04 hrs]**

Measurement of high DC voltages - measurement of high AC voltages - electrostatic voltmeters , sphere gaps - DC Hall effect sensors - high current measurements. Study of Phasor Measurement Units (PMU). Current transformers and potential transformers , principle working, ratio and phase angle errors , numerical problems, Clamp on meters

UNIT 5: Measurement of Power & Energy **[05 hrs]**

Principle of Measurement of active, reactive and apparent power single and in polyphase circuits. Measurement of Energy in single and polyphase circuits. Electrodynamometer Wattmeters, Construction, Working, Errors in wattmeter, Single phase Energy meter, Theory and operation , compensation and adjustment. Testing and calibration of single-phase energy meter by phantom loading

UNIT 6: Transducers **[04 hrs]**

Definition and classification - common transducers for measurement of displacement, velocity, flow, liquid level, force, pressure, strain and temperature - basic principles and working of LVDT, electromagnetic and ultrasonic flow meters, piezoelectric transducer, load cell, strain gauge, RTD, Thermistors, thermocouple, Need for instrumentation system, data acquisition system.

Text Book:

1. Sawhney A.K., A course in Electrical and Electronic Measurements & instrumentation, DhanpatRai .

2. J. B. Gupta, A course in Electrical & Electronic Measurement & Instrumentation., S K Kataria& Sons

3. Kalsi H. S., Electronic Instrumentation, 3/e, Tata McGraw Hill, New Delhi, 2012

References:

1. Golding E.W., Electrical Measurements & Measuring Instruments, Wheeler Pub.

2. Cooper W.D., Modern Electronics Instrumentation, Prentice Hall of India

3. Stout M.B., Basic Electrical Measurements, Prentice Hall

4. Oliver & Cage, Electronic Measurements & Instrumentation, McGraw Hill

5. E.O Doebelin and D.N Manik, Doebelin's Measurements Systems, sixth edition, McGraw Hill Education (India) Pvt. Ltd.

6. P.Purkait, B.Biswas, S.Das and C. Koley, Electrical and Electronics Measurements and Instrumentation, McGraw Hill Education (India) Pvt. Ltd.,2013

EE3L006	Measurement and Instrumentation Lab	1 Credit

COURSE OBJECTIVE

Students will learn:

1. Remembering the fundamental principles of electrical instruments and measurements
2. Classification of various electrical measuring instruments
3. Make a use of operating principles of various electrical measuring instruments.
4. To distinguish between variety of measuring instruments available.
5. To utilize various electrical measuring instruments for different measurements.
6. Estimate various parameters of electrical measuring instruments.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Choose correct instrument for measuring given electrical/ physical quantity.
2. Compare various methods and instruments available for measurement of single quantity.
3. Apply understanding about instrumentation concepts which can be applied to electrical measurements.
4. Analyse the testing and measuring set up for electrical systems
5. Evaluate efficiency of different instruments
6. Design circuit for measuring given quantity.

List of Practical:-

1. To measure low resistance by Kelvin's double bridge
2. To measure medium resistance by Wheatstone bridge
3. To measure self inductance by Hay's bridge
4. To measure capacitance by De Sauty Bridge
5. To calibrate a given single phase induction type energy meter.
6. To Study and Calibrate Three Phase Wattmeter.
7. To measure active and reactive power in three phase balanced load by one wattmeter method

8. To find the effect of various parameters on output of given LVDT
9. To Study the change in resistance of RTD probe depending on the process temperature and to Study the dynamic response of RTD probe.
10. To Study the change in EMF of a thermocouple in response to the process temperature.
11. To study impulse voltage generator
12. To study impulse current generator

Note : Some practicals will be conducted through simulations tools.

EE3T007	Innovation and Entrepreneurship Development	Audit

Course Outcomes:

At the end of the Course, Student will be able to:

1. Discover the creative / innovative side within her/him.
2. Hone entrepreneurial and leadership skills within his/her personality.
3. Develop new ways of thinking and Learn the entire innovation cycle from Ideation to GoToMarket.
4. Study frameworks, strategies, techniques and business models for conceived ideas.
5. Develop skills for evaluating, articulating, refining, and pitching a new product or service.

Course Contents:

Introduction to Innovation, Personal thinking preferences, ‘Innovation’ mind set, Everyday creativity and eliminating mental blocks, Introduction to Innovation, Creative thinking techniques, Innovation types, Idea management and approaches, Teaming techniques for creativity, Idea Conception, Idea Scoping, Self-Evaluation, Idea Brainstorming sessions, Idea Verification, Market Evaluation, Concept Evaluation, Idea Verification, Prototype Evaluation, Protection/Patent review, Innovation Case Study, Idea Presentations, Idea Incubation, Product and Market Plan, Product and Market Development, Innovation Case Studies, Idea Incubation and Product Launch, Marketing and selling, Post Launch Review

Reference Books:

1. Jeff Dyer, Hal Gregersen, Clayton M. Christensen, " The Innovator's DNA: Mastering the Five Skills of Disruptive Innovators, Harvard Business Review Press, 2011.

2. Paddy Miller, Thomas Wedell-Wedellsborg, "Innovation as Usual: How to Help Your People Bring Great Ideas to Life, Harvard Business Review Press, Kindle Edition.

Sr. No.	Subject Category	Subject Code	Course Title	Teaching Scheme			Evaluation Scheme				Credits
				L	T	P	CA	MSE	ESE	**TOTAL**	
1	HSMC	EE4T001	Constitution of India	2	0	0	20	20	60	100	2
2	BSC	EE4T002	Numerical method and probability	2	1	0	20	20	60	100	3
3	ESC	EE4T003	Power Station Practice	4	0	0	20	20	60	100	4
4	PCC-EE	EE4T004	Electronic Devices and circuits	3	0	0	20	20	60	100	3
5	PCC-EE	EE4T005	Power System I	2	1	0	20	20	60	100	3
6	PCC-EE	EE4T006	Electrical Machine II	3	0	0	20	20	60	100	3
7	BSC	EE4L002	Numerical method and probability Lab	0	0	2	60	0	40	100	1
8	PCC-EE	EE4L005	Power System I Lab	0	0	2	60	0	40	100	1
9	PCC-EE	EE4L006	Electrical Machine II Lab	0	0	2	60	0	40	100	1
10	PROJ-EE	EE4P002	Field training/ Internship/ industrial visit	0	0	0	0	0	50	50	1
11	MC	EE4T007	Universal Human Values	2	0	0	10	15	25	50	Audit
				18	**2**	**6**	**310**	**135**	**555**	**1000**	

Total Credits	22

Curriculum for Semester- IV [Second Year]

EE4T001	Constitution of India	Credit 2

COURSE OBJECTIVES

1. Understand the concept of Constitution and its importance.
2. Know the need and importance of protecting Constitution.
3. Familiarize students (Prospective engineers) with elementary knowledge of laws that would be of utility in their profession.
4. To be supplemented by the historical development of laws wherever required.

COURSE OUTCOME

1. To define Constitution and basic knowledge about Indian Constitution.
2. To demonstrate Constitution and its importance.
3. To identify constitution law and constitutionalism

4. Classify Responsibilities, Fundamental Duties and its legal status values of an engineer.
5. To evaluate the Parliamentary Form of Government in India.
6. To create awareness on Constitutional Scheme in India

COURSE CONTENTS:

COURSE CONTENT

Unit 1: Introduction to constitution law and constitutionalism [06 hrs]

Meaning of the constitution law and constitutionalism. Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India. Scheme of the fundamental rights.

Unit 2: The Fundamental Duties and its legal status [06 hrs]

The scheme of the Fundamental Duties and its legal status. The Directive Principles of State Policy – Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and the States.

Unit 3: The constitution powers [06 hrs]

Parliamentary Form of Government in India – The constitution powers and status of the President of India. Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments in India. Emergency Provisions : National Emergency, President Rule, Financial Emergency

Unit 4: Constitutional Scheme in India [06 hrs]

Local Self Government – Constitutional Scheme in India. Scheme of the Fundamental Right to Equality. Scheme of the Fundamental Right to certain Freedom under Article 19. Scope of the Right to Life and Personal Liberty under Article 21

Text Books:

1. The Constitutional Law Of India 9th Edition, by Pandey. J. N.
2. The Constitution of India by P.M.Bakshi
3. Constitution Law of India by Narender Kumar
4. Bare Act by P. M. Bakshi

EE4T002	Numerical method and probability	Credit 3

Course Outcome

1. Define approximation and errors in numerical differentiation and Integration.
2. Evaluate the roots of the equation using Bracketing methods: Bisection methods, Open methods: Newton Raphson method
3. Apply the Cramer's rule, Gauss- Elimination Method, pivoting, scaling, Heun's method, Runge–Kutta Method,to engineering problem.
4. Analyze the question Newton's Cotes Integration Formulas: Trapezoidal Rule, Simpson's rule, engineering applications Numerical differentiation using Finite divide Difference method.
5. Compute the linear and non linear equation, regression, Interpolation and ordinary differential equation using MATLAB programming
6. Develop computer program for linear and non linear equation.

Course Contents:

Unit 1: Error Analysis [08 Hours]
Significant figures, round-off, precision and accuracy, approximate and true error, truncation error and Taylor series, machine epsilon, data uncertainties, error propagation, importance of errors in computer programming.

Unit 2: Roots of Equations [06 Hours]
Motivation, Bracketing methods: Bisection methods, Open methods: Newton Raphson method, Engineering applications.

Unit 3: Numerical Solution of Algebraic Equations [07 Hours] :
Cramer's rule, Gauss- Elimination Method, pivoting, scaling, engineering applications, Heun's method, Runge–Kutta Method, engineering applications.

Unit 4: Numerical Integration and Differentiation [06 Hours]
Motivation, Newton's Cotes Integration Formulas: Trapezoidal Rule, Simpson's rule, engineering applications Numerical differentiation using Finite divide Difference method

Unit 5: Curve Fitting and Interpolation [08 Hours]
Motivation, Least Square Regression: Linear Regression, Polynomial regression. Interpolation: Newton's Divide Difference interpolation, engineering applications.Motivation, Euler's and Modified Euler's Method.

Unit 6: Introduction to MATLAB Programming : [07 Hours]
Array operations ,Loops and execution control lecture ,working with file: Scripts and function ,Plotting and program output. Overview of programming language, Algorithms and Flowchart of method based on each unit,Development of at least one computer program based on each unit.

Texts:
1. Steven C Chapra, Reymond P. Canale, "Numerical Methods for Engineers", TataMcGraw Hill Publications, 2010.
2. E.Balagurusamy, "Numerical Methods", TataMcGraw Hill Publications,1999.

References:
1. V. Rajaraman, "Fundamental of Computers", Prentice Hall of India,NewDelhi,2003.
2. S. S. Sastri,"IntroductoryMethodsofNumericalMethods",PrenticeHallofIndia,NewDelhi, 3 rdedition,2003. 3. K. E. Atkinson, "An Introduction to Numerical Analysis",Wiley,1978.
4. M.J. Maron, "Numerical Analysis: A Practical Approach", Macmillan, New York, 1982

EE4L002	Numerical method and probability	Credit 1

Course Outcome

1. Define approximation and errors in numerical differentiation and Integration.

2. Evaluate the roots of the equation using Bracketing methods: Bisection methods, Open methods: Newton Raphson method
3. Apply the Cramer's rule, Gauss- Elimination Method, pivoting, scaling, Heun's method, Runge–Kutta Method,to engineering problem.
4. Analyze the question Newton's Cotes Integration Formulas: Trapezoidal Rule, Simpson's rule, engineering applications Numerical differentiation using Finite divide Difference method.
5. Compute the linear and non linear equation, regression, Interpolation and ordinary differential equation using MATLAB programming

Develop computer program for linear and non linear equation.

List of Experiments

1. Program for plotting a circle centre at the point (4,3) with a radius=2 and also 3D circle.
2. Program to plot filled in black circle at x=50, y=55 and with radius =1.
3. Program to plot a sphere
4. Program to plot a straight line
5. Program to plot an ellipsoid
6. Program to plot a cylinder
7. Program for finding roots of f(x)=0 by bisection method.
8. Program for finding roots of equation by newton raphson method.
9. Program for solving numerical integration by simpson's 1/3 rule.
10. Program for solving ordinary differential equation by runge kutta method.

EE4T003	Power Station Practice	Credit 4

COURSE OBJECTIVE

Students will learn:

1 Remember fundamental principles of power plant system

2 Understand various power plant and its practices

3 To apply Economic Operation of Power Systems.

4 To analyze Economic Operation of Power Systems

5 To utilize concept of power plant operations and demand also evaluation of same.

6 Design parameters of basics of power plant operation and its economy.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Remember the basic operations of various power plants.
2. Understand and interpret the requirements and basics of power plant installation and site selection.
3. Apply knowledge to Economic Operation of Power Systems and the knowledge related with its need.
4. Analyze various electric power plants operations and distinguish between properties.
5. Evaluate thermal, hydro, nuclear, gas power plant also able to Explain its fundamentals.
6. Design Economic Operation of Power Systems and also able to give solutions implementation of power plant on its basics.

Course Contents:

Unit 1: Introduction

Electric energy demand and growth in India, electric energy sources. Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts. Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

Unit 2: Nuclear Power Plant

Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding. Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications. Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

Unit 3: Sub-stations Layout

Types of substations, bus-bar arrangements, typical layout of substation. Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

Unit 4: Economic Operation of Power Systems

Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

Unit 5: Non Conventional Energy Sources

Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:

1. B.R. Gupta, "Generation of Electrical Energy", S. Chand Publication.
2. Soni, Gupta & Bhatnagar, "A text book on Power System Engg.", Dhanpat Rai & Co.
3. P.S.R. Murthy, "Operation and control of Power System" BS Publications, Hyderabad. Reference Books:
4. W. D. Stevenson, "Elements of Power System Analysis", McGraw Hill.
5. S. L. Uppal, "Electrical Power", Khanna Publishers

EE4T004	Electronics Devices and Circuits	3 Credit

COURSE OBJECTIVE

Students will learn:

1 To understand operation of semiconductor devices
2 To be exposed to the characteristics of basic electronic devices
3 To apply concepts for the design of Regulators and Amplifiers
4 To verify the theoretical concepts through laboratory and simulation experiments.
5 To implement mini projects based on concept of electronics circuit concepts.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to:

1. Understand the characteristics of the p-n junction, the diode and some special function diodes and these diodes' application in electronic circuits
2. Familiarize the operation and applications of transistor like BJT
3. Develop design competence in power amplifiers using BJT.
4. Apply the knowledge of amplifier in order to Design various differential amplifier
5. Design Various Oscillator Circuits and Understand the concept of FETs as well as MOSFETs
6. Apply the knowledge of Digital Electronics in order to develop the truth tables for various logic Gates

Unit 1: Diode theory and Diode Circuits **[07 Hrs]**

Theory of PN-junction diodes, operation and characteristics, Zener diodes and voltage regulators, Half and Full Wave Rectifiers, Filters, Ripple factor, Voltage doublers.

Unit 2: Bipolar Junction Transistor **[07 Hrs]**

BJT, Theory of operation, characteristics, Biasing arrangements, Stability factor, Small signal analysis of CE, CB, CC amplifiers and their comparison, Power Transistors, Transistor as a switch

Unit 3: Power Amplifiers **[07 Hrs]**

Power amplifiers- classification as A,B, AB, C, Push pull amplifiers, Cross over distortion, Positive and Negative amplifiers- classification, feedback amplifiers, advantages and applications

Unit 4: Differential Amplifiers **[07 Hrs]**

Differential amplifier circuits and their stages, current source, biasing, level Shifting techniques, Common mode and differential mode gain, Impedance of different stages**.**

Unit 5: Oscillators **[07 Hrs]**

Oscillators- Barkhausen"s criterion, RC and Crystal oscillators. Field effect transistors and MOSFETs- Principle of operation and characteristics, biasing arrangements.

Unit 6: Digital Electronics **[07 Hrs]**

Boolean Identities, Binary, Gray, Octal, Hex & ASCII, Codes, Logic gates and their truth tables, De Morgan"s Laws, Concept of Sum of Products and Product of Sums.

Text Books:

1. Sanjeev Gupta, "Electronic Devices and Circuits" Dhanpat Rai Publication
2. P. Godse, U. A. Bakshi, "Electronic Devices and Circuits" Technical Publication

3. R P Jain, “Modern Digital Electronics” Tata McGraw-Hill Education

Reference Books:

1. Millman and Halkias;, “Electronic Devices and Circuits” McGraw Hill
2. Millman and Halkias, “Integrated Electronics”, McGraw Hill
3. H. Taub,“ Digital Integrated Electronics”, McGraw Hill
4. Wait, “Introduction to Operation Amplifiers”, Tata McGraw Hill

EE4T005	Power System-I	3 Credit

COURSE OBJECTIVE

Students will develop the ability

1 To calculate the basic parameters of transmission line of power systems.

2 To know the power flow through transmission lines under different circumstances.

3 To model and represent the system components used in power system

4 To represent and understand the transmission line

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. To define basic components of power system and remember the structure of power system.
2. To understand the working of transmission and distribution system and relate the different parameters of transmission and distribution system
3. To do Modeling and representation of the system component used in power system

4. To Analyze the per unit system of power system
5. To select the proper parameter of power system and determine the value of inductance, capacitance, voltage regulation and efficiency of transmission line and explain the effect of sag and corona on transmission line.
6. To create the structure of power system with suitable components and improve the efficiency of power system

COURSE CONTENTS

UNIT 1: General Structure of Electrical Power System [04 hrs]

Introduction to Power System, Generation, Transmission, Distribution and Utilization- Overview Single Line Diagram (SLD) Representation, Use of high voltage, idea about substation (indoor and outdoor), concept of real, reactive and complex power unit system, load and their characteristics, voltage and frequency dependence of loads, overhead v/s underground transmission

UNIT 2: Inductance [05 hrs]

Definition, Inductance due to internal flux of two wire single phase line of composite conductor line, Concept of GMD, Inductance of three phase line with equal & unequal spacing, vertical spacing.

Capacitance: Concept of electric field, Potential difference between two points in space, Effect of earth's surface on electric field, Computation of capacitance of single phase, three phase transmission lines with & without symmetrical spacing for solid & composite conductors.

UNIT 3: Representation of power system elements [05 hrs]

Representation of power system elements, models and parameters of generator, transformer and transmission lines, Transmission line parameters calculation (R,L,C), per unit system representation. Elementary distribution scheme: Feeders and distributors. Introduction to distribution automation.

UNIT 4: Transmission [06 hrs]

Transmission: Types of conductors, Choice of conductor materials, Stranded copper & ACSR conductor, Current and Voltage relation: Representation of short, medium & long transmission lines, voltage regulation and efficiency of power transmission lines using equivalent pi and T representation. Representation using circle diagram with generalized constants. Ferrant effect, Skin Effect, Proximity Effect.

Unit 5: Insulators and Cables Types [03 hrs]

Insulators and Cables Types: Classification of Insulators, Potential distribution over suspension insulator string, String efficiency, Numericals on string efficiency. CABLES: Construction, classification, insulation resistance, capacitance, Dielectric stress, economical size, Grading of cables, Numericals.

Unit 6:Mechanical Design of Transmission Line **[04 hrs]**

Mechanical Design of Transmission Line: Effect of wind & ice coating on transmission line, sag due to equal & unequal supports, with their derivation, Numericals. Corona: Phenomenon of corona, factors affecting the corona, Power loss & disadvantages of corona.

Textbook:

1. J. B. Gupta, "Power System Analysis",(Katson Books)
2. Kothari Nagrath, "Electric Power System", (Tata McGraw Hill Publications)
3. Wadhva C. L.,"Electric Power System",(Tata McGraw Hill Publications)
4. Asfaque Hussain, "Power System Analysis" CBS

Reference:

1. W.D. Stevenson Jr., Elements of power system analysis, McGraw-Hill publications
2. John J Grainger, W.D. Stevenson, Power System Analysis, McGraw-Hill (India) Pub. , 2003

EE4T006	Electrical Machine II	3 Credit

COURSE OBJECTIVES

This course provides the fundamental knowledge to the students to

1. Understand the concept of MMFs and rotating magnetic fields in synchronous motor.
2. Understand basic principle, construction and operation of synchronous machines.
3. Understand transient and steady state analysis of synchronous machines.
4. Analyse performance characteristics of synchronous machines.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to,

1. Define voltage regulation, load torque angle and MMF of windings.
2. Classify reactances under transient conditions and effects of variable excitation.
3. Apply the method of synchronous impedance and Potier triangle to find voltage regulation.

4. Develop phasor diagram of three phase synchronous machine.
5. Analyze the V curves and effects of excitation and load on motor operation.
6. Compare various methods of cooling in synchronous machine.

Unit 1: Synchronous Machines **[08hrs]**

Construction, types, armature reaction, introduction to armature winding and field windings MMF of armature and field windings induced EMF, circuit model of synchronous machine, power angle characteristics, two axis theory, synchronous motor operation, characteristic curves, synchronous condenser, dynamics, Single phase synchronous motors.

Unit 2: Steady State Operation of Three Phase Synchronous Machine **[06hrs]**

Phasor diagram, voltage regulation using synchronous impedance and Potier triangle method, steady state performance of three phase synchronous machines, circle diagrams

Unit 3: Synchronization **[08hrs]**

Parallel operation, experimental determination of parameters (positive sequence reactance, negative sequence reactance, Zero sequence reactance), short circuit ratio, losses and efficiency

Unit 4: Synchronous Machines On Infinite Bus **[06hrs]**

Phasor diagram, expression for torque, load torque angle, V curve and inverted V curve, effectsof variable excitation and power input on generator operation and effect of variable excitation and load on motor operation, asynchronous generator.

Unit 5: Transient Behaviour **[07hrs]**

Sudden 3, phase short circuit. Transient and sub- transient reactances and their measurement. Time constant and equivalent circuit diagram, hunting & damper windings.

Unit 6: Methods Of Cooling In Synchronous Machines **[07Hrs]**

Cooling system classification, Open ventilated, Air-to-water cooler, Air-to-air cooler, Radial flow ventilation system, Axial flow ventilation system, Circumferential Ventilation, Direct water cooling, Hydrogen cooling, their advantages and disadvantages.

Text Books:

1. Electrical Machine : Dr.P.K.Mukherjee and S. Chakravarti , DhanpatRai
2. Electrical Machinery : Nagrath and Kothari, 3rd , Tata Mcgraw Hill
3. Generalised Theory of Electrical Machinery: P.S. Bhimbra, Tata Mcgraw Hill

Reference Books:

1. Fitzgerald and Kingsley and Kusco , “Electrical Machinery” McGraw Hill
2. P. S. Bhimbra, “Electrical Machinary”

EE4L006	Electrical Machine II Lab	1 Credit

COURSE OBJECTIVES

This course provides the fundamental knowledge to the students

1. To study the performance characteristics of synchronous machine.
2. To study the predetermination of voltage regulation of synchronous generator.
3. To study the variation in reluctance in salient pole machine.
4. To predetermine the characteristics of three phase synchronous motors.

COURSE OUTCOMES

Upon completion of this course, the students shall be able to correlate the theory and practice of the study of

1. Performance characteristics of synchronous machines using direct and indirect methods
2. Regulation of three phase alternator using the predetermination methods
3. Saliency nature of synchronous machine
4. Starting and Speed control of ac machines
5. Synchronization of two three phase alternators
6. Measurement of impedances and short circuit ratio of alternator

List of Experiments

1. Predetermination of regulation of three phase alternator using emf, mmf and Potier triangle method
2. To determine Xd and Xq of the salient pole type synchronous machine
3. To plot V curves and inverted V curves for three phase synchronous machine.
4. Study of prime mover and damper windings in synchronous motor
5. To measure the synchronous reactance of a synchronous generator by measured values of open circuit voltage and short circuit current
7. To study and measure positive, negative and zero sequence impedance of alternator.
8. To measure short circuit ratio of synchronous generator
9. To perform synchronization of two three phase alternators by
    a) Synchroscope method
    b) Three dark lamp method

c) Two bright one dark lamp method

10. To perform OC test on synchronous generator and determine full load regulation of a three phase synchronous generator by synchronous impedance method
11. To study synchronization of the alternator with infinite bus bar

EE4T007	Universal Human Values	Audit

COURSE OBJECTIVES

1. Sensitization of student towards self, family (relationship), society and nature.

2. Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.

3. Strengthening of self reflection.

4. Development of commitment and courage to act.

COURSE OUTCOMES

1. Students are expected to become more aware of their surroundings, society, social problems and their sustainable solutions, while keeping human relationships and human nature in mind.
2. They would have better critical ability.

3. They would also become sensitive to their commitment towards what they believe in (humane values. Humane relationships and humane society).
4. they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education [10 hrs]

Purpose and motivation for the course, recapitulation from Universal Human Values-I . Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations . Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself! [12 hrs]

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensureSanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship [12 hrs]

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive

Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence **[10 hrs]**

Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics **[12 hrs]**

Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books :

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj - PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

Recommendations for specialization B.Tech. with Honor (Major) and B. Tech. with Minor Engineering Degree

1. The concept of Honour and Minors at B. Tech. level is introduced, to enhance learning skills of students, acquisition of additional knowledge in domains and other than the discipline being pursued by the student through online mode, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

2. Eligibility Criteria and rules to award Honours

i) The Student should have Minimum CGPA of 7.5 up to 2nd Semester.

ii) Student willing to opt for honors has to register in 2nd year.

iii) The Student has to complete 6 to 7 additional advanced courses from the same discipline specified in the curriculum. Total credits of these courses should be between 18 to 20. The students should complete these credits before the end of last semester.

iv) Student to opt for the courses from NPTEL/SWAYAM platform as recommend by concern BOS.

v) If the credits of NPTEL/ SWAYAM courses do not match then proper scaling will be done).

Student complying with above criteria will be awarded B. Tech. with Honour Degree.

3. Eligibility Criteria and rules to award Minor Degree

i) The Student should have Minimum CGPA of 7.5 up to 2nd Semester.

ii) Student willing to opt for honors has to register in 2nd year.

iii) The Student has to complete 6-7 additional courses from other discipline of their interest, which are specified in the respective discipline. These courses are of total 18-20 credits.

iv) Student to opt for the courses from NPTEL/SWAYAM platform as recommended by concern BOS.

v) If the credits of NPTEL / SWAYAM courses do not match then proper scaling will be done).

Student complying with above criteria will be awarded B. Tech. with Minor Degree.

4. Availability of course from MOOC platform will be reviewed by the Major and Minor committee before beginning of semester.

Dr.S.R.Vaishnav
Chairman
Board of Studies, EE Dept

JAIDEV EDUCATION SOCIETY'S
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Affiliated to DBATU, RTMNU & MSBTE, Mumbai
Department of Civil Engineering
"Building Better Development"
Session 2020-21

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

Teaching Scheme

Branch: Civil Engineering **Branch Code: CE**

III Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	CE3T001	Civil Engineering - Societal & Global Impact	2	0	0	20	20	60	100	2
2	BSC	CE3T002	Engineering Mathematics-III	2	1	0	20	20	60	100	4
3	ESC	CE3T003	Building Drawing and Drafting	2	1	0	20	20	60	100	3
4	ESC	CE3T004	Mechanics of Rigid bodies	2	1	0	20	20	60	100	4
5	ESC	CE3T005	Energy Science and Engineering	3	0	0	20	20	60	100	3
6	PCC	CE3T006	Basic Geology and Geotechnical Engineering	3	0	0	20	20	60	100	3

7	ESC	CE3L001	Building Drawing and Drafting Lab	0	0	4	60	0	40	100	2
8	ESC	CE3L002	Mechanics of Rigid Bodies Lab	0	0	2	60	0	40	100	1
9	PCC	CE3L003	Basic Geology and Geotechnical Engineering Lab	0	0	2	60	0	40	100	1
10	PROJECT	CE3F004	Internship/Field Visit	0	0	0	0	0	50	50	1
11	MC	CE3T007	Innovation and Entrepreneurship Development	2	0	0	10	15	25	50	AU
				16	**3**	**8**					**24**

NOTE: Introduction of III & IV Semester scheme from session 2020-21.

IV Semester												
Sr. No.	**Category of Subject**	**Course Code**	**Course Name**	**Teaching Scheme**			**Evaluation Scheme**				**Credit**
				L	**T**	**P**	**CA**	**MSE**	**ESE/Ext. Pra.**	**Total**	
1	BSC	CE4T001	Life Science	2	0	0	20	20	60	100	2
2	PCC	CE4T002	Hydrology & Water Resource Engineering	2	1	0	20	20	60	100	3
3	PCC	CE4T003	Concrete Technology & Design of RCC Building Elements	2	1	0	20	20	60	100	3
4	PCC	CE4T004	Solid Mechanics	2	1	0	20	20	60	100	3
5	PCC	CE4T005	Surveying and Geomatics	2	0	0	20	20	60	100	2
6	PCC	CE4T006	Materials, Testing & Evaluation	2	0	0	20	20	60	100	2
7	PCC	CE4L001	Concrete Technology & Design of RCC Building Elements Lab	0	0	2	60	0	40	100	2
8	PCC	CE4L002	Solid Mechanics Lab	0	0	2	60	0	40	100	1
9	PCC	CE4L003	Surveying and Geomatics Lab	0	0	4	60	0	40	100	2
10	PROJECT	CE4F004	Internship/Field Visit II	0	0	0	0	0	50	50	1
11	MC	CE4T007	Universal Human Values	3	0	0	10	15	25	50	AU
				15	**3**	**8**					**21**

Semester- V

Sr. No	Subject Code	Subject	Contact Hours L	T	P	Credit
Theory						
01	BTCVC 501	Design of Steel Structures	2	2	-	4
02	BTCVC 502	Structural Mechanics-II	2	1	-	3
03	BTCVC 503	Soil Mechanics	3	1	✓	4
04	BTCVC 504	Environmental Engineering	2	-	✓	2
05	BTCVC 505	Transportation Engineering	2	-	✓	2
06	CV E2	**Elective II**	3	-	-	3
07	BTHM507	Essence of Indian Traditional Knowledge	1	-	-	AU
Practical / Drawing and/or Design						
08	BTCVL508	Soil Mechanics Laboratory	-	-	2	1
09	BTCVL509	Environmental Engineering Laboratory	-	-	2	1
10	BTCVL510	Transportation Engineering Laboratory	-	-	2	1
11	BTCVS511	Seminar on Topic of Field Visit to works related to Building Services	-	-	1	AU
		Sub-Total	**15**	**4**	**7**	
		Total	**26**			**1**
	BTCVE506A BTCVE506B BTCVE506C BTCVE506D	**Elective II** Materials, Testing & Evaluation Computer Aided Drawing Development Engineering Business Communication & Presentation Skills	3	-		3

Semester- VI

$: Students should register for the CVF 705 in Semester VI to undergo training during vacation after semester VI and appear at examination in Semester VII. Result shall appear in Grade-sheet of Semester VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	BTCVC601	Design of Concrete Structures I	3	1	-	3
02	BTCVC602	Foundation Engineering	2	1	-	3
03	BTCVC603	Concrete Technology	2	-	✓	2
04	BTCVC604	Project Management	2	1	-	2
05	CVE3	**Elective III**	3	-	-	3
06	BTCVC606	Building Planning and Design	2	-	✓	2
Practical / Drawing and/or Design						
07	BTCVL607	Concrete Technology Laboratory	-	-	2	1
08	BTCVL608	Building Planning, Design and Drawing Laboratory	-	-	4	2
09	BTCVM609	Community Project (Mini Project)	-	-	2	1
10	BTCVS610	Seminar on Topic of Field Visit Road Construction	-	-	1	AU
11	BTCVF611	Industrial Training$	-	-	2	--
		Sub-Total	**14**	**3**	**11**	
		Total	**28**			**19**
Elective III						
	BTCVE605A BTCVE605B BTCVE605C BTCVE605D BTCVE605E BTCVE605F	Waste Water Treatment Operations Research Geographic Data Analysis and Applications Advanced Engineering Geology Advanced Soil Mechanics Design of Masonry and Timber Structures				

. Tech. Civil Engineering

Course Structure for Semester VII (Fourth Year) w.e.f. 2020-2021

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme				Credits
			L	T	P	CA	MSE	ESE	Total	
BTCVC701	**Core**	Design of Concrete Structures - II	2	1	--	20	20	60	100	3
BTCVC702	**Core**	Infrastructure Engineering	3	--	--	20	20	60	100	3
BTCVC703	**Core**	Water Resources Engineering	3	1	--	20	20	60	100	4
BTCVC704	**Core**	Professional Practices	2	1	--	20	20	60	100	3
BTCVE705A	**Elective IV**	Construction Techniques	3	--	--	20	20	60	100	3
BTCVE705B		Engineering Economics								
BTCVE705C		Finite Element Method								
BTCVE705D		Limit State Design of Steel Structures								
BTCVE705E		Plastic Analysis and Design								
BTCVE705F		Water Power Engineering								
BTCVOE706A	**Open Elective V**	Advanced Structural Mechanics	3	--	--	--	--	--	--	Audit (AU/ NP)
BTCVOE706B		Air Pollution Control								
BTCVOE706C		Bridge Engineering								
BTCVOE706D		Introduction to Earthquake Engineering								
BTCVOE706E		Town and Urban Planning								
BTCVOE706F		Tunneling and Underground Excavations								
BTCVL707	Laboratory	Design & Drawing of RC & Steel Structures	--	--	2	30	--	20	50	1
BTCVL708	Laboratory	Professional Practices	--	--	2	30	--	20	50	1
BTCVT709	Training	Field Training /Internship/Industrial	--	--	--	--	--	50	50	1
BTCVS710	BTS	Seminar	--	--	2	--	--	50	50	1
BTCVP711	BTP	Project Stage-I**	--	--	6	--	50	50	100	3
		Total	**16**	**3**	**12**	**160**	**150**	**490**	**800**	**23**

***In case of students opting for Internship and Industry Project in the eighth semester, the Project must be industry-based.*

B. Tech. Civil Engineering

Course Structure for Semester VIII [Fourth Year] w.e.f. 2020-2021

Course Code	Type of Course	Course Title	Weekly Teaching Scheme			Evaluation Scheme$				Credits
			L	T	P	CA	MSE	ESE	Total	
BTCVSS801A	(Self-Study Course) #	Characterization of Construction Materials	03**	--	--	20	20	60	100	3
BTCVSS801B		Geosynthetics and Reinforced Soil Structures								
BTCVSS801C		Higher Surveying								
BTCVSS801D		Maintenance and Repair of Concrete Structures								
BTCESS801E		Structural Dynamics								
BTCESS802A	(Self-Study Course) #	Energy Efficiency Acoustics and Daylighting in Building	03**	--	--	20	20	60	100	3
BTCESS802B		Environmental Remediation of Contaminated Sites								
BTCESS802C		Remote Sensing Essentials								
BTCESS802D		Mechanical Characterization of Bituminous Materials								
BTCESS802E		Soil Structure Interaction								
BTCEP803	Project Stage-II	In-house Project or Internship and Project in Industry*	--	--	30	50	--	100	150	15
		Total	04	--	30	90	40	220	350	21

 # The subjects are to be studied on self-study mode using SWAYAM/NPTEL/any other online source approved by the University.

***** If required Coordinator may be appointed for each Self study course and an administrative load of 03 hours per week may be considered for monitoring and assisting the students, and to conduct examination (if required), evaluation and preparation of result.***

$ If the examination schedule for the online Self study course chosen by student do not match with the University's Academic Schedule, the University/Institute have to conduct exam for such courses.

****** Six months of Internship and Project in the Industry. One Faculty guide from the Institute and one Mentor from the Industry should be identified to monitor the progress of work. During the Project/Internship period of work, a review of work should be taken twice followed by a final presentation at the end of Project period***

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

An Autonomous Institute, with NAAC "A" Grade

At: Khandala, Post- Valni, Kalmeshwar Road, Nagpur

Department of Computer Science & Engineering

"A Place to Learn, A Chance to Grow"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

3rd Semester CSE

B. Tech. Computer Science and Engineering

INDEX

Sr. No.	Particular
G	Vision & Mission of Institute & Department / Programm Educational Objectives(PEOs) / Program Outcomes (POs) / Program Specific Outcomes (PSOs)
1.	Syllabus Autonomy (I & II Sem, III & IV Sem)
2.	Major domains AI Autonomy
3.	Subject description major domains AI Autonomy
4.1	Syllabus major 1: Artificial Intelligence
4.2	Syllabus major 2: Data Science
4.3	Syllabus major 3: Programming
4.4	Syllabus major 4: Internet of Things
4.5	Syllabus major 5: Machine Learning
5.	Minor domains offered by AI Autonomy
6.	Subject description of minor domains AI Autonomy

VISION AND MISSION OF INSTITUTE

VISION

To be a centre of excellence imparting professional education satisfying societal and global needs.

MISSION

Transforming students into lifelong learners through quality teaching, training and exposure to concurrent technologies. Fostering conducive atmosphere for research and development through well-equipped laboratories and qualified personnel in collaboration with global organizations.

VISION AND MISSION OF DEPARTMENT

VISION

To Produce Competent Professionals equipped with technical knowledge and commitment for satisfying the needs of society.

MISSION

1. To impart advanced knowledge with an inclination towards Research with well equipped Lab.

2. To develop an ability to work ethically and Responsive towards the need of society.

PROGRAM EDUCATIONAL OBJECTIVES (PEO’s)

PEOs	ATTRIBUTES
PEO 1	Students will have In-depth knowledge of trending technologies, effective communication skills, lifelong learning with leadership qualities in order to work in any multidisciplinary areas in a team or individually.
PEO 2	Students will be able to interpret and analyze the requirements of the software design and development to provide efficient engineering solutions with novel product designs within the jurisdiction of humanity and social constraints
PEO 3	Students will have the attitude to pursue higher studies or research work or initiate entrepreneurial activity

PROGRAM OUTCOMES (PO's)

POs	ATTRIBUTES
1	An Understanding of IT architecture, software and hardware concepts, functionalities and applications
2	An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages.
3	Competency of business domains and functional processes that employ IT systems and applications
4	Practical use of communication protocols and their applications in the field of internet and world wide web.
5	Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century.
6	An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains.
7	Thought leadership to design and implement practical solutions for global industry needs.
8	An Acumen to embrace and adopt futuristic IT technological developments.
9	Sound knowledge of entrepreneurship traits to succeed.
10	Adoption of practices that are ethical ensuring transparency and accountability.
11	Capability to provide solutions that are socially empowering and environment friendly.
12	Effective communication and collaboration techniques with stakeholders to achieve best results.

PROGRAM SPECIFIC OUTCOMES (PSOS):

At the end of Electronics and Telecommunication program the student will have following Program specific outcomes.

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity

PSO2: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: The ability o employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning & a zest for higher studies and also acts as good citizen by inculcating in them moral values & ethics.

Recommendations for conducting one theory course of curriculum through online Teaching / Learning

1. Only Swayam / NPTEL platform is allowed.

2. One defined subject per semester in online mode and BOS should declare that one subject for online mode based on availability of NPTEL offering before commencement of the semester.

3. Student will be allowed to appear for NPTEL / Institute level / University Examination as applicable.

4. In order to ensure learning, NPTEL lectures to be telecast in the class by including it in regular time table if required.

5. 75% assignment submission is mandatory for these online classes also like regular lecture attendance.

6. One faculty to be allotted for this subject, who will discuss and solve student's doubts. Allot 3 hrs/week load to teacher who is allotted to work as facilitator of online course.

7. For Autonomy Students: For online mode the student should submit all assignment given by nptel then his/her score has weightage of 40% for CA & MSE. And if student clear the nptel final exam and producing certificate then 60% weightage should be given as ESE, otherwise he/she has to appear for Makeup exam of Institute.

If student cannot enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II and End sem exams of the Institute.

8. For DBATU students: For online mode he has to appear for CA-I, CA-II, Midsem exam of the institute and End sem exam of University.

If student can't enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II of the institute and End sem exams of the University.

10. If the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

This system will ensure real learning; avoid any problem arising due to cancellation of NPTEL exam as it happened in this semester. At least for first year and in the unpredictable situation of covid pandemic these provisions will avoid any last moment chaos.

3rd Semester CSE

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	HSMC	CS3T001	Organizational Behaviour	2	0	0	20	20	60	100	2
2	BSC	CS3T002	Mathematics-III	3	1	0	20	20	60	100	4
3	ESC	CS3T003	Programming for Problem Solving	3	0	0	20	20	60	100	3
4	HSMC	CS3T004	Universal Human Values(UHV)	2	1	0	20	20	60	100	3
5	PCC	CS3T005	Digital Electronics and Microprocessor	3	0	0	20	20	60	100	3
6	PCC	CS3T006	Data structure & Algorithms	3	0	0	20	20	60	100	3
7	PCC	CS3T007	Operating System	3	0	0	20	20	60	100	3
8	PCC	CS3L008	Digital Electronics and Microprocessor (Lab)	0	0	2	60	0	40	100	1
9	PCC	CS3L009	Data structure and Algorithms(Lab)	0	0	2	60	0	40	100	1
10	PCC	CS3L010	Web Designing (Lab)	0	0	2	60	0	40	100	1
				19	**2**	**6**	**320**	**140**	**540**	**1000**	**24**

CS3T001	Organizational Behaviour	2 Credit

Course Objectives:

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions and understand why people behave as they do.
3. To provide the students to analyze specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

Course outcomes:

Students will be able to:

1. Outline the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.
2. Categorizing the applicability of analyzing the complexities associated with management of individual behaviour in the organization.
3. Analyze the complexities associated with management of the group behaviour in the organization
4. Validate how the organizational behaviour can integrate in understanding the motivation (why) behind behaviour of people in the organization

Course Contents:

Unit 1:Introduction to organization Behaviour [4Hrs]

Meaning, Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Challenges and Opportunities of OB, Models of OB, Impact of technology on organizational behaviour.

Organization 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.

Unit 2: Organizational Design, Change And Innovation [4 Hrs]

Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control, Dimensions of structure, Organizational design models, Multinational Structure and Design, Virtual Organizations.

Communication: The importance of communication, The communication process, Communicating within organizations, Information richness, How technology affects communication, Interpersonal communication, Multicultural communication, Barriers to effective communication, Improving Communication in organizations, Promoting ethical communications

Technical Report Writing : Characteristics of Technical Communication, Types of Technical Documents, Establishing Goals in Technical Writing, Technical Writing Process: Prewriting, writing, rewriting, Examples of Industries user manuals.

Unit3: Personality [4 Hrs]

Meaning of personality, 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.

Attitude: Attributes of personality- Transactional Analysis – Ego states – Johari window - Nature and dimensions of attitude – Developing the right attitude, ABC model of Attitude, Managerial Implications of Attitude

Unit 4: Groups and Organizations [4 Hrs]

Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, five stages of group/team development, Determinants of group behaviour, 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 5: Motivation [4 Hrs]

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.

Power and Politics: The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics, power and politics, using power to manage effectively.

Empowerment and Participation: The nature of empowerment and participation, How participation works, Programs for participation, Important considerations in participation.

Unit 6: Conflict Management [4 Hrs]

Definition. Traditional vs Modern view of conflict – Types of conflict – Intrapersonal, Interpersonal, and Organizational, Constructive and Destructive conflict, Conflict management

Stress and Counselling: What is stress? Stress model, Work stressors, Stress outcomes, Stress moderators, Stress prevention and management, Employee counselling, Types of counselling

Text Books:

1. Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2. Govind Daryanani, "Analysis and Synthesis of Filters".

Reference Books:

1. Kendall Su, “Analog Filters”, Kluwer Academic Publisher, 2nd Edition, 2002.

2. John O’ Malley, “Basic Circuit Analysis”, Schaum’s series.

3. Van Valkenberg, “Network Analysis”, Pearson Education.

CS3T002	Mathematics-III	4 Credit

COURSE OBJECTIVES:

1. To understand the concept of Laplace Transform , Fourier transform, complex variables Numerical Linear algebra, Stochastic calculus, Computational graph theory.
2. To understand the application of Mathematics in engineering and in real life.
3. To enable students to apply mathematical tool to solve problems in real life.
4. To enable students to apply mathematical tool to analyze problems in real life

COURSE OUTCOMES:

1. Describe the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory
2. Illustrate the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory by using examples.
3. Apply the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory to solve the problem.
4. Analyze the problem by using the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.
5. Evaluate the problem base on the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.
6. Create the new concept by using the theory of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.

Unit1 **[6Hrs]**

Laplace transform: Definition ;Transforms of elementary functions; Properties of Laplace transform; Inverse Laplace transform; Convolution Theorem for finding inverse Laplace transforms ; Applications of Laplace transform to find the solutions differential equations. Introduction to Latex. Calculation of Laplace transform by using software.

Unit2 **[6Hrs]**

Fourier transform: Definitions – Fourier transforms ; Properties of Fourier transforms ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms; Finite Fourier transform.

Unit3

[6Hrs]

Functions of complex variables : Analytic functions; Harmonic functions in Cartesian form; fundamental theorem of algebra; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem.

Unit4

[6Hrs]

Numerical linear algebra: Introduction to linear algebra; condition number of a matrix; sensitivity analysis; Norm ; stability of numerical algorithms; stability of nonlinear system; SVD; Power method; Google page rank algorithm.

Introduction about meta-heuristic method; Nature-inspired method : ant colony optimization .

Unit5

[6Hrs]

Stochastic calculus: Stochastic Processes: Definition and classification of random processes; Discrete-time Markov chains; Poisson process; Continuous-time Markov chains; Stochastic integration, Itôintegral , Itôformula. Stochastic differential equations. Application of stochastic calculus in computer science.

Unit6

[6Hrs]

Computational graph theory : Basic terminology in graph theory; Invariant of a graph; Adjacency matrix of a graph; Laplacian matrix of a graph; Algebraic connectivity of a graph; Properties of eigenvalues and eigenvectors of an adjacency matrix and Laplacian matrix of a graph.

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 Knowledgeware, 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.

6. D. S. Watkins, Fundamentals of Matrix Computations, John Wiley, 1991.

7. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Edition, John Hopkins University Press, 1996.

8**.** S.M. Ross, Stochastic Processes, 2nd Edition, Wiley, 1996.

9. J. Medhi, Stochastic Processes, New Age International, 1994.

10. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.North-Holland, 1976.

11. J. M. Aldous. Graphs and Applications. Springer, LPE, 2007.

12. D. M. Cvetkovic, M. Doob and H. Sachs, Spectra of Graphs: Theory and Applications, Academic Press, 1980.

13. C. Godsil and G. Royale, Algebraic Graph Theory, Graduate Texts in Mathematics 207, Springer, 2001.

14. R. B. Bapat, Graphs and Matrices, Texts and Readings in Mathematics, Hindustan Book Agency, New Delhi, 2010.

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, NewDelhi.

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.

6. L. N. Trefethen and D. Bau III, Numerical Linear Algebra, SIAM, 1997.

7. J. W. Demmel, Applied Numerical Linear Algebra, SIAM, 1997.

8. S. Shreve, Stochastic Calculus for Finance, Vol. 2, Springer, 2004.

9. J. M. Steele, Stochastic Calculus and Financial Applications, Springer, 2001

10. R. M. Patne, G. R. Avachar, note on an adjacency matrix of a graph G, Advances in Mathematics: Scientific Journal, volume 9(3), 1281–1291,2020

11. D. Lamberton and B. Lapeyre, Introduction to Stochastic Calculus Applied to Finance, Chapmans & Hall/CRC, 2000.

12. M. Baxter and A. Rennie, Financial Calculus, Cambridge University Press, 1996.

13. F. Harary: graph theory, addison-wesley reading, Massachusetts, 1996.

CS3T003	Programming for Problem Solving	3 Credit

Course Objective:

1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of C programming language.
4. To learn the usage of structured programming approach in solving problems.

Course Outcome:

1. To write algorithms and to draw flowcharts for solving problems.

2. To convert the algorithms/flowcharts to C programs.

3. To code and test a given logic in C programming language.

4. To decompose a problem into functions and to develop modular reusable code.

5. To use arrays, pointers, strings and structures to write C programs

6. Searching and sorting problems

Syllabus:

[Unit 1]: 8 **Hrs**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

[Unit 2] **6 Hrs**

Conditional Branching and Loops,Writing and evaluation of conditionals and consequent branching **,**Iteration and loops

[Unit 3] **6 Hrs**

Arrays (1-D, 2-D), Character arrays and Strings,Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations,notion of order of complexity through example programs (no formal definition required)

[Unit 4] **6 Hrs**

Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference,Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

[Unit 5] **6 Hrs**
Structures, Defining structures and Array of Structures,Pointers**,**Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list

[Unit 6]File handling and Its Implementation **3 Hrs**

Text Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. R1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice

2. R2. Hall of India

3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)

4. R3.Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

5. R4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

CS3T004	Universal Human Values	3Credit

Course Objective:

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (humanbeing), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Contents:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and ExperientialValidation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillmentof aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of 'I' and harmony in 'I'

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal ofPhysical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role othershave played in making material goods available to me.

Identifying from one's own life. Differentiate between prosperity and accumulation. Discussprogram for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5. Small is Beautiful - E. F Schumacher.

6. Slow is Beautiful - Cecile Andrews

7. Economy of Permanence - J C Kumarappa

8. Bharat Mein Angreji Raj - PanditSunderlal

9. Rediscovering India - by Dharampal

10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - Romain Rolland (English)

13. Gandhi - Romain Rolland (English)

CS3T005	Digital Electronics & Microprocessor	3	Credit

Course Objectives:

1. Understanding basic knowledge of Boolean algebra and automaton theory as a core of computer science.
2. Theoretical and practical knowledge about synthesis of combinational and sequential circuits, and programmable structures.

Course Outcomes:

Students will be able to:

1. Define basic logical circuits, Boolean algebra, minimization methods, methods for writing Boolean functions, combinational and sequential circuits, flip-flops, digital automaton, and programmable structures.
2. Describe operation methods of combinational and sequential circuits, similarities and differences of writing the Boolean functions and minimizations.
3. Select appropriate methods for realization and circuit minimization.
4. Pattern recognition for specific circuit realization and error discovery during circuit design process.
5. Synthesis of appropriate combinational and sequential logic circuits.
6. Evaluation of own solutions and error discovery.

Course Contents:

Unit 1: Logic Simplification **[6 Hrs]**

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, 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: Combinational Digital Circuits **[6 Hrs]**

Standard representation for logic functions, K-map representation, and 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

Unit3: **Sequential circuits and systems** **6 Hrs**

A 1-bit memory, the circuit properties of Bi-stable 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.

Unit4: Fundamentals of Microprocessors **[6 Hrs]**

Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bitmicroprocessors (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: Memory Interfacing **[6 Hrs]**

Memory Interfacing. I/O Interfacing. Direct Memory Access. (DMA). Interrupts in 8086.

Unit 6: 8086 Instruction Set and Programming **[6 Hrs]**

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 Publications

Reference Books:

1. An approach to digital Design: Morris Mano, Pearson Publications.

2. Microprocessor Architecture, Programming and Applications with the 8085:Ramesh Gaonkar, Penram International Publications.

3. Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

CS3T006	Data Structure & Algorithms	3Credit

COURSE OBJECTIVES

1. To understand the concepts of ADTs.
2. To learn linear data structures – lists, stacks, and queues
3. To understand sorting, searching and hashing algorithms.
4. To apply Tree and Graph structures.

COURSE OUTCOMES

1. Student shall be able to Implement abstract data types for linear data structures.
2. Student shall be able to apply the different linear and non-linear data structures to problem solutions
3. Student shall be able toCritically analyze the various sorting algorithms

[Unit 1] 4 Hrs

Complexity Analysis: Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.

[Unit 2] 6 Hrs

ADT Array-Searching and sorting on arrays: Linear search, binary search on a sorted arrays. Bubble sort, Insertion sort, merge sort and analysis; Emphasis on the comparison based sorting model, Counting sort, Radix sort, and bucket sort

[Unit 3] 8 Hrs

Stacks and Queues: Abstract data types, sequential and linked implementations, exception handling in classes, representative applications such as parenthesis matching, towers of Hanoi, wire routing in a circuit, finding path in a maze, simulation of queuing systems, equivalence problem.

[Unit 4] 8 Hrs

Linked Lists: Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, exception and iterator classes for lists, doubly linked lists, circular lists, linked lists through simulated pointers, lists in STL, skip lists, applications of lists in bin sort, radix sort, sparse tables.

[Unit 5] 8 Hrs

Trees: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heap sort, heaps in Huffman coding, leftist trees, tournament trees, use of winner trees in merge sort as an external sorting algorithm, bin packing.

[Unit 6] 6 Hrs

Graphs: Breadth first search and connected components, Depth first search in directed and undirected graphs.

Text Books:

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,1997.
2. ReemaThareja, ―Data Structures Using C, Second Edition , Oxford University Press, 2011

Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, ―Data Structures and Algorithms‖, Pearson Education,1983.
3. Stephen G. Kochan, ―Programming in C‖, 3rd edition, Pearson Education.
4. Ellis Horowitz, SartajSahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

CS3T007	Operating System	3Credit

COURSE OBJECTIVES

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.
6. Students should understand the data structures and algorithms used to implement an OS.

COURSE OUTCOMES

1. Identify the significance of operating system in computing devices.
2. Exemplify the communication between application programs and hardware devices through system calls
3. Compare and illustrate various process scheduling algoritIhms
4. Apply appropriate memory and file management schemes
5. Illustrate various disk scheduling algorithms.
6. Understand the need of access control and protection in an operating system

[Unit 1] **6 Hrs**

Introduction: Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation, UNIX system introduction and commands.

[Unit 2] **6 Hrs**

Processes and Threads: Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Communication in Client – Server Systems, Multithreading Models, Threading Issues.

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation, Process Scheduling Models.

[Unit 3] **6 Hrs**

Process Synchronization: Synchronization Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Critical Regions, Monitors, OS Synchronization

[Unit 4] **6 Hrs**

Deadlocks & Protection: Deadlock definition, Prevention, Avoidance, Detection and recovery, Goals of Protection, access matrix, implementation, Security problem.

[Unit 5] **6 Hrs**

Memory Management : Memory Management Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Basics of Virtual Memory – Hardware and control structures – Locality of reference ,Paging: Principle of operation, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing .

[Unit 6] **6 Hrs**

File systems: File concept, Access methods, Disk space management and Allocation methods strategies, Directory structures, Recovery, Log-structured File System, Disk arm scheduling strategies**.**

Protection and security: Illustrations of security model of UNIX and other OSs. Examples of attacks.

Textbook:

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, 4thEdition, 2015
3. Richard Stevens, Stephen Rago, Advanced Programming in the UNIX Environment, Pearson Education, 2/e

Reference Books:

1. D. M. Dhamdhere, *Systems Programming and Operating Systems*, McGraw-Hill, 2ndEdition, 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
5. M. J. Bach. Design of the Unix Operating System, Prentice Hall of India, 1986.Publication, 2011.

CS3L008	Digital Electronics and Microprocessor (Lab)	1Credit

Course Objectives:

1. Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs). Investigate the operation of several digital circuits combinational and sequential.
2. To understand architecture and features of typical Microprocessors.
3. To learn interfacing of real world input and output devices.

Course Outcomes:

Students will be able to:

1. Describe and explain the operation of fundamental digital gates.
2. Analyze the operation of medium complexity standard combinational circuits like the encoder, decoder, multiplexer, de-multiplexer, and adder.
3. Analyze the operation of a flip-flop and examine relevant timing diagrams.
4. Learn importance of Microprocessors in designing real time applications.
5. Describe the 8085, 8086 & 80386 Microprocessors architectures and its feature.
6. Develop interfacing to real world devices.

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-3codeconversion & 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

CS3L009	Data structure and Algorithms(Lab)	1Credit

Course Objectives:

1. To impart the basic concepts of data structures and algorithms

2. To understand concepts about searching and sorting techniques

3. To Understand basic concepts about stacks, queues, lists, trees and graphs

4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures**.**

Course Objectives:

1. Ability to analyze algorithms and algorithm correctness.

2. Ability to summarize searching and sorting techniques.

3. Ability to describe stack, queue and linked list operation.

4. Ability to have knowledge of tree and graphs concepts.

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 (de queue) 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 a program to implement a queue using two stacks such that the enqueue operation runs in linear time and dequeue operation runs in constant time.
10. Write programs to implement the following data structures:
    (a) Single linked list
    (b) Double linked list
11. Implement the following sorting algorithms:
    (a) Insertion sort
    (b) Merge sort
    (c) Quick sort
    (d) Heap sort

CS3L010	**Web Designing (Lab)**	**1Credit**

COURSE OBJECTIVES:

1. Students will able to understand and illustrate HTML.

2. Students will be able to understand about CSS Properties.

3. Student will able to understand basic of Java Script

4. Student will able to design website

COURSE OUTCOMES: Student will able to

CO1. Remember the basic tags of HTML, CSS, and JavaScript

CO2. Understand the basic tags of HTML, CSS, and JavaScript

CO3: Execute the different Syntax and Tags present in HTML, CSS, and JavaScript

CO4. Analyze difference between various web design Languages

CO5. Evaluate the design of Different Forms

CO6. Design the web site form

List of Experiments

1) Designing static web pages using basics and important tags in HTML.
2) Designing dynamic web pages using different cascading style sheets.
3) Design an XML document to store information about a patient in a hospital. Information contains first name, middle name, last name, aadhar no., age, address etc. Create CSS for the above XML document.
4) Write a JavaScript to design a simple calculator to perform various arithmetic operations.
5) Programs using Java servlets and JSP.
6) Designing web applications using PHP.
7) File handling using PHP: Design a page to save the user input details to a text file and display its contents.
8) Write a PHP code to display the number of visitors visiting the web page.
9) Designing web applications in Net Beans Environment.
10) Database Connectivity with MySQL using Java Servlets, JSP, and PHP.

4th Semester CSE

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	CS4T001	Computer Architecture Organization	3	0	0	20	20	60	100	3
2	PCC	CS4T002	Java Programming	3	0	0	20	20	60	100	3
3	PCC	CS4T003	FLAT	3	1	0	20	20	60	100	4
4	PCC	CS4T004	Computer Network	3	0	0	20	20	60	100	3
5	PCC	CS4T005	Database Management Systems	3	0	0	20	20	60	100	3
6	PCC	CS4T006	Discrete Mathematics & Graph Structures	3	0	0	20	20	60	100	3
7	PCC	CS4L007	JAVA(Lab)	0	0	2	60	0	40	100	1
8	PCC	CS4L008	Computer	0	0	2	60	0	40	100	1
9	PCC	CS4L009	DBMS(Lab)	0	0	2	60	0	40	100	1
10	MC	CS4T010	Consumer Affairs	2	0	0	15	10	25	50	Audit
				20	**1**	**6**	**315**	**130**	**505**	**950**	**22**

CS4T001	Computer Architecture Organization	3Credit

COURSE OBJECTIVES

1. To understand the relationship between instruction set architecture,architecture, and system architecture and their roles in thedevelopment of the computer.
2. To be aware of the various classes of instruction: data movement,arithmetic, logical and flow control. Explain how interrupts are used to implement I/O control and datatransfers.

3 To Understand how a CPU’s control unit interprets a machine –levelinstructions.

4 To Identify various types of buses in Computer systems.

5 To Understand memory hierarchy.

6 To Understand various peripheral devices.

COURSE OUTCOMES

Student shall be able to

1 Describe the fundamental organisation of a computer system

2 Interpret the functional architecture of computing systems. (Understanding)

3 Explain addressing modes, instruction formats and program control statements

4 Distinguishtheorganizationofvariouspartsofasystemmemoryhierarchy

5 Describe basic concept of parallel computing and Describe fundamentals concepts of pipeline and vector processing

6 Identify, compare and assess issues related to ISA, memory, control and I/O functions. (Applying, Analyzing, Evaluating)

[Unit 1] **6 Hrs**

Basic Structure of Computer: Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplicationof Positive numbers, Floating-Point Numbers and related operations Basic I/O Operations, Stacks, Queues & Subroutines.

[Unit 2] **6 Hrs**

Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Micro-programmed Control, Microinstructions, Micro-program Sequencing, Microinstruction Pre-fetching, Emulation., Booth’s Algorithm, Integer Division.

[Unit 3] **6 Hrs**

I/O Organization: Accessing I/O Devices, Interrupts, Addressing Modes, Direct Memory Access, Bus arbitration, I/O Hardware, ProcessorBus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

[Unit 4] 6 Hrs

Memory Unit: Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size& Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.

[Unit 5] 6 Hrs

Arithmetic: RISC philosophy, pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution units, performance considerations.

[Unit 6] 6 Hrs

Computer Peripherals: Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

1. V. Carl Hamacher& S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1. Stallings. W: Computer Organization &Arcitecture, Fifth Edition, Pearson Education.
2. Tananbaum A. S: Structured Computer Organization, Fifth Edition, Pearson Education.
3. Hayes J. P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.
4. M. Mano&KimeLogie: Computer Design Fundamentals, Second Edition, Pearson Education.

CS4T002	Java Programming	3Credit

COURSE OBJECTIVES

1. To learn the Advanced concepts in J2SE
2. To understand Web Application Development, Database Connectivity and itsImplementation using Servlets, JSP and JDBC
3. To introduce advanced Java frameworks for improving the web application design.

COURSE OUTCOMES

1. Student shall be able to Understand and implement advanced Java concepts.
2. Student shall be able to Develop Java based Web applications using Servlets and JSP
3. Student shall be able toIncorporate cutting-edge frameworks in web application development.

Syllabus

[Unit 1] **6 Hrs**

Basics of OOP: Abstraction, Inheritance, Encapsulation, Classes, subclasses and super classes, Polymorphism and Overloading, message communication Procedure-Oriented vs. Object-Oriented Programming concept

Introduction to Java Programming : Basics of Java, Background/History of Java, Java and the Internet, Advantages of Java , Java Virtual Machine & Byte Code , Java Environment Setup ,Java Program Structure

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[Unit 2] **6 Hrs**

Primitive Data Types : Integers, Floating Point type, Characters, Booleans , User Defined Data Type , Identifiers & Literals , Declarations of constants & variables , Type Conversion and Casting , Scope of variables & default values of variables declared , Wrapper classes , Comment Syntax , Garbage Collection

Arrays of Primitive Data Types: Types of Arrays, Creation, concatenation and conversion of a string, Decision & Control Statements, Different Operators

[Unit 3] **6 Hrs**

Class : Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword

Constructor: Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading

[Unit 4] **6 Hrs**

Basics of Inheritance: Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, Abstract Class

Package : Creating package, importing package, access rules for packages, class hiding rules in a package, Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface

[Unit 5] **6 Hrs**

Exception Handling : Introduction, Built in classes for Exception Handling, Mechanism of Exception Handling in Java, Error Handling Exception Classes

Multithreading : Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in threads

[Unit 6] **6 Hrs**

Java Applets Programming : local and remote applets, difference between applet and application, applet life cycle, developing executable applet code

Web Page Design : applet tag, adding applet to HTML file, running the applet, passing parameter to applet, various methods and component classes to develop basic applet

Textbook:

1) Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2) Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3) Complete Reference J2EE by James Keogh mcgraw publication.

Reference Books:

1) Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath .
2) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.
3) Spring in Action 3rd edition , Craig walls, Manning Publication.
4) Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication

CS4T003	FLAT(Formal Language and AutomataTheory)	4Credit

COURSE OBJECTIVES

1	To Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
2	To Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms

COURSE OUTCOMES

1	Students shall able to Define the mathematical principles behind theoretical computer science.
2	Students shall able to Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and turing machine
3	Students shall able to Correlate the different types of automata to real world applications

4	Students shall able toChoose and design appropriate automata for the different requirements outlined by theoretical computer science
5	Students shall able toIdentify the different computational problems and their associated complexity.

[Unit 1] 8 Hrs

Fundamentals : Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts of Automata Theory, DFA, NFA, and NFA & epsilon Machine. Conversions and Equivalence: Equivalence between NFA with and without epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

[Unit 2] 7 Hrs

Regular Languages : Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions, Pumping Lemma for Regular Languages, Applications of the Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages.

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms, Right most and leftmost derivation of strings.

[Unit 3] 6 Hrs

Context Free Grammars : Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push-Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of CFL and PDA, interconversion,Introduction to DCFL and DPDA.

[Unit 4] 6 Hrs

Turing Machine : Definition of Recursive and Recursively Enumerable , Church's Hypothesis , Computable Functions , Methods for Turing Machine Construction, Modifications of the Basic Turing Machine Model, Multiple Tape , Multiple Tracks, Non-determinism, etc. Equivalence of the different TM Models and the Basic TM Model.

[Unit 5] 7 Hrs

Computability Theory : Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of, problems, Universal Turing

Machine, undecidability, Posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXT BOOKS :

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H. E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation – Sipser 2nd edition Thomson .

REFERENCES BOOKS:

1. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. Theory of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley India Pvt. Ltd.
4. "Elements of Theory of Computation", Lewis H.P. &PapadimitionC.H. Pearson /PHI.
5. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI.

CS4T004	**Computer Network**	**3Credit**

1	Acquire the computer networking knowledge as well as the existing connectivity technologies and the required infrastructure which comprises the key steps involved in the communication process.
2	Identify the key issues for the realization of the LAN/WAN/MAN network
3	Establish a solid knowledge of the layered approach that makes design, implementation and operation of extensive networks possible. To learn the 7-layer OSI network model (each layer and its responsibilities) and understand the TCP/IP suite of protocols and the networked applications supported by it.
4	Establish a solid knowledge of the layered approach that makes design, implementation, and operation of extensive networks possible.
5	Acquire the knowledge of the basic protocols involved in wired/wireless communication process
6	Acquire the computer networking knowledge as well as the existing connectivity

technologies and the required infrastructure which comprises the key steps involved in the communication process.

COURSE OUTCOMES

1	Defining, using and implementing Computer Networks and the basic components of a Network system, explain the importance of data communications, how communication works in data networks.
2	Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
3	Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols.
4	Estimate the congestion control mechanism to improve quality of service of networking application
5	Analyze the features and operations of various application layer protocols such as Http, DNS, Telnet, FTP and SMTP.

[Unit 1] **6 Hrs**

Data and Signal: Define data, signal. Time domain and frequency domain representation of signal, bandwidth of a signal and medium, Sources of impairment, Attenuation, distortion, noise, data rate Limits and Nyquist bit rate, FDM and TDM, synchronous and asynchronous TDM.

[Unit 2] **6 Hrs**

Introduction of LAN; MAN; WAN; PAN, Ad-hoc Network, Network Architectures: Client-Server; Peer to Peer; OSI Model, TCP/IP Model, Topologies, Data Link Layer: Data Link Layer Design Issues: Service provided to network layer Framing, Error Control, Flow Control, Error Detection and Correction, Data Link Control, Multiple Access.

[Unit 3] **6 Hrs**

Network Layer: Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms.

[Unit 4] **6 Hrs**

Transport Layer: UDP, TCP, Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.

[Unit 5] **6 Hrs**

Application Layer: Application protocols for email, ftp, web, DNS

[Unit 6] **6 Hrs**

Advanced Networking: overview to network management systems; security threats and solutions – Firewalls, Access Control Lists, IPSec, IDS

Textbook:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. Kurose and Ross, "Computer Networking - A top-down approach", Seventh Edition, Pearson, 2017.
4. Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011.

Reference Book:

1. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning**.**

CS4T005	**Database Management Systems**	**3Credit**

COURSE OBJECTIVES

1 To Eliminate redundant data.

2 To Make access to the data easy for the user.

3 To Provide for mass storage of relevant data.

4 To Make the latest modifications to the data base available immediately.

5 To Protect data from physical harm and un-authorised systems.

6 To Allow multiple users to be active at one time.

COURSE OUTCOMES

1	Student shall be able to learn and understand fundamentals of database management system
2	Student shall be able to exhibit the query development knowledge
3	Student shall be able to learn modeling and normalization of databases.

4 Student shall be able to learn query processing and optimization techniques.

5 Students shall be able to exhibit to File Organization, Indexing and Hashing

6 Student shall be able to exhibit the knowledge of transaction and concurrency control.

[Unit 1] 6 Hrs

Introduction to Database Systems: Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, Data DefinitionLanguage (DDL), Data Manipulation Language (DML).

Data models: Evolution of Data Models, Entity-relationship model, Relational integrity constraints, data manipulationoperations.

[Unit 2] 6 Hrs

Relational query languages: Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Open source and Commercial DBMS – MYSQL,ORACLE, DB2, SQL server.

[Unit 3] 6 Hrs

Relational database design: Normalization of Database Tables: Need and Significance, Domain and data dependency, Armstrong's axioms, Normalforms, Dependency preservation, Lossless design.

[Unit 4] 6 Hrs

Query processing: Evaluation of relational algebra expressions, Query equivalence, Joinstrategies.

[Unit 5] 6 Hrs

File Organization and Indexing: Indices, B-trees, hashing.

[Unit 6] 6 Hrs

Transaction processing: Concurrency control, ACID property, Serializability of scheduling,Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Controlschemes, Database recovery.

Text Books:

1. Henry Korth, Abraham Silberschatz& S. Sudarshan, *Database System Concepts*, McGraw-Hill Publication, 6th Edition, 2011.
2. Bipin Desai, An Introduction to Database System, West Publishing Company, College & School Division, 1990.
3. RaghuRamakrishnan, Johannes Gehrke, *Database Management Systems*, McGraw-Hill Publication, 3rd Edition, 2003.

Reference Books:

1. Joel Murach, *Murach's Oracle SQL and PL/SQL for Developers,* Mike Murach& Associates, 2nd Edition, 2014.
2. Wiederhold, *Database Design*, McGraw-Hill Publication, 2nd Edition, 1983.
3. Navathe, *Fundamentals of Database System*, Addison-Wesley Publication, 6th Edition, 2012.
4. J. D. Ullman, “Principles of Database and Knowledge – Base Systems”,Vol 1, Computer Science Press.

CS4T006	**Discrete Mathematics & Graph Structures**	**3Credit**

[Unit 1] **6 Hrs**

Set Theory: Basic concepts of Set theory, Power set, some operations on Sets, Venn diagram, some basic set identities, Cartesian products. Properties of binary relation in a set, Inclusion& equality of set, Power Set, Ordered Pairs and n-tuples, Operations on Sets**.**

Mathematical Logic: Statement and notations, connectives, Negation, conjunction, disjunction, conditional & bi-conditional, statement formulas & truth tables. Tautologies, equivalence of formulas, Duality law, Tautological implications, Arguments and validity.

[Unit 2] **6 Hrs**

Relations and Functions: Relation and Ordering, Properties of Binary in a set, Relation Matrix and Graphs, Partition and Covering of a set, Equivalence relation, Partial ordering, Partially Ordered sets, Function (Definition and Introduction), Composition of functions, Inverse Functions, Characteristics function of a set.

[Unit 3] **6 Hrs**

Algebraic structures: Semi groups, monoids definition and examples, Group definitions and examples, cyclic group, permutation groups, subgroups and homomorphism, co-sets, Lagrange's theorem and Normal Subgroups.

[Unit 4] **6 Hrs**

Introduction to graphs: Graphs and their basic properties - degree, path, cycle, subgraphs, isomorphism, Eulerian and Hamiltonian walks, graph coloring, planar graphs, trees.

[Unit 5] **6 Hrs**

Introduction to counting: Basic counting techniques - inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating function.

[Unit 6] **6 Hrs**

Random variables and probability distribution: Random variables: discrete and continuous; probability density function of one and two variables; Probability distribution function for discrete and continuous random variables (one and two variables), Joint distributions, conditional distributions.

Textbooks:

1. Discrete and Combinatorial Mathematics, Ralph P. Grimaldi& B. V. Ramana, 5^{th}Edition, PHI/Pearson education.
2. "Discrete Mathematical structures", Dr D. S. Chandrashekariah, Prism 2005.
3. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7^{th}Revied and Enlarged Edition, 2016.

Reference Books:

1. "Discrete Mathematics and its Applications", Kenneth H. Rosen, 6^{th} Edition, McGraw Hill, 2007.
2. "Discrete Mathematical Structures: Theory and Applications ", D. S. Malik and M. K. Sen, Thomson, 2004.
3. "Discrete Mathematical structures", Kolman Busby Ross, 5^{th}edition , PHI.
4. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2^{nd} Edition, 2001.

CS4L007	JAVA(Lab)	1Credit

Course Objective:

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
3. Understand the principles of inheritance, packages and interfaces.

Course Outcome:

1. Identify classes, objects, members of a class and relationships among them needed for a specific problem
2. Write Java application programs using OOP principles and proper program structuring
3. Demonstrate the concepts of polymorphism and inheritance.
4. Write Java programs to implement error handling techniques using exception handling

List of Experiments

1. Install JDK, write a simple "Hello World" or similar java program, compilation, debugging, executing using java compiler and interpreter
2. Write a Java program that takes a number as input and prints its multiplication table upto 10.
3. Write a program in Java to find second maximum of n numbers without using arrays.
4. Designed a class that demonstrates the use of constructor and destructor.
5. Write a java program to demonstrate the implementation of abstract class.
6. Write a java program to implement single level inheritance.
7. Write a java program to implement method overriding

8. Create a package, Add the necessary classes and import the package in java class.
9. Write a java program to implement thread life cycle.
10. Develop minimum two basic Applets. Display Output with Applet Viewer and Browser

CS4L008	**Computer Networks(Lab)**	**1Credit**

Course Objectives:

1. To understand the working principle of various communication protocols.
2. To analyze the various routing algorithms.
3. To know the concept of data transfer between nodes.

Course Outcomes:

Students will be able to:

1. Understand fundamental underlying principles of computer networking.
2. Understand details and functionality of layered network architecture.
3. Apply mathematical foundations to solve computational problems in computer networking.
4. Analyze performance of various communication protocols.
5. Compare routing algorithms.
6. Practice packet /file transmission between nodes.

List of Experiments:

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS.
2. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS.
3. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination using NS.
4. Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment using NS.
5. Write a Program for ERROR detecting code using CRC-CCITT (16bit).
6. Write a program to find the shortest path between vertices using bellman-ford algorithm.
7. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS.
8. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).

CS4L009	**DBMS(Lab)**	**1Credit**

COURSE OBJECTIVES:

1. To explain basic database concepts, applications, data models, schemas and instances.

2. To demonstrate the use of constraints and relational algebra operations. IV. Describe the basics of SQL and construct queries using SQL.

3. To emphasize the importance of normalization in databases.

4. To facilitate students in Database design

5. To familiarize issues of concurrency control and transaction management.

COURSE OUTCOMES: At the end of the course the students are able to:

1. Apply the basic concepts of Database Systems and Applications.

2. Use the basics of SQL and construct queries using SQL in database creation and interaction.

3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.

4. Analyze and Select storage and recovery techniques of database system.

List of Experiments

1. Defining schema for applications.
2. Creating tables, Renaming tables, Data constraints (Primary key, Foreign key, Not Null), Data insertion into a table.
3. Grouping data, aggregate functions, Oracle functions (mathematical, character functions).
4. Sub-queries, Set operations, Joins.
5. Creation of databases, writing SQL and PL/SQL queries to retrieve information from the databases.
6. Assignment on Triggers & Cursors.
7. Normal Forms: First, Second, Third and Boyce Codd Normal Forms.
8. Assignment in Design and Implementation of Database systems or packages for applications such as office automation, hotel management, hospital management.
9. Deployment of Forms, Reports Normalization, Query Processing Algorithms in the above application project.
10. Large objects – CLOB, NCLOB, BLOB and BFILE.

11. Distributed data base Management, creating web-page interfaces for database applications using servlet.

CS4T010	**Consumer Affairs**	**Audit**

Course Objectives:

1. To familiarise the students with of their rights as a consumer, the social framework of

consumer rights and legal framework of protecting consumer rights.

2. To provide an understanding of the procedure of redress of consumer complaints, and the role of different agencies in establishing product and service standards.

Course Outcomes:

The student should be able to

1. Remember the basic terminology related to Consumer Affairs
2. Understand the different approaches applied in different aspects of consumption, customer protection and consumer awareness and their evolution.
3. Apply the knowledge in different aspects of consumption, customer protection and consumer awareness.
4. Comprehend the business firms' interface with consumers and the consumer related regulatory and business environment.
5. Analyse: the norms applicable to different consumption patterns.
6. Evaluating the functioning of Consumer Protection mechanism in India.

Syllabus

Unit I: **An Introduction to Consumer Affairs** **(6 hrs)**

An Introduction to History and Development of Consumer Movement; An introduction to International Organizations and Agreements; Product Liabilities Including Tortious Liabilities; Role of Non-Government Organizations (NGOs)and Voluntary Consumer Organizations (VCOs);Importance

Unit II: Grievance Redress Mechanism under the Consumer Protection Act **(6 hrs)**

Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy to be provided; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Globalization and its Consequences; Unfair Trade Practice;

Unit III: Legislation **(6 hrs)**

Features and Aim of Consumer Protection Act; Consumer Protection Act; Comparison between Pre and Post Legislation Period; Land Mark Judgements

Unit IV: Understanding Consumption and Consumer Values **(6 hrs)**

Customer Awareness Importance, Companies' Behaviour and Customer Awareness Relevance, Understanding the Market and Companies' Behaviour, Companies' Practices Requiring Consumers' Protection, Customer Awareness Relevance and Strategies

Unit V: Project Work **(4 hrs)**

Leading Cases decided under Consumer Protection Act: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity, Water, and Telecom Services; Education; Defective Product; Presenting a comprehensive solution to a selected case study.

Text Books:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. "Consumer Affairs" (2007) Delhi University Publication
2. Aggarwal, V. K. (2003). Consumer Protection: Law and Practice. 5th Ed. Bharat Law House, Delhi
3. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
4. Nader, Ralph (1973). The Consumer and Corporate Accountability. USA, Harcourt Brace Jovanovich, Inc.
5. Sharma, Deepa (2011).Consumer Protection and Grievance-Redress in India: A Study of Insurance Industry(LAP LAMBERT Academic Publishing GmbH & Co.KG, Saarbrucken, Germany

Reference Books:

1. Empowering Consumers e-book, www.consumeraffairs.nic.in

2. EBook www.bis.org8. The Consumer Protection Act, 1986 Consumer Protection Judgments (CPJ) (Relevant cases reported in various issues)

3. Recent issues of magazines: Insight, published by CERC, Ahmedabad 'Consumer Voice', Published by VOICE Society, New Delhi.

4. Upbhokta Jagran, Ministry of Consumer Affairs, Govt, of India, New Delhi

Websites:

1. www.ncdrc.nic.in
2. www.fcamin.nic.in
3. www.consumeraffairs.nic.in
4. www.iso.org.in
5. www.bis.org
6. www.ascionline.org.in
7. www.trai.gov.in
8. www.irda.gov.in
9. www.derc.gov.in
10. www.rbi.org.in
11. www.fssai.gov.in
12. www.consumer-voice.org
13. www.nationalconsumerhelpline.in
14. www.cci.gov.in

5th Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	ESC	CS5T001	Internet Of Things	3	0	0	20	20	60	100	3
2	PCC	CS5T002	TCP/IP	3	0	0	20	20	60	100	3
3	PCC	CS5T003	Design and Analysis of Algorithm	3	1	0	20	20	60	100	4
4	PCC	CS5O001	Open Elective-1	3	1	0	20	20	60	100	4
5	PEC	CS5TE01	Elective -I	3	0	0	20	20	60	100	3
6	ESC	CS5L005	Internet Of Things (Lab)	0	0	2	60	0	40	100	1
7	PCC	CS5L006	TCP/IP(Lab)	0	0	2	60	0	40	100	1
8	PCC	CS5L007	Python Programming(Lab)	0	0	2	60	0	40	100	1
9	PROJECT	CS5P008	Internship	0	0	0	0	0	0	0	1
10	MC	CS5T009	Innovation and Enterpreneurship Development	2	0	0	15	10	25	50	Audit
				17	**2**	**6**	**295**	**110**	**445**	**850**	**21**

CS5T001	Internet Of Things	3 Credit

COURSE OBJECTIVES:

1. Understand the definition and significance of the Internet of Things

2. Discuss the architecture, operation, and business benefits of an IoT solution
3. Examine the potential business opportunities that IoT can uncover
4. Explore the relationship between IoT, cloud computing, and big data
5. Identify how IoT differs from traditional data collection systems.
6. Implement IOT Applications in different areas.

COURSE OUTCOMES:

Students will able to:

1. Apply the concept of IoT.
2. Identify the different technology
3. Apply IoT to different applications.
4. Analysis and evaluate protocols used in IoT
5. Design and develop smart city in IoT
6. Analysis and evaluate the data received through sensors in IoT

COURSE CONTENTS:

UNIT I:- IoT Introduction **6 Hours**

Origin of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoTchallenges, Need of IoT ,IoT features, Bulding blocks of IoT , IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, The Core IoT Functional Stack, IoT Data Management and Compute Stack. IoT Things : Sensors and Actuators

UNIT II :- IoT Ecosystem **6 Hours**

Three layered architecture, five layer architecture, cloud computing , fog computing,
IoT taxonomy.
Connectivity Terminology : IoT LAN , IoT WAN, IoT Node, IoT Gateway IoT Proxy.

UNIT III :- IoT Protocols **6 Hours**

IoT Networking protocols : MQTT, SMQTT, CoAP, XMPP, AMQP.

IoT Communication protocols : IEEE 802.15.4, Zigbee, 6LoWPAN, Wireless HART, Z-Wave, Bluetooth, NFC, RFID, RFID.

UNIT IV :- Data AnalyticsforIoT 6 Hours

An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of IoT Security, Common Challenges in IoT Security, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment.

UNIT V :- Implementation of IoT with Arduino and RaspberryPi 7 Hours

Introduction to Arduino , Integration of sensors and actuators with Arduino, IDE programming , Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi, Programming RaspberryPi with Python, Wireless Temperature Monitoring System Temperature Sensor, Connecting Raspberry Pi via SSH, Accessing Temperature from sensors, Remote access to RaspberryPi.

UNIT VI : Application of IoT 5 Hours

Smart City and smart Homes : . Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart Home architecture, Smart Grid, Connected Vehicles.

TEXT BOOKS

[1].David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, 1 st Edition, Pearson Education

[2].Srinivasa K G, “Internet of Things”, CENGAGE Leaning India, 2017.

[3].Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1 stEdition, VPT,2014.

REFERENCE BOOK:

[1].Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017.

[2]” Analytics for the Internet of Things (IoT): Intelligent analytics for your intelligent devices”, by Andrew Minteer

[3] “Internet of Things: Architectures, Protocols and Standards”, by Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri

CS5T002	TCP/IP	3 Credit

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:

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 Contents:

UNIT-I:- **[6 Hrs]**

Network architecture-Standards, TCP/IP Model Overview, Networking Technologies: LANS, WANS, Connecting Devices. Internetworking concept, Internet Backbones, NAP, ISPs, RFCs and Internet Standards.

UNIT-II:- **[6 Hrs]**

Classful Internet address, CIDR-Subnetting and Supernetting, ARP, RARP, OOTP, DHCP.

UNIT-III:- [6 Hrs]

IP Datagram- IP Package- IP forwarding and routing algorithms, computing paths, RIPOSPF, ICMP, IGMP.

UNIT-IV :- [6 Hrs]

TCP header, services, Connection establishment and termination, Interactive data flow, Bulk data flow, Flow control and Retransmission, TCP timers, Urgent Data processing, Congestion control, Extension headers.

UNIT-V :- **[6 Hrs]**

Switching technology, MPLS fundamentals, signaling protocols, LDP, IP traffic engineering, ECMP, SBR, Routing extensions for traffic engineering, Traffic engineering limitations and future developments.

UNIT-VI:- **[6 Hrs]**

IP security protocol-IPv6 addresses, Packet format, Multicast, Anycast, ICMPv6, Interoperation between IPv4 and IPv6-QoS, Auto configuration.

Text Books:

1. TCP/IP Network Administration, Craig Haut, 3rd Edition, Shroff Publications, 2002.
2. Internetworking with TCP/IP - Principles, Protocols, and Architecture, Douglas E. Comer, 5th edition Volume-1, Prentice Hall, 2006.
3. The Internet and its Protocols- A Comparative approach, Adrian Farrel, Morgan Kaufmann, 2004. 9
4. TCP/IP Illustrated - the Protocols, W. Richard Stevens, Volume I, Pearson Education, 2003.
5. TCP/IP Protocol Suite, Behrouz A. Forouzan, 3rd edition, Tata McGraw Hill, 2006.

Reference Books: 1. IPv6 Theory, Protocol and Practice, Pete Loshin, 2nd edition, Morgan Kaufmann, 2003.

2. Internetworking TCP/IP, Comer D.E and Stevens D.L, Volume III, Prentice Hall of India, 1997.

CS5T003	Design and Analysis of Algorithm	4 Credit

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.
5. Apply important algorithmic design paradigms and methods of analysis.
6. Synthesize efficient algorithms in common engineering design situations

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 Contents:

Unit 1 : **[8 Hrs]**

Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space, Order Notation (O, Θ, Ω Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm.

Unit 2 **[8 Hrs]**

Introduction to Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Finding median, Closest Pair, Convex Hulls Problem.

Unit 3 **[8 Hrs]**

Greedy Methods, Fractional Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree – Kruskal's and Prim's Algorithm, Dijkstra's Shortest Path Algorithm.

Unit 4 **[8 Hrs]**

Introduction to Dynamic Programming, Elements of Dynamic Programming, Multistage Graphs, Traveling Salesman Problem, Matrix-chain multiplication, Optimal Polygon Triangulation, Longest common subsequence, Floyd-Warshall algorithm

Unit 5 **[8 Hrs]**

Introduction to Backtracking, N-Queen Problem, Combinational Search, Backtracking Strategies, Search & Traversal Techniques – BFS, DFS, Sum of Subsets, Graph coloring, Hamiltonian Circuit Problem, Tower of Hanoi Problem, State Space Tree, Branch & Bound, Least cost (LC) Search, Control Abstractions for LC search, FIFO Branch & Bound..

Unit 6 **[8 Hrs]**

Efficiency of Algorithms: Polynomial Time & Non-Polynomial Time Algorithms, NP-Complete, NP-Hard, Limitation of Algorithm, Worst and Average Case Behavior, Efficiency of Recursion, Complexity Calculation for Various Sorting Algorithms, Approximation of Algorithms, Time-Space Trade off in algorithms research.

Text Books:

1. Parag Dave, Himanshu Dave, Design and Analysis of Algorithm, Pearson Education India, 2nd Edition.
2. Thomas H. Cormen, Charles E Leiserson, Introduction to Algorithms, PHI Publication, 3rd Edition.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, India.

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.

CS5O001	**Open Elective-1**	**Web Development & Design**	**4 Credit**

COURSE OBJECTIVES:

1. Students will able to understand and illustrate HTML.

2. Students will be able to understand about CSS Properties.

3. Student will able to understand basic of Java Script

4. Student will able to design website

COURSE OUTCOMES: Student will able to

CO1. Remember the basic tags of HTML, CSS, and JavaScript

CO2. Understand the basic tags of HTML, CSS, and JavaScript

CO3: Execute the different Syntax and Tags present in HTML, CSS, and JavaScript

CO4. Analyze difference between various web design Languages

CO5. Evaluate the design of Different Forms

CO6. Design the web site form

Course Contents:

Unit 1 - Introduction [8 Hrs]

Introduction to Internet, World Wide Web Communication & Markup Language, HTTP Request / Response, The HTTP Request Circle.

Unit 2 -HTML Basic Tags [8 Hrs]

HTML Basic Examples, HTML Editors, HTML Elements, HTML Attributes, HTML Documents, HTML Document Structure, HTML Headings, HTML Paragraphs, HTML Styles, HTML Text Formatting, HTML Quotation and Citation Elements, HTML Comments

Unit 3 -HTML Table [8 hrs]

HTML Colors, HTML Links, HTML Images, HTML Tables, HTML List, HTML frames, HTML Layout Elements and Techniques

Unit 4 - HTML form & Media [8Hrs]

HTML Form, Attribute, Element, Input Type, Input Attribute, Input Form Attribute

Unit 5 - CSS Introduction [8Hrs]

Concept of CSS: Introduction, Syntax, CSS Border, Background, CSS Text, Font, Link, Table, list ,Align, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts)

Unit 6 -Java Script Introduction [8Hrs]

JAVA Script Implementation, Syntax Basics and Variable Types: History of a java script, java script Implementation, The language syntax, The character set, Data Types,

Reference Books:

1. Reference Book: Web Developer's Reference Guide. By: Joshua Johanan, Talha Khan, Ricardo Zea.

Reference Website:

2. Reference Website: W3 School web Developemt: https://www.w3schools.com/whatis/whatis_icons.asp

Course Outcomes:-

1. Understand Linux Architecture, different Linux installation and Linux commands.
2. Effectively use Linux Environment using shell, file system, scripts, filters and program development tools
3. Perform file I/O management through commands and perform package management, storage management and failure recovery.
4. Create backup and do recovery using tools like Rsync and Bacula
5. Automate tasks and write simple programs using scripts
6. Configure important services like FTP, DNS, MAIL and WEB.

Course Contents:

Unit I **[8Hrs]**

History of Linux OS, Architecture of Linux OS, Linux Distributions, Installation of Linux OS

Unit II **[8Hrs]**

Introduction to terminal, Basic commands, File system, File handling commands, process and process management commands, VI editor.

Unit III **[8Hrs]**

Users and Group management- Creation, Updating, Deletion of user and group, Commands – passwd, Shadow, useradd, usermod, userdel, groupadd, groupmod, groupdel.

Unit IV **[8Hrs]**

Package Management - Introduction to package manager, function of package manager, Package management commands – rpm, yum.

Unit V **[8Hrs]**

Storage management- Types of storages, creating partitions using fdisk command, Logical volume management (LVM), Creating file system, mounting file system.

Unit VI **[8Hrs]**

Shell and Shell script. Text Book 1. Unix and Shell Programming – B. M. Harwani, OXFORD University Press.

Reference Books

1. Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication

2. Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication

CS5TE01A	**Elective –I (Augmented Reality)**	**3 Credit**

COURSE OBJECTIVES:

- To make students know the basic concept and framework of virtual reality.
- To introduce students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To aware students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.
- To expose learners to the basic of AR/VR technology and devices.
- Implement applications on AR/VR technology.

COURSE OUTCOMES: After completion of the course, student will be able to

1. To understand the basic concept and framework of virtual reality
2. To understand the technology for multimodal user interaction and perception in VR
3. Decide & Apply algorithmic strategies to solve a given problem
4. To apply VR Tools in real time environment.
5. To understand augmented reality
6. To implement application of AR/VR technology with hands on experience through more informative and practical exploration.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction - VR and AR Fundamentals, Differences between AR/VR Selection of technology AR or VR AR/VR characteristics Hardware and Software for AR/VR introduction. Requirements for VR/AR. Benefits and Applications of AR/VR. AR and VR case study.

Unit 2 Visual Computation in Virtual Reality **[6 Hrs]**

Fundamentals of Computer Graphics; Real time rendering technology; Principles of Stereoscopic Display; Software and Hardware Technology on Stereoscopic Display

Unit 3 **[6 Hrs]**

software technologies - Database - World Space, World Coordinate, World Environment, Objects - Geometry, Position / Orientation, Hierarchy, Bounding Volume, Scripts and other attributes, VR Environment - VR Database, Tessellated Data, LODs, Cullers and Occluders, Lights and Cameras, Scripts, Interaction - Simple, Feedback, Graphical User Interface, Control Panel, 2D Controls, Hardware Controls, Room / Stage / Area Descriptions, World Authoring and Playback, VR toolkits, Available software in the market (Unity and Vuforia based) - Case Studies in AR, VR - Industrial applications, medial AR/VR, education and AR/VR.

Unit 4 Environment Modeling in Virtual Reality **[6 Hrs]**

Geometric Modeling; Behavior Simulation; Physically Based Simulation

Unit 5 **[6 Hrs]**

Haptic & Force Interaction in Virtual Reality

Concept of haptic interaction; Principles of touch feedback and force feedback; Typical structure andprinciples of touch/force feedback facilities in applications

Unit 6 **[6 Hrs]**

VR Development Tools

Frameworks of Software Development Tools in VR; Modeling Tools for VR; X3D Standard; Vega, Multi Gen

Text Books:

1. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
2. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009.
3. Gerard Jounghyun Kim, Designing Virtual Systems: The Structured Approach, 2005.

Reference Books:

1. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, 3D User Interfaces, Theory and Practice, Addison Wesley, USA, 2005.

2. Oliver Bimber and Ramesh Raskar, Spatial Augmented Reality: Meging Real and Virtual Worlds, 2005.

3. Burdea, Grigore C and Philippe Coiffet, Virtual Reality Technology, Wiley Interscience, India, 2003.

CS5TE01B	**Elective –I(Block Chain)**	**3 Credit**

Course Objectives:

1. To understand the concepts of blockchain
2. To understand various cryptocurrency and their working
3. To Use various algorithms for distributed consensus
4. To build a applications based on blockchain technology

Course Outcome:

CO1: Understand emerging abstract models for Blockchain Technology.

CO2: Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.

CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4: Apply hyperledger Fabric and Etherum platform to implement the Block chain Application

CO5: To designapplications based on blockchain technology for E-Governance, Land Registration, Medical Information Systems, and others

Unit I: Introduction : [6 Hrs]

Blockchain-History, Myths, Benefits, Limitations and Challenges of Blockchain, Structure of Blocks, Miners, Working of Blockchain, Types of Blockchain, Blockchain as Public Ledgers-Bitcoin , Blockchain 2.0, Smart Contracts, Transactions-Distributed Consensus, The Chain and the Longest Chain -Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain,

Unit II: Blockchain Architecture and Cryptographic**: [7 Hrs]**

Crypto Primitives, Permissioned Blockchain, Consensus mechanism ,Cryptographic -Hash Function, Properties of a hash function-pointer and Merkle tree. Public key cryptosystems, private vs public blockchain. Introduction to cryptographic concepts required, Hashing, public key cryptosystems, private vs public blockchain and use cases,

Unit III: Bitcoin Consensus: **[6 Hrs]**

Introduction to Bitcoin Blockchain, Transactions, Bitcoin limitations, Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

Unit IV: Cryptocurrency and Smart Contracts **[6 Hrs]**

Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, IOTA, Namecoin. Legal Aspects Cryptocurrency Exchange, Black Market and Global Economy. Smart Contracts: Definition, DAO, Ricardian contracts, Precompiled contracts.

Unit V: HyperledgerFabric: **[6 Hrs]**

Architecture of Hyperledger fabric v1.1-Introduction to hyperledger fabric v1.1, chain code-Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, TruffleDesign and issue Crypto currency, Mining, DApps, DAO

Unit VI: BlockchainApplications : **[6 Hrs]**

Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, Finance, and others

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016
2. Draft version of “S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology: Cryptocurrency and Applications’, Oxford University Press, 2019.
3. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

4. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017

Reference Books

1. Nicola Atzei, Massimo Bartoletti, and TizianaCimoli, A survey of attacks on Ethereum smart contracts
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.
3. Nakamoto, Satoshi, Bitcoin: A peer-to-peer electronic cash system, Research Paper

CS5TE01C	Elective –I (3D Printing & Design)	3 Credit

COURSE OBJECTIVES:

1. To gain knowledge and skills related to 3D printing technologies.
2. To learn the selection of material, equipment and development of a product for Industry 4.0 environment.
3. To understand the various software tools, process and techniques for digital manufacturing.
4. To apply these techniques into various applications.

COURSE OUTCOMES:

1. Develop CAD models for 3D printing. Import and Export CAD data and generate .stl file.
2. Select a specific material for the given application.
3. Select a 3D printing process for an application.
4. Produce a product using 3D Printing or Additive Manufacturing (AM).

Course Contents:

Unit 1 3D Printing (Additive Manufacturing) [6 Hrs]

Introduction, Process, Classifications, Advantages, Additive v/s Conventional Manufacturing processes, Applications.

Unit 2 CAD for Additive Manufacturing [4 Hrs]

CAD Data formats, Data translation, Data loss, STL format.

Unit 3 Additive Manufacturing Techniques [8 Hrs]

Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology. Process, Process parameter, Process Selection for various applications. Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools

Unit 4 Materials **[6Hrs]**

Polymers, Metals, Non-Metals, Ceramics Process, Process parameter, Process Selection for various applications. Various forms of raw material- Liquid, Solid, Wire, Powder; Powder Preparation and their desired properties, Polymers and their properties. 4.3 Support Materials

Unit 5 Additive Manufacturing Equipment **[6Hrs]**

5.1 Process Equipment- Design and process parameters

5.2 Governing Bonding Mechanism

5.3 Common faults and troubleshooting

5.4 Process Design

Unit 6 Post Processing: Requirement and Techniques & Product Quality **[6Hrs]**

6.1 - **Post Processing: Requirement and Techniques-** Support Removal, Sanding, Acetone treatment, polishing.

6.2- **Product Quality** -Inspection and testing Defects and their causes.

Text Books:

1. Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies:• Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3. Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
4. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.
5. J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
6. L. Lu, J. Fuh and Y.S. Wong, "Laser-Induced Materials and Processes for Rapid Prototyping", Kulwer Academic Press, 2001.
7. Zhiqiang Fan And Frank Liou, "Numerical Modelling of the Additive Manufacturing (AM) Processes of Titanium Alloy", InTech, 2012.

CS5L005	Internet Of Things (Lab)	1 Credit

Course Objectives:

1. To understand the technologies in Internet of Things.
2. Students should get the knowledge of Arduino board and Raspberry-Pi board
3. Students should get the knowledge about the different components of IoT such as LED, LCD, different sensors, actuators etc..
4. To Analyze, design and develop parts of Internet of Things solution.
5. To understand the concept of IoT and can able to build the IoT applications.

Course Outcomes:

Students will able to;

1. Identify and adopt knowledge of the terminology, application, requirements and constraints of IoT development.
2. Explain development of hardware and software in real-time environment via advanced automated designing and testing tools.
3. Design and implementation of IoT with advanced microcontroller and interfaces.
4. Testing of complex and critical real world IoT, interfaced to digital hardware in real world situation.
5. Evaluate a real-time. IoT industrial control system using an embedded microcontroller with associated interface and communication devices.

List of Experiments:

1. Control a LED with push button using Arduino board.
2. Traffic light controller using Arduino.
3. Fire alarm system by interfacing Arduino with temperature and gas sensors
4. Interfacing 4x4 keypad with Arduino and print on LCD 16x2
5. Design password protected door lock system using Arduino.
6. Interfacing servo motor with Raspberry-Pi .
7. Interfacing stepper motor with Raspberry-Pi

8. Controlling LED using Raspberry-Pi using web server.
9. Mini project on home automation.
10. Case study on smart city.

CS5L006	TCP/IP (Lab)	1 Credit

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:

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 Contents:

1) To study the of different types of network cables and practically implement the crossed wired cable, straight through cable and roll over cable using clamping tool
2) To study of network devices in detail.
3) Connect the computers in local area network (star topology, pear to pear network)
4) To study of basic network command and network configuration command
5) To study ipv4 Addressing to give IP addresses of diffrent classes in different network id
6) To study ipv4 subnetting to give ip addresses of diffrent class in given network id at subnet
7) Decode header fields of IP datagram
8) Decode header fields from TCP header
9) To Study implement TCP/IP socket communication
10) To study configure a DNS server/ FTP server

CS5L007	Python Programming(Lab)	1 Credit

Course Objectives:

- Develop a basic understanding of programming and the Python programming language.
- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python.
- To develop the ability to write database applications in Python

Course Outcome: At the end of the course, the student will be able to

- Explain basic principles of Python programming language
- Implement object oriented concepts
- Implement database and GUI applications.

List of Experiments:

1. Write a Python program to print all the Even/Odd numbers between 1 and 100.
2. Write a Python class to implement pow(x, n).
3. Write a recursive function to calculate the sum of numbers from 0 to 10.
4. Arrange string characters such that lowercase letters should come first.
5. Create a child class Bus that will inherit all of the variables and methods of the Vehicle class
6. Python Program to Remove the ith Occurrence of the Given Word in a List where Words can Repeat.
7. Python Program to Remove All Tuples in a List of Tuples with the USN Outside the Given Range
8. Python Program to Count the Occurrences of Each Word in a Given String Sentence
9. Python Program to Count the Frequency of Words Appearing in a String Using a Dictionary.
10. Python Program to Map Two Lists into a Dictionary

CS5P008	**Internship**	**1 Credit**

CS5T009	**Innovation and Entrepreneurship Development**	**Audit**

COURSE OBJECTIVES

1. To understand the importance of Innovation and Idea Generation
2. To understand the concept of entrepreneurship.

COURSE OUTCOMES

At the end of the course students will be able to

1. Identify and validate of ideas.
2. Remember Patent registration of Innovation.
3. Understand roles and responsibilities of Entrepreneurship.

Unit 1: Innovation [06 Hours]

Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.

Unit 2: Entrepreneurship [06 Hours]

Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur,

Factors affecting growth of entrepreneurship.

Unit 3: Role of Entrepreneurial Bodies [06 Hours]

Theory of achievement, motivation, Medelland’s. experiment, Women entrepreneurship, Role of SSI,

it’s advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.

Unit 4: Role of Entrepreneurial Support [06 Hours]

Factors governing project selection, Market survey, Preparation of project report. Financial, technical
& market analysis of project. Entrepreneurial support systems, Role of consultancy organization like,District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time.

Text Book

1) Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.

Reference Book

1) Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business
Publishers.

Scheme of 6th Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	CS6T001	Artificial Intelligence & Robotics	3	0	0	20	20	60	100	3
2	PCC	CS6T002	Neural Networks and Machine Learning	3	0	0	20	20	60	100	3
3	PEC	CS6TE02	Elective -II	3	0	0	20	20	60	100	3
4	PEC	CS6TE03	Elective-III	3	0	0	20	20	60	100	3
5	OEC	CS6O002	Open Elective-2	3	1	0	20	20	60	100	4
6	PCC	CS6L003	Neural Networks and Machine Learning(Lab)	0	0	2	60	0	40	100	1
7	PCC	CS6L004	Full Stack Development(Lab)	0	0	2	60	0	40	100	1
8	PCC	CS6L005	Advance Java Programming(LAB)	0	0	2	60	0	40	100	1
9	PROJECT	CS6P006	Mini Project	0	0	6	25	0	25	50	3
10	MC	CS6T007	Intellectual Property Rights	2	0	0	15	10	25	50	Audit
11	PROJECT	CS6P007	CRT(Campus Recruitment Training)	0	0	2	60	0	40	100	1
				17	**1**	**12**	**320**	**110**	**470**	**900**	**23**

CS6T001	Artificial Intelligence & Robotics	3 Credit

COURSE OBJECTIVES:

- To understand the concept of Artificial Intelligence (AI) .
- To learn various peculiar search strategies for AI
- To acquaint with the fundamentals of mobile robotics
- To develop a mind to solve real world problems unconventionally with optimality

COURSE OUTCOMES: After completion of the course, student will be able to

- Identify and apply suitable Intelligent agents for various AI applications
- Design smart system using different informed search / uninformed search or heuristic approaches.
- Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem.
- Apply the suitable algorithms to solve AI problems

Course Contents:

Unit 1 **[8Hrs]**

Introduction –

Artificial Intelligence: Introduction, Typical Applications. State Space Search: Depth Bounded DFS, Depth First Iterative Deepening. Heuristic Search: Heuristic Functions, Best First Search, Hill Climbing, Variable Neighborhood Descent, Beam Search, Tabu Search. Optimal Search: A * algorithm, Iterative Deepening A* , Recursive Best First Search, Pruning the CLOSED and OPEN Lists.

Unit 2 [8Hrs]

Problem Decomposition and Planning

Problem Decomposition: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan

Space Planning, A Unified Framework For Planning. Constraint Satisfaction : N-Queens, Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies.

Unit 3 [8 Hrs]

Logic and Reasoning

Knowledge Based Reasoning: Agents, Facets of Knowledge. Logic and Inferences: Formal Logic, Propositional and First Order Logic, Resolution in Propositional and First Order Logic, Deductive Retrieval, Backward Chaining, Second order Logic. Knowledge Representation: Conceptual Dependency, Frames, Semantic nets

Unit 4 [8Hrs]

Natural Language Processing and ANN

Natural Language Processing: Introduction, Stages in natural language Processing, Application of NLP in Machine Translation, Information Retrieval and Big Data Information Retrieval. Learning: Supervised, Unsupervised and Reinforcement learning. Artificial Neural Networks (ANNs): Concept, Feed forward and Feedback ANNs, Error Back Propagation, Boltzmann Machine.

Unit 5 Robotics [8Hrs]

Robotics: Fundamentals, path Planning for Point Robot, Sensing and mapping for Point Robot, Mobile Robot Hardware, Non Visual Sensors like: Contact Sensors, Inertial Sensors, Infrared Sensors, Sonar, Radar, laser Rangefinders, Biological Sensing. Robot System Control: Horizontal and Vertical Decomposition, Hybrid Control Architectures, Middleware, High-Level Control, Human-Robot Interface.

Unit 6 Robots in Practice [8Hrs]

Robot Pose Maintenance and Localization: Simple Landmark Measurement, Servo Control, Recursive Filtering, Global Localization. Mapping: Sensorial Maps, Topological Maps, Geometric Maps, Exploration. Robots in Practice: Delivery Robots, Intelligent Vehicles, Mining Automation, Space Robotics, Autonomous Aircrafts, Agriculture, Forestry, Domestic Robots.

Text Books:

1. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India), 2013, ISBN : 978-1-25-902998-1

2. 2. Elaine Rich, Kevin Knight and Nair, “Artificial Intelligence”, TMH, ISBN-978-0-07-008770-5
3. 3. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Third edition, Pearson, 2003, ISBN :10: 0136042597
4. 4. Michael Jenkin, Gregory, “ Computational Principals of Mobile Robotics”, Cambridge University Press, 2010, ISBN : 978-0-52-187157-0

Reference Books:

1. Nilsson Nils J , “Artificial Intelligence: A new Synthesis, Morgan Kaufmann Publishers Inc. San Francisco, CA, ISBN: 978-1-55-860467-4

2. Patrick Henry Winston, “Artificial Intelligence”, Addison-Wesley Publishing Company, ISBN: 0-201-53377-4

3. Andries P. Engelbrecht-Computational Intelligence: An Introduction, 2nd Edition-Wiley India- ISBN: 978-0-470-51250-0

CS6T002	Neural Networks and Machine Learning	3 Credit

COURSE OBJECTIVES:

1. Basic neuron models: McCulloch-Pitts model and the generalized one, distance or similarity based neuron model, radial basis function model, etc.
2. Basic neural network models: multilayer perceptron, distance or similarity based neural networks, associative memory and self-organizing feature map, radial basis function based multilayer perceptron, neural network decision trees, etc.
3. Basic learning algorithms: the delta learning rule, the back propagation algorithm, self-organization learning, the r4-rule, etc.

COURSE OUTCOMES:

After learning the course the student will be able:

1. Understand the mathematical foundations of neural network models
2. Design and implement neural network systems to solve real world problems.

Unit 1 **[6Hrs]**

Structure of biological neurons relevant to ANNs. Models of ANNs; Feedforward & feedback networks; learning rules; Hebbian learning rule, perception learning rule, delta learning rule, Widrow-Hoff learning rule, correction learning rule, Winner –lake all elarning rule, etc.

Unit 2 **[6Hrs]**

Classification model, Features & Decision regions; training & classification using discrete perceptron, algorithm, single layer continuous perceptron networks for linearly seperable classifications. Linearly non-seperable pattern classification, Delta learning rule for multi-perceptron layer, Generalized delta learning rule, Error back-propagation training, learning factors, Examples.

Unit 3 **[6Hrs]**

Linear Association, Basic Concepts of recurrent Auto associative memory: rentrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.

Unit 4 **[6Hrs]**

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 5 **[6Hrs]**

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 6 **[6Hrs]**

Unsupervised Learning: Clustering:Learning from unclassified data, Hierarchical Aglomerative Clustering, k-means partitional clustering, Batchler and Wilkin's algorithm.
Reinforcement Learning: The learning task, Q learning, Non-deterministic rewards and action, Temporal difference learning, Generalizing from examples.

Text Books:

1. Jacek M. Zurada, Introduction to Artificial Neural Systems, PWS Publishing Company, 1995.
2. Simon Haykin, Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company, 1994.

Reference Books:

1. Miroslav, Kubat. “An Introduction to Machine Learning”, Springer Publishing.
2. Bishop, C. M., “Pattern Recognition and Machine Learning”, Springer Publishing.

CS6TE02A	Cloud Computing	3 Credit

COURSE OBJECTIVES:

1.To provide students with the fundamentals and essentials of Cloud Computing.

2.To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.

3.To enable students exploring some important cloud computing driven commercial systems and applications.

4.To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

COURSE OUTCOMES:

1. Understand the core concepts of the cloud computing and its benefits along with its various models and services in cloud computing.

2.Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

3.Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.

4.Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.

5.Analyze various cloud programming models and apply them to solve problems on the cloud.

Course Contents:

Unit 1 **[6 Hrs]**

Cloud Computing Fundamental: History of cloud computing, Cloud Computing definition, private, public and hybrid cloud. Applications and challenges of cloud computing.

Types of Cloud Services: IaaS, PaaS, SaaS., Public Cloud Vs Private Clouds..

Unit 2 **]6 Hrs]**

Cloud Architecture: Introduction to Architecture, Benefits and challenges, Application availability, performance, security and disaster recovery; future of Cloud Applications. Desktop and Device Management: Introduction- Objectives, Desktop Virtualization- Across Industries Client Desktops, Desktop placement in the cloud Merits Desktop as a Service (DaaS), Desktop Management Watching the four areas Asset Management.

Unit 3 **[6 Hrs]**

Virtualization: Introduction to Virtualization, Network virtualization techniques, Virtual Machine (VM), VM Components and process of converting physical to VMs, Block virtualization and file level storage virtualization, Virtual LAN (VLAN) and Virtual SAN (VSAN)

Unit 4 **[6 Hrs]**

Cloud Application Development: Service creation environments, Development environments, Amazon, Azure, Google App. Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages. Accessing the Cloud Introduction-Objectives, Platforms Web Application Framework- Web Hosting Services Proprietary Methods, Web Applications APIs in Cloud Computing, Browsers for Cloud Computing Internet Explorer Mozilla Firefox Safari Chrome.

Unit 5 **[6 Hrs]**

Cloud Services Management: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

Unit 6 **[6 Hrs]**

Cloud Security: Cloud Security Overview, Cloud Security Challenges and Secure Cloud Software Requirements. Risks: Risk Management, Privacy and compliance risk. Software-as-a-Service Security, Security Governance, Security Monitoring, Security Architecture Design. Data Security, Application Security, Virtual Machine Security, Identity Management and Access Control, Autonomic Security.

Text Books:

1. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach [ISBN: 0071626948]
2. Rajkumar Buyya, Christian Vecchiola, S.TamaraiSelvi, Mastering Cloud Computing- ,TMGH,2013.
3. Barrie Sosinsky: "Cloud Computing Bible", Wiley-India, 2010

Reference Books:

1. GautamShroff, Enterprise Cloud Computing Technology Architecture Applications [ISBN: 978-0521137355]
2. Ronald L. rutz, Russell Dean Vines, Cloud Security A comprehensive Guide to Secure Cloud Computing, Wiley India, 2010.
3. ohn W.Rittinghouse and ames F.Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press, 2010.
4. Kumar Saurabh, Cloud Computing insights into New-Era Infrastructure, Wiley India,2011.

CS6TE02B	**Angular JS**	**3 Credit**

COURSE OBJECTIVES:

1. To Understand the architecture and the instruction set of microprocessor
2. To study Assembly language programming as well as the design of various types of Digital and analog interfaces

1. To Understand the architecture of 8086

COURSE OUTCOMES:

1. Perform the conversion among different number systems
2. Design digital components including – decoders, multiplexers, arithmetic circuits.
3. Design of synchronous sequential circuits.
4. Illustrate how the different peripherals are interfaced with Microprocessor.
5. Distinguish and analyze the properties of Microprocessors & Microcontrollers.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction to AngularJS, AngularJS Expressions: Numbers, Strings, Objects, Arrays, Expressions using {{ }} and ng-bind.

Modules: Creating a module, adding a controller & directive, myApp.js ,myCtrl.js, Loading library.

Unit 2 **]6 Hrs]**

Directives: Data Binding, ng-init, ng-repeat, ng-app & ng-model directives, custom directives.2 way binding, Validating User Input, Status, ng-empty, ng-touched, ng-valid, ngpending. Data Binding: Synchronization between model and view. AngularJS Controllers: ng-controller, Controller Methods, External Files. Scope: $scope, understanding the scope, $rootScope.

Unit 3 **[7 Hrs]**

Filters: Adding Filters to Expressions, Adding Filters to Directives, The currency Filter, The filter Filter, Filter an Array Based on User Input, Sort an Array Based on User Input, Custom Filters. AngularJS Services: The $http Service, The $timeout Service, The $interval Service, Create Your Own Service. AngularJS AJAX - $http: AngularJS $http, Methods, Properties, JSON.

AngularJS Tables: Displaying Data in a Table, Displaying with CSS Style, Display with orderBy Filter, Display with uppercase Filter, Display the Table Index ($index), Using $even and $odd.

Unit 4 **[6 Hrs]**

AngularJS Select Boxes: Creating a Select Box Using ng-options.

AngularJS HTML DOM: The ng-disabled Directive, The ng-show Directive, The ng-hide Directive.

AngularJS Events: AngularJS Events, Mouse Events, The ng-click Directive, Toggle, True/False, $event Object.

AngularJS Forms: Input Controls, Data-Binding, Checkbox, Radiobuttons, Selectbox.

AngularJS Form Validation: Required, E-mail, Form State and Input State, CSS Classes, Custom Validation.

Unit 5 **[6 Hrs]**

AngularJS API: AngularJS Global API

AngularJS and W3.CSS: W3.CSS

AngularJS Includes: AngularJS Includes.

Unit 6 **[5Hrs]**

AngularJS Animations: CSS Transitions,

AngularJS Routing

AngularJS Application

Reference Book:

AngularJS

Author: By Brad Green, Shyam Seshadri · 2013

Learning AngularJS

By Brad Dayley · 2014

Reference Link: Angular JS w3 school

https://www.w3schools.com/angular/angular_application.asp

CS6TE02C	Middleware Technologies	3 Credit

COURSE OBJECTIVES:

The course content enables students to:

1. Understand different types, benefits and pitfalls of client server computing models.
2. Establish communication between client and server through java RMI and JDBC.
3. Implement C#.Net applications using Assemblies, and Callback Interfaces.
4. Develop client server applications using heterogeneous programming languages with CORBA
5. Learn java bean component model with EJBS and CORBA.

COURSE OUTCOMES:

At the end of the course students are able to:

1. Choose appropriate client server computing model for given problem.
2. Design a dynamic remote application with RMI and JDBC Connectivity.
3. Develop client server applications using C#.net
4. Select appropriate language for homogeneous and heterogeneous objects.
5. Develop real time projects by combining CORBA and database interfacing

UNIT – I

Introduction to client server computing: Evolution of corporate computing models from centralized to Distributed computing, client server models. Benefits of client server computing , pitfalls of client server Programming. Advanced Java: Review of Java concept like RMI , and JDBC.

UNIT – II

Introducing C# and the .NET Platform; Understanding .NET Assemblies, Object –Oriented Programming with C#, Callback Interfaces. Building c# applications: Type Reflection, Late Binding, and Data Access with ADO.NET .

UNIT-III

Core CORBA / Java: Two types of Client/ Server invocations-static , dynamic. The static CORBA, first CORBA program, ORBlets with Applets, Dynamic CORBA-The portable count, the dynamic count Existential CORBA: CORBA initialization protocol, CORBA activation services, Introduction to SOA

UNIT-IV

Java Bean Component Model: Events, properties, persistency, Introspection of beans, CORBA Beans. CORBA: Object transaction monitors CORBA OTM's, CORBA OTM's.

UNIT V - EJB Java Bean Component Model, EJB Architecture, Session Bean, Java Message Service, Message Driven Bean, Entity Bean

Text Books:

1. Client/Server programming with Java and CORBA Robert Orfali and Dan Harkey, John Wiley & Sons , SPD 2nd Edition .

2. Java programming with CORBA 3rd Edition, G.Brose, A Vogel and K.Duddy, Wiley-dreamtech, India John Wiley and sons.

Reference Books:

1. Distributed Computing, Principles and applications, M.L.Liu, Pearson Education.

2. Client/Server Survival Guide 3rd edition Robert Orfali Dan Harkey & Jeri Edwards, John Wiley & Sons 3. C# Preciesely Peter Sestoft and Henrik I . Hansen , Prentice Hall of India.

CS6TE02D	Human Computing	3 Credit

COURSE OBJECTIVES

The student should be made to:

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Gain an understanding and articulate the fundamental design concepts and practices associated with the design of human-computer interactions.
- Analyze human factors such as cognition, affect and behaviour as they relate to the human-computer interaction and apply them in the development of human-computer interactions.
- Evaluate the impact of new and emerging technology trends on human computer interactions and the user experience.
- Synthesize sound (solid) design principles and aesthetics as they apply to the design of innovative interfaces.

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

- Design effective dialog for HCI.
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

Unit 1: FOUNDATIONS OF HCI [**6 Hrs]**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks.

Unit 2 : INTERACTIVE SYSTEM DESIGN **[6 Hrs]**

Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering .

Unit 3 : MODELS AND THEORIES **[6 Hrs]**

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit 4: MODEL BASED DESIGN AND EVALUATION [6 Hrs]

Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and HickHyman's law.

Unit 5: GUIDELINES IN HCI [6 Hrs]

Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Cognitive walkthrough.

Unit 6: TASK MODELING AND ANALYSIS [6 Hrs]

Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design.

TEXTBOOK:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O‟Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O‟Reilly, 2009.(UNIT-V)

REFERENCE BOOK:

1. Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.
2. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).

CS6TE03A	Brain Machine Interface and Interaction	3 Credit

Course Objectives:

(1) Obtain the background to conduct research in brain-computer interaction and human-computer interaction;

(2) Understand the literature in the field of brain sensing for human-computer interaction research;

(3) Understand the various tools used in brain sensing, with a focus on functional near-infrared spectroscopy (fNIRS) research at Drexel;

(4) Understand the steps required to use real-time brain sensing data as input to an interactive system;

(5) Understand the domains and contexts in which brain-computer interfaces may be effective;

(6) Understand the open questions and challenges in brain-computer interaction research today.

Course Outcomes:

Learner will be able to understand the biophysical basis of non-invasive brain signals, to apply signal processing, discrimination, and classification tools to interpret these signals, and to implement these tools into a control system for a brain-computer interface

Unit I

Hardware/Software Components Of BMI

Introduction, Components and signals, Electrodes, Bio signal amplifier, Real-time processing environment, Motor imagery, P300 spelling device, SSVEP, Accuracies achieved with different BCI principles, Applications-twitter, second life, smart home control with BCI

Unit 2 **]6 Hrs]**

Feature Extraction Methods : Time/Space Methods – Fourier Transform, Wavelets, AR, MA, ARMA models, Bandpass filtering, Template matching, Kalman filter, PCA, Laplacian filter – Linear and Non-Linear Features

Unit 3

Feature Translation Methods : Linear Discriminant Analysis –Nearest neighbours, Support Vector Machines - Regression – Learning Vector Quantization –Gaussian Mixture Modeling – Hidden Markov Modeling –Neural Networks

Unit 4 **[6Hrs]**

BCI: Based On The Flash Onset And Offset Vep

Introduction- Methods- Peak-to-valley amplitudes in the onset and offset FVEPs, Determination of gazed target, Usability of Transient VEPs in BCIs- VEPs, Availability of transient VEPs, Machine learning approach

Unit 5

Applications of BCI:

Study of BCI Competition III – Dataset I, II, III, IV and V, Functional restoration using Neuroprosthesis - Functional Electrical Stimulation, Visual Feedback and control - External device controllers, Case study: Brain actuated control of mobile Robot. Ethical issues in BCI research.

Text Books:

Reza Fazel-Rezai, “Recent Advances in Brain-Computer Interface Systems”,Intech Publications, First Edition, 2011.

Theodre Berger W, John k Chapin et all, “Brain computer interfaces, An International assessment of research and developmental trends”, Springer, First Edition, 2008.)

Reference Books:

1. Jonathan Wolpaw,Elizabeth Winter Wolpaw,’Brain Computer Interfaces: Principles and practice”, Edition 1, Oxford University Press, USA, January 2012

2. Special Issue on Brain Control Interfaces, IEEE Transactions on Neural Systems and Rehabilitation Engineering, Vol 14, June 2006.

3. R. Spehlmann, “EEG Primer”, Elsevier Biomedical Press, 1981.

4. Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010

CS6TE03B	Computer Forensic	3 Credit

COURSE OBJECTIVES:

1. To correctly define and cite appropriate instances for the application of computer forensics correctly collect and analyze computer forensic evidence.

2. Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics

COURSE OUTCOMES:

1. Students will explain and properly document the process of digital forensics analysis.

2. Students will gain an understanding of the tradeoffs and differences between various forensic tools.

3. Students will be able to describe the representation and organization of data and metadata within modern computer systems.

4. Students will understand the inner workings of file systems.

5. Students will be able to create disk images, recover deleted files and extract hidden information.

6. Students will be introduced to the current research in computer forensics. This will encourage them to define research problems and develop effective solutions.

Course Contents:

Unit -I: Cyber Crime and computer crime

Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.

Unit -II: Cyber Laws

Security Assurance, Security Laws, IPR , International Standards ,Security Audit , SSE-CMM/COBIT etc.

Unit-III: Computer Forensics

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications

Unit-IV: Forensic Tools and Processing of Electronic Evidence

Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information,

Unit- V Process of computer forensics and digital investigations

Processing of digital evidence, digital images damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.

Text Books:

1. The Third Edition of Internet Cryptography" by Richard E.Smith
2. Computer Forensics by John R.Vacca
3. The Third Edition of Computer Forensics and Cyber Crime: An Introduction by Marjie T.Britz

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Reference Books:

1. "Digital Forensics and Cyber Crime" by Joshua I James and Frank Breitinger
2. "Practical Forensic Imaging" by Bruce Nikkel

CS6TE03C	Deep Learning	3 Credit

COURSE OBJECTIVES:

1. understand complexity of Deep Learning algorithms and their limitations
2. understand modern notions in data analysis oriented computing;
3. Be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
4. Be capable of performing distributed computations.
5. Be capable of performing experiments in Deep Learning using real-world data.

COURSE OUTCOMES:

1. Learn topics such as convolutional neural networks, recurrent neural networks, training deep networks and high-level interfaces.
2. Understand the language and fundamental concepts of artificial neural networks.
3. Troubleshoot and improve deep learning models.
4. Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.

Course Contents:

Unit 1 INTRODUCTION [8 Hrs]

Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression) - Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates.

Unit 2 DEEP NETWORKS [8 Hrs]

History of Deep Learning- A Probabilistic Theory of Deep Learning- Backpropagation and regularization, batch normalization- VC Dimension and Neural Nets-Deep Vs Shallow NetworksConvolutional Networks- Generative Adversarial Networks (GAN), Semi-supervised Learning.

Unit 3 DIMENTIONALITY REDUCTION [8 Hrs]

Linear (PCA, LDA) and manifolds, metric learning - Auto encoders and dimensionality reduction in networks - Introduction to Convnet - Architectures – AlexNet, VGG, Inception, ResNet - Training a Convnet: weights initialization, batch normalization, hyperparameter optimization.

Unit 4 OPTIMIZATION AND GENERALIZATION [6 Hrs]

Optimization in deep learning– Non-convex optimization for deep networks- Stochastic OptimizationGeneralization in neural networks-. Spatial Transformer Networks- Recurrent networks, LSTM - Recurrent Neural Network Language Models- Word-Level RNNs & Deep Reinforcement Learning - Computational & Artificial Neuroscience.

Unit 5 CASE STUDY AND APPLICATIONS [6 Hrs]

Imagenet- Detection-Audio WaveNet-Natural Language Processing Word2Vec - Joint DetectionBioInformatics- Face Recognition- Scene Understanding- Gathering Image Captions

Text Books:

1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016.
2. Cosma Rohilla Shalizi, Advanced Data Analysis from an Elementary Point of View, 2015.
3. Deng & Yu, Deep Learning: Methods and Applications, Now Publishers, 2013.
4. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Reference Books:

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

CS6TE03D	Quantum Computing	3 Credit

COURSE OBJECTIVES:

1. The objective of this course is to provide the students an introduction to quantum computation.
2. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.

COURSE OUTCOMES:

1. Basics of complex vector spaces.
2. Quantum mechanics as applied in Quantum computing.
3. Architecture and algorithms.
4. Fundamentals of Quantum computations

Course Contents:

Unit 1 **[3 Hrs]**

Introduction to Quantum Computation: Quantum bits, B loch sphere representation of a qubit, multiple qubits. (Reference IIT Roorke)

Unit 2 **[8 Hrs]**

Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis. (Reference IIT Roorke)

Unit 3 **[6 Hrs]**

quantum mechanics, Measurements in bases other than computational basis. 083 Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits. (Reference IIT Roorke)

Unit 4 **[6 Hrs]**

Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states, Quantum teleportation. Quantum Cryptography, no cloning theorem. (Reference IIT Roorke)

Unit 5 **[8 Hrs]**

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search. (Reference IIT Roorke)

Unit 6 **[8 Hrs]**

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation.(Reference IIT Roorke)

Text Books:

1. Nielsen M. A ., Quantum Computation and Quantum Information, Cambridge University Press.2002
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I : Basic Concepts, Vol I I: Basic Tools an d Special Topics, World Scientific.2004
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms.2000

Reference Books:

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010
3. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

CS6L003	Neural Networks and Machine Learning(Lab)	3 Credit

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.

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples. 3. Write a program to demonstrate the working of the decision tree based ID algorithm.
3. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

CS6L004	Full Stack Development(Lab)	3 Credit

Practical:

1.a Develop static pages (using Only HTML5) of an online Book store. The pages should resemble: www.flipkart.com the website should consist the following pages. Home page, Registration and user Login User Profile Page, Books catalog Shopping Cart, Payment By credit card Order Conformation

1.b Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

1.c Write an HTML page including any required Javascript that takes a number from one text field in the range of 0 to 999 and shows it in another text field in words. If the number is out of range, it should show "out of range" and if it is not a number, it should show "not a number" message in the result box

1.d Write a program in CSS to show your city with building and moving cars.

Or

Write a program to show personal portfolio web page using HTML, CSS, JQuery& AJAX

1.e Write JQuery code to show website slider.

2.a A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello , you are not authorized to visit this site" message, where should be replaced with the entered name. Otherwise it should send "Welcome to this site" message.

2.b A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary

2.c A web application takes a name as input and on submit it shows a hello page where is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You Message with the duration of usage (hint: Use session to store name and time).Modify the above program to use an xml file instead of database

3. Build the Frontend and Backend of Zomato like website with Express.js,Node.js and MongoDB

4 Build best practices applications by using NoSQL

5 Build Frontend using React + Redux

6 Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings

7 Write PHP program how to send mail using PHP.

8 Implement Cloud-hosted deployment & project dependency management and bundling tools

CS6L005	Advance Java Programming(LAB)	3 Credit

Course Objectives:

1. To build software development skills using java programming for real world applications.
2. To implement frontend and backend of an application.
3. To implement classical problems using java programming.

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand the structure and model of the Java programming language, (knowledge)
2. Use the Java programming language for various programming technologies (understanding).
3. Develop software in the Java programming language, (application).
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis).
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis).
6. Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

List of Experiments:

1. Write a Servlet to display "Hello World" on browser.
2. Assume that the information regarding the marks for all the subjects of a student in the last exam are available in a database, Develop a Servlet which takes the enrolment number of a student as a request parameter and displays the mark sheet for the student.
3. Develop a Servlet which looks for cookies for username and password, and forwards to a home.jsp in case the cookies are valid and forwards to login.jsp, in case the cookies are not found or the cookies are not valid.

4. Develop a Servlet to authenticate a user, where the login id and password are available as request parameters. In case the authentication is successful, it should setup a new session and store the user's information in the session before forwarding to home.jsp, which displays the user's information like full name, address, etc.
5. Create Servlet file which contains following functions:
    1. Connect
    2. Create Database
    3. Create Table
    4. Insert Records into respective table
    5. Update records of particular table of database
    6. Delete Records from table.
    7. Delete table and also database
6. User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions. Use following Java Statement interface to implement program:

    a) Prepared Statement

    b) Callable statement
7. Study and implement Hibernate.
8. Study and Implement MVC using Spring Framework.

CS6P006	Mini Project	3 Credit

Evaluation Criteria: The total term work shall be of 50 marks. The 30 marks shall be distributed over internal assessments / reviews (at least 02 reviews) during the semester by a review committee. The remaining 5 marks shall be distributed for attendance. The Head of the Department shall constitute the review committee. The student shall make presentation on the progress made before the committee. The 20marks of the practical will be awarded based on the performance in the practical exam conducted by the University at the end of the semester.

General Suggestions and Expectations / Guidelines

• The project shall be developed in C++/JAVA/PYTHON

• The students may choose the theory concepts they studied in different subjects as project topic.

• Interdisciplinary project proposals and innovative projects are encouraged and more appreciable.

• The project topic can be suggested by the staff member or it can be proposed by the students.

• The project topic shall be approved by the project in-charge.

• The Guides are advised to give projects and suggest project titles focusing more on the current field ofresearch and ensure the level of innovation.

• A project team shall contain a maximum of 2 members.

• The project work should be properly distributed among the team members.

• Students should submit the project documentation at the beginning of the semester consisting of:

Title, AbstractModules Split-upDeliverables for each reviewData Model (If Any)Details of Team Members

• Reviews for the project work will be conducted at regular intervals by the panel of examiners formed by theHead of the Department.

• The student failing to attend the project review will be subject to strict action as decided by the Head of theDepartment.

• Throughout the semester at any point of time if students are found to be involved in any of the following:

Using project codes available on the Internet

Using project codes developed by someone elseUsing project work which is already submitted in other institute or university Such students shall bedeclared failed or penalized as decided by the Examiners.

• The students must arrange regular meetings with the guide and present progress of project work.

• A Spiral bound Project report to be prepared as per the guidelines and format given by the Department

• The guides are advised to check for the formatting of the presentation and project report.

• Students must submit a report well before the end of the semester

CS6T007	Intellectual Property Rights	3 Credit

Course Objective :

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
6. To aware about current trends in IPR and Govt. steps in fostering IPR

Course Outcome :

1. The students once they complete their academic projects, shall get an adequate knowledge on patent and copyright for their innovative research works.
2. During their research career, information in patent documents provide useful insight on novelty of their idea from state-of-the art search. This provide further way for developing their ideaor innovations.
3. Pave the way for the students to catch up Intellectual Property(IP) as an career option R&D IP Counsel, Government Jobs such as Patent Examiner, Private Jobs,Patent agent and Trademark agent , Entrepreneur

Course Contents:

UNIT1: Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad Function of IPR. Public good, Incentive theory, different forms of IPR , Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT 2: Practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad .Introduction to competition Law, Anti-competitive agreements, Abuse of dominance, Regulation of combinations,

UNIT3: International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT 4: The relationship and Interaction between IPR and competition law The economics of US Anti trust law, IP and competition issues, Technology transfer agreements. The EU experience with IP and Competition Law

UNIT5: Market allocation, Horizontal agreements, Vertical agreements, licensing issues. Indian Competition Act and IPR protection. Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

Reference book:

1. Ahuja, V K. (2017). Law relating to Intellectual Property Rights. India, IN: Lexis Nexis.

E-resources:

1. Subramanian, N., & Sundararaman, M. (2018). Intellectual Property Rights–An Overview. Retrieved from http://www.bdu.ac.in/cells/ipr/docs/ipr-eng-ebook.pdf

2. World Intellectual Property Organisation. (2004). WIPOIntellectual property Handbook. Retrieved from https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

CS6P007	Campus Recruitment Training	1 Credit

About CRT Training Campus Recruitment training (CRT) at is designed to aid candidates in their preparation for Recruitment through Campuses or outside campuses (i.e On campus or off campus). Students in their final step of graduation looking for placement in reputed organizations can make use of this training to get trained to deliver their best in the selection processes of organizations.

COURSE OBJECTIVES

1. To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of campus recruitment drive.
2. To groom the students to the corporate level
3. To ensure that all eligible students are employed by the end of the final year of study.

COURSE OUTCOMES

At the end of the course students will be able to

1. Solve the problems easily by using Short-cut method with time management which will be helpful to them to clear the competitive exams for better job opportunity.
2. Analyze the Problems logically and approach the problems in a different manner.
3. Students will be able to apply mathematical analysis of data to make connections, draw conclusions and solve problems.
4. Students will learn a series of techniques through practical activities to develop presenting skills and enhance confidence to expand the potential of the individual.
5. Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
6. Students demonstrate an ability to target the resume to the presenting purpose
7. Demonstrate professional behavior(s) including preparedness, professional attire, and respectful presentation during interviews.

PART I: - QUANTITATIVE ABILITY

Unit 1: - 03 hrs

Speed Maths Calculation, Number Systems, Ratio & Proportion, Percentage

Unit 2: - 03 hrs

Profit – Loss & Discount, Simple Interest & Compound Interest, Simple Equation and Age's

Unit 3:- 03 hrs

Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation – Combination & Probability

PART II: - REASONING ABILITY

Unit 1: - 03 hrs

Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy

Unit 2: - 03 hrs

Sitting Arrangement, Puzzles.

Unit 3:- 03 hrs

Syllogism, Statement course of action, Statement arguments, Statement Assumptions, Miscellaneous Type of Reasoning

PART III: - Employability Skills

Unit 1: - Presentation Skills (02 hrs)

What is a presentation? Essential characteristics of Good presentation.

Preparation of presentation: Identify the purpose, Analyze the audience, Design and organize the information, Medium of presentation and Visual aids

Delivering Presentation: rehearsal, body Language, Handling questions, Tips to fight stage fear.

Unit 2: - Job Interview Skills (02 hrs)

Types of interviews, Focus of interview, dress code, importance of body language.

Probable interview questions, Telephonic and video interview, Strategies for success at interview.

Unit 3: - Resume Building (02 hrs)

Meaning, Difference among Bio-data, Curriculum vitae and Resume.

CV writing tips, The content of Resume, Structure of Resume

Books

1. Prashant Sharma, SOFT SKILLS PERSONALITY DEVELOPMENT FOR LIFE SUCCESS. BPB Publication.
2. P. D. Chaturvedi & Mukesh Chaturvedi, Business Communication: Concepts, Cases, and Applications 2nd Edition. Pearson Education.
3. Barun Mitra, Personality Development and Soft Skills. Oxford University Press.
4. Dr.K.Alex, *Soft Skills Know yourself and Know the World*. S.ChandPublishing, 2014
5. R.S Agrawal, Quantitative Aptitude.
6. Arun Sharma, How to Prepare for Quantitative Aptitude.
7. R. S Agrawal, Verbal and Non Verbal Reasoning.
8. R.V.Praveen,Quantitative Aptitude and Reasoning, 2nd Revised Edition 2013, Prentice-Hall of India Pvt.Ltd.
9. G. K. Ranganath, C. S. Sampangiram and Y. Rajaram, A text Book of business Mathematics, 2008, Himalaya Publishing House

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Department of Electronics and Telecommunication Engineering

"Rectifying Ideas, Amplifying Knowledge"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

Third Semester B. Tech. in Electronics and Telecommunication Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	ET3T001	Multivariate Calculus	2	1	0	20	20	60	100	3
2	ESC	ET3T002	Electronic Devices & Circuits-I	3	1	0	20	20	60	100	4
3	PCC	ET3T003	Analog communication system	2	1	0	20	20	60	100	3
4	PCC	ET3T004	Digital Circuits and microprocessor	2	1	0	20	20	60	100	3
5	PCC	ET3T005	Integrated circuit and application	3	1	0	20	20	60	100	4
6	PCC	ET3T006	Network synthesis and analog filter	2	1	0	20	20	60	100	3
7	ESC	ET3L002	Electronic Devices & Circuits-I lab	0	0	2	60	0	40	100	1
8	PCC	ET3L003	Analog communication system lab	0	0	2	60	0	40	100	1
9	PCC	ET3L004	Digital Circuits and microprocessor Lab	0	0	2	60	0	40	100	1
10	Internship	ET3F007	Field Training-1	0	0	0	0	0	50	50	1
11	MC	ET3T008	Innovation and Entrepreneurship Development	2	0	0	10	15	25	50	Audit
			Total	**16**	**6**	**6**	**310**	**135**	**555**	**1000**	**24**

ET3T001	Multivariate Calculus	3 Credit

Course outcomes:

Students will be able to:

1. Describe properties of Laplace transform, Convolution Theorem, Fourier integral theorem, Parseval's identity, Cauchy's integral theorem, Cauchy's residue theorem.
2. Illustrate the examples using Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables, Matrices.
3. Apply the knowledge of Laplace transform, Z-transform, function of complex variable, Advance partial differential equation.
4. Analyze the question on Laplace transform, Fourier Transform, Partial differential equation, Function of Complex Variables
5. Create a modal using Laplace transform, Fourier Transform, Theory of probability, Function of Complex Variables, Matrices.

Course Contents:

Module-1: Matrices **[6 Hrs]**

Characteristics equation, Eigen values and Eigen vectors, Statement and Verification of Cayley Hamilton Theorem [without proof], Reduction to Diagonal form, Sylvester's theorem [without proof.]

Module-2: Laplace Transform **[5 Hrs]**

Definition – conditions for existence; Properties of Laplace transforms; Transforms of some special functions- periodic function, Heaviside-unit step function.

Module-3: Inverse Laplace Transform **[5 Hrs]**

Introductory remarks; Inverse transforms of some elementary functions; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of differential equations.

Module-4: Z-Transform **[5 Hrs]**

Definition, Convergence of Z-transform and Properties, Inverse Z-transform by PartialFraction Method, Residue Method (Inversion Integral Method), Solutions of DifferenceEquations with Constant Coefficients by Z- transform.

Module-5: Theory of Probability **[6 Hrs]**

Axioms of Probability, Conditional Probability, Baye's Rule, Random variables: Discrete and Continuous random variables, Probability function and Distribution function, Joint distributions, Independent Random Variables, Conditional Distributions.

Module-6: Functions of Complex Variables **[5 Hrs]**

Analytic functions; Conjugate functions; Cauchy- Riemann equations in Cartesian and polarforms; Harmonic functions in Cartesian form, Cauchy's integral theorem; Bilinear transform Cauchy's integral formula; Residues; Cauchy's residue theorem (All theorem without proofs)

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
2. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
3. A Course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
4. A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N.Wartikar, Pune VidyarthiGriha Prakashan, Pune.
5. Higher Engineering Mathematics by H. K. Das and Er. RajnishVerma, S. Chand & CO.Pvt. Ltd., NewDelhi.

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, NewDelhi.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia PteLtd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, TataMcgraw-Hill Publishing Company Ltd., NewDelhi.
4. Integral Transforms and Their Engineering Applications by Dr.B.B.Singh, Synergy. Knowledgeware, Mumbai.
5. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, NewYork.
6. Advanced Mathematics for Engineers by Chandrika Prasad

ET3T002	Electronics Devices and Circuits-I	4 Credit

Prerequisites: Basic knowledge of Semiconductor Physics (FYT106 and FYT110)

Course Objectives:

1. To understand properties, characteristics and behaviour of basic solid state devices such as PN junction diode/BJT/JFET
2. To know and analyse different amplifier configurations.
3. To introduce concepts of feedback in electronic circuits
4. To design Electronic circuits using diodes and transistors

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Explain the working principle, operation and characteristics of basic solid state devices such as PN junction diode, BJT and JFET.
2. Apply the concept of biasing techniques and feedback to improve stability of circuits.
3. Categorize amplifiers and oscillators based on feedback topology.
4. Analyse different amplifier configurations and DC bias circuitry of BJT.
5. Interpret BJT circuits for small signal at low and high frequencies.
6. Design Electronic circuits using diodes and transistors.

Course Contents:

Module-1: Semiconductor Theory and PN Junction Devices **[5 Hrs]**

Energy bands in silicon, intrinsic and extrinsic silicon, Carrier transport in silicon diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. P-N junction diode theory, Zener diode, Zener as a Voltage regulator, Tunnel diode, LED, Schottky diode, Varactor Diode operation, characteristics and applications such as Rectifiers, Filters

Module-2: Bipolar Junction Transistors **[5 Hrs]**

BJT Structure, Operation, Input and Output Characteristics in CE, CB and CC configuration, Comparison of transistor configurations,Ebers-Moll model, BJT biasing techniques, Load line concept, Thermal Runaway, Stability factor, Stabilization Techniques, Ratings and specifications of BJT from data sheet.

Module-3: Single Stage Amplifiers **[5 Hrs]**

BJT small signal model – Analysis of CE, CB, CC amplifiers, Concept of frequency response, Miller's theorem, Effect of coupling, bypass, junction and stray capacitance on frequency response of BJT amplifiers

Module-4: Power Amplifiers **[5 Hrs]**

Classes of Power amplifiers – Class A, Class B, Class AB, Class C and Class D amplifiers, Analysis of Class A, Class B, Class AB amplifiers, Distortions in amplifiers, concept of Total Harmonic Distortion, Comparison of power amplifiers

Module-5: Feedback Amplifiers and Oscillators **[5 Hrs]**

Feedback Concept, Classification of amplifiers based on feedback topology, (Voltage, Current, Transconductance and Transresistance amplifiers), Effect of negative feedback on various performance parameters of an amplifier, Analysis of one circuit for each feedback topology. Oscillators: Condition for oscillations, Phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators

Module-6: Junction Field Effect Transistors **[5 Hrs]**

JFET:-Structure, Symbol, Basic Operation, Drain and Transfer Characteristics, Biasing arrangements for JFET, Biasing against device variation, biasing for zero current drift.

Universal JFET bias curve, Ratings and specifications of JFET from data sheet.

Text Books:

1. Millman & Halkies, "Electronic Devices and Circuits", Second Edition, Tata McGraw Hill.

2. Boylestead & Nashelsky, "Electronic devices and Circuits Theory" Eighth edition, PHI

3. S. Salivahanan, N.Suresh Kumar,"Electronic devices and Circuits", Fourth Edition ,McGraw Hill Education (India) Private Ltd

4. Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition, Tata McGraw Hill

Reference Books.

1. MillmanHalkies, "Integrated Electronics", Seventh edition,Tata McGraw Hill.

2. David A. Bell,"Electronic Device and Circuits", Fourth Edition, PHI.

3. Gupta.J.B, "Electron Devices and Circuits", Second Edition,S.K.Kataria& Sons,

4. Floyd,"Electronic Devices", Seventh Edition, Pearson.

5. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004.

6. Ben G. Streetman "Solid State Electronic Devices", Sixth Edition ,Pearson

E-Resources:

1. https://nptel.ac.in/courses/122/106/122106025/
2. https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
3. http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
4. http://www.electronics-tutorials.ws/transistor/tran_1.html
5. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/

ET3T003	Analog Communication System	3 Credit

Course Objectives:

1. To introduce the concepts of analog communication systems and to make the students understand the functions of major building blocks of communication system and noise performance.
2. To develop a clear insight into techniques involved in different types of modulation and demodulation of AM & FM signals.
3. To introduce the fundamental concepts of sampling theorem.
4. To describe the effect of noise in analog and pulse modulation systems

Course Outcomes:

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

1. Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
2. Distinguish between different types of analog modulation techniques based on bandwidth Occupied and power transmitted.
3. Analyze the performance of analog communications in the presence of noise by evaluating the figure of merit for different schemes of modulation
4. Evaluate different components of analog communication systems such as modulator, demodulator, mixer, receiver etc in time and frequency domain.
5. Design the modulators, demodulators for amplitude and frequency modulated systems.
6. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

Course Contents:

Module-1: AM Transmission **[5 Hrs]**

Introduction Overview: Signals and their classifications, Fourier analysis of Signals and Systems. Elements of a Communication System, Need for modulation, Channel, Noise, and Band pass transmission: Complex low pass representation of narrowband signals and systems,
Equivalent low pass transmission model.

Module-2: AM Reception **[6 Hrs]**

Amplitude modulation DSB-FC, DSB-SC, SSB, VSB and ISB transmissions: mathematical Analysis-time and frequency domain analysis, modulation index, generation and detection methods, power requirement of these systems, Comparison of AM modulation schemes, Quadrature Carrier Multiplexing(QAM), frequency division multiplexing.

Module-3: FM Transmission **[6 Hrs]**

Angle Modulation Frequency Modulation (FM),: Single Tone Frequency Modulation, Spectrum Analysis, Narrowband FM, Wideband FM, Transmission Bandwidth of FM Waves, Generation of FM waves: Direct and Indirect Methods, Demodulation of FM, Phase Locked Loops, Limiting of FM waves, comparison between AM & FM, Phase Modulation, Relation between FM and PM.

Module-4: FM Reception **[5 Hrs]**

Radio Receivers and performance in the noise Basic receiver (TRF), Super heterodyne receiver for AM and FM, performance parameters for receiver such as sensitivity, selectivity, fidelity, image frequency rejection etc., AGC technique, Sources of noise, Signal to Noise Ratios, Figure of Merit Calculations, Noise in AM, Pre emphasis and De-emphasis in FM, Comparison of Noise Performance of different modulation schemes.

Module-5: Applications of AM and FM **[4 Hrs]**

Applications of AM and FM AM Radio, Television: Video Bandwidth, Choice of Modulation, Colour Television, HDTV, FM Radio, FM Stereo Multiplexing.

Module-6: Acoustics **[5 Hrs]**

Acoustics: Introduction to acoustic transducers, microphone and loud speakers, construction, types, characteristics and applications, Block schematic of Public address system, High quality audio such as stereophonic, Dolby, surround, 3-D etc.

Text Books:

1. J. G. Proakis and M. Salehi, “Communication system engineering”, 2/e, Pearson Education Asia, 2002.

2. R. E. Ziemer, W. H. Tranter, “Principles of Communications: Systems, Modulation, and Noise”, 5/e, John Wiley & Sons, 2001.

3. Simon Haykins and Michael Moher,”Communication Systems”, 5th Edition, John Wiley and sons, 201

4. Communication Systems - Analog and digital, Singh and Sapre, 2nd edition, 2007, TMH.

Reference Books:

1. Wayne Tomasi, "Electronic Communications Systems – Fundamentals Through advanced", 5th Edition Pearson Education, 2012
2. H. Taub and D. L. Schilling, Principles of Communication Systems, 3rd Reprint,McGraw Hill, 2006.
3. George Kennedy and Bernard Davis," Electronic Communication systems", 4thEdition, TMH, 2008
4. Modern digital and analog Communication systems, B. P. Lathi, 3rd edition, 2015, Oxford University Press.
5. Roddy and Coolen, "Electronic Communication Systems", Pearson Education.
6. Frank R. Dungan, "Electronic Communication Systems", Delmar Publishers.

ET3T004	Digital Circuits and Microprocessor	3 Credit

Course Objectives:

1. Develop a strong foundation of digital electronics.
2. Understand concepts of combinational and sequential circuits.
3. Develop and design synchronous circuits and sequential machines.
4. Understand the concepts of processors

Course Outcomes:

Students will be able to:

1. Define Logic Families and Programmable Devices and understand the architecture of logic families and combinational digital circuits and describe the basic concept and interrupts in microprocessors.
2. Classify SOP and POS forms, combinational and sequential circuits, synchronous and asynchronous circuits.
3. Apply the principles of Boolean algebra to manipulate, minimize design logic circuits using logic gates and K-map and Use HDL & appropriate EDA tool for digital logic design and simulation.
4. Analyze combinational logic circuits and sequential circuits.
5. Recommend various combinational logic circuits like code converters, multiplexers, adders in the design of complex hierarchical combinational blocks like multipliers, fast adders etc and Validate sequential logic circuits elements like latches, flip-flops for counters, registers, simple finite state machine and similar circuits.
6. Design modular combinational circuits, synchronous sequential logic circuits and interface various devices with microprocessor.

Course Contents:

Module-1: Logic Simplification **[6 Hrs]**

Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Logic Gates, combinational Logic Optimization Techniques, Canonical forms of Boolean expression. Implementations of Boolean expressions using logic gate, Introduction to logic families & their characteristics such as Fan-In, Fan-out, Propagation delay, Power dissipation, Noise Margin

Module-2: Combinational logic Design **[5 Hrs]**

Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, K-Map, half and full adders, Subtractors, serial parallel adders, Barrel Shifter, ALU. VHDL constructs and codes for combinational circuits.

Module-3: Sequential circuits **[5 Hrs]**

Latches and flip-flops: SR-FF, D-FF, JK-FF, Master-Slave JK-FF & T-FF's, Excitation &Truth Table, Flip-flop conversions, Shift registers. Introduction to Synchronous Counters: Ring counter, Johnson counter.

Module-4: Synchronous machines **[5 Hrs]**

Classification of synchronous machines, Design of synchronous sequential machines using Moore & Mealy circuits: Sequence detector, State diagram and implementation.

Module-5: Fundamentals of Microprocessor **[5 Hrs]**

Basic 8085 microprocessor architecture and its functional blocks, 8085 microprocessor IC pinouts and signals.

Module-6: Programming with 8085 **[6 Hrs]**

Assembly Language Programming Basics, Addressing Modes, Instruction set of microprocessor, Instruction timing diagram. Writing, Assembling & Executing Assembly Language Programs, Memory Interfacing.

Text Books:

1. An approach to digital Design: Morris Mano, Pearson Publications.
2. Microprocessor Architecture, Programming and Applications with the 8085:Ramesh Gaonkar, Penram International Publications.
3. Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

Reference Books:

1. Fundamentals of digital circuits: A. Anand Kumar, Prentice-Hall of India, 4Edition.t
2. Modern digital Electronics: R.P. Jain, Tata McGraw Hill, 4Edition.r
3. Digital Electronic Principles: Malvino, PHI, 3Edition.

ET3T005	Integrated Circuit and Applications	4 Credit

Prerequisites:

1. Concepts of Basic Electrical Engineering.
2. Fundamentals of Engineering Mathematics

Course Objectives:

1. To understand characteristics of various Analog Circuits.
2. To study and interpret the datasheet
3. To study various op-amp parameters and their significance for Op-Amp.
4. To analyze and identify linear and nonlinear applications of Op-Amp.
5. To understand functionalities of PLL.

Course Outcomes:

Students will be able to:

1. Understand and explain the basic concepts of OPAMP.
2. Demonstrate the working principle of various analog circuits.
3. Conduct experiments using analog electronic components, electronic instruments and modern tool.
4. Analyze analog circuits to evaluate various performance parameters.
5. Compare multivibrator circuits, Data converters.
6. Design and realize filters, Oscillators, linear and non-linear applications of Op-Amp.

Course Contents:

Module-1: Introduction to Operational Amplifier **[6 Hrs]**

Op-Amp Fundamentals: Block diagram of operational amplifier, Op-Amp parameters, virtual ground concept, Differential amplifiers, Interpreting datasheet. Inverting & non invertingconfigurations

Circuits with resistive feedback: Concept of feedback & their types.

Module-2: OP-Amp Linear Applications **[6 Hrs]**

Voltage follower, Summing amplifier, scaling and averaging amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), current to voltage converters, voltage to current converters, Peak detector, using Op-Amp & Transistor and analog multipliers.

Module-3: OP-Amp Non Linear Applications **[6 Hrs]**

Comparators, Log and antilog amplifiers, Schmitt trigger, Clipper and Clamper, Precision Rectifier. Multivibrators: Bistable, Monostable, Astable multivibrator circuits using Op-Amp, Sample/Hold circuits.

Module-4: Signal Generator **[6 Hrs]**

Principle of Oscillators, Barkhausen's criterion, Oscillator types: RC, LC oscillators, Triangular wave generator, Saw tooth wave generators. Monolithic timer IC 555, applications of IC 555, V to F and F to V converters.

Module-5: Design of Converters and filters **[6 Hrs]**

D-A conversion techniques, A-D Conversion techniques, First and second order Low Pass filter, High Pass filter, Band Pass filter, Band Select and All pass active filters.

Module-6: Phase Locked Loops & multipliers **[6 Hrs]**

Block diagram of PLL free running frequency, lock range, capture range and Sample circuits for each block. Applications of PLL - Frequency synthesizer FM demodulator, AM demodulator, FSK demodulator, Analog multiplier, Multiplier IC.

Text Books:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, SheilB.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.
4. N. C. Goyal and Khetan 'A Monograph on Electronics Design Principals', Khanna Publications
5. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", McGraw Hill.

Reference Books:

1. Fiore, "Opamps& Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
2. Floyd ,Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, "Integrated Electronics – Analog and Digital circuits system", Tata McGraw Hill, 2003.
4. Robert F. Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6th edition, 2012.
5. Tobey, Graham, Huelsman "Operational Amplifier Design and Applications" McGraw Hill.

ET3T006	Network Synthesis and Analog Filter	3 Credits

Prerequisites:

Basic knowledge of network analysis, Ohms law, Kirchoff's Current and Voltage law.

Course Objectives:

1. To review basic components of electric network.
2. To appreciate the consequences of linearity using various network theorems.
3. To analyze Analog circuits that include energy storage elements using Laplace transforms for circuit analysis.
4. To analyze and synthesize waveforms for different electrical parameters.
5. To analyze four terminal networks using two-port parameters
6. To learn about the basics of analog Filters

Course outcomes:

Students will be able to:

1. Define various terminologies and network theorems.
2. Understand the basics of Network synthesis and analog filters.
3. Apply knowledge of mathematics to solve numerical based on network simplification and it will be used to analyze the same.
4. Analyze steady state and transient response of electrical circuits
5. Characterize the transfer function for two – port networks.
6. Design various electrical circuits using network theorems.

Course Contents:

Module-1: Basics of electric circuits **[5 Hrs]**

Basics of electric circuits, circuit elements and their voltage – current relationship,classification of circuit elements, sources – their types and characteristics, concept of equivalent sources, source transformation, nodal analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy. Series Circuit, Parallel Circuit, Source shifting, Principe of duality, concept of V-shift and I-shift.

Module-2: Basics of Network Analysis **[5 Hrs]**

Mutual inductance, coefficient of coupling, dot convention, dot marking in coupled coils, mesh analysis of circuits containing resistors, inductors, capacitors, transformers, and both independent and dependent sources to determine current, voltage, power, and energy.

Module-3: Network Theorems **[5 Hrs]**

Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Module-4: Laplace Transform **[5 Hrs]**

Review of Laplace Transform, concept of complex frequency, transform impedance and admittance, s – domain impedance and admittance models for resistor, inductor and capacitor, series and parallel combinations of elements. Transformed network on loop and mesh basis, mesh and node equations for transformed networks, time response of electrical network with and without initial conditions by Laplace transform, Transient analysis.

Module-5: Introduction to Active Filters **[6 Hrs]**

Aspects of filter design problem, approximation problem in network theory, maximally flat low pass filter approximation (Butterworth), Chebyshev approximations.

Module-6: Synthesis of Active filters **[5 Hrs]**

Synthesis of Active filters: Low Pass, Band Pass, RC-CR Transformation, Sensitivity, Biquad Circuits.

Text Books:

1. Franklin Kuo, "Network Analysis & Synthesis", Wiley International.
2. Govind Daryanani, "Analysis and Synthesis of Filters".

Reference Books:

1. Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.
2. John O' Malley, "Basic Circuit Analysis", Schaum's series.
3. Van Valkenberg, "Network Analysis", Pearson Education.

ET3L002	Electronics Devices and Circuits-I Lab	1 Credit

Prerequisites: Basic knowledge of Semiconductor Physics and theoretical knowledge about the practical.

Course Objectives:

1. To identify Basic electronic components and devices
2. To observe the characteristics of diodes and Transistors
3. To analyze different amplifier configurations and their Frequency response
4. To design Electronic circuits using diodes and transistors

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Acquire the basic concepts of different semiconductor components and understand the use of semiconductor devices in different electronic circuits.
2. Identify basic devices such as diodes, BJT and JFET from their package information by referring to manufacturer's data sheets.
3. Plot and study the characteristics of semiconductor devices.
4. Simulate Electronic circuits using SPICE.
5. Calculate different performance parameters of transistor.
6. Design, build and test the performance of various circuits.

List of Experiments:

1. To Plot the V- I characteristics of PN junction diode (Silicon), Zener diode, LED under forward and reverse bias conditions.
2. To find the i) Voltage regulation ii) Load Regulation of a Zener shunt regulator
3. To design Half wave rectifier (with and without Filter) and find ripple factor and efficiency of Half wave Rectifier
4. To plot input and output wave forms of the Full Wave Rectifier (with and without Filter) and find ripple factor and efficiency of Full wave Rectifier
5. To observe the action of a Transistor as an Electronic switch
6. To plot input and Output Characteristics of Common Base Transistor configuration
7. To plot input and Output Characteristics of Common Emitter Transistor configuration
8. To obtain Frequency Response of single stage CE Amplifier and Find performance parameters
9. To plot Drain and Transfer characteristics of Field Effect Transistor (JFET) and Find gm,rd and μ from characteristics

10. Design and simulate LC Oscillators (Compare practical and theoretical oscillation frequency)
11. Build and test RC oscillator
12. Design and simulate Power Amplifiers - Class A, Class B, Class AB
13. Design and simulate Voltage Shunt Feedback Amplifiers
14. Design and simulate Current Series Feedback Amplifiers
15. Applications of Diodes: To verify the truth table for Logic Gates (AND & OR) using Diodes

ET3L003	Analog Communication System Lab	1 Credit

Course outcomes:

Students will be able to:

1. Observe SSB detection techniques.
2. Realize various modulation technique..
3. Generate signals using Scilab.
4. Identify and design different analog modulation techniques.
5. Analyze multiplexing systems such as FDM, TDM and QAM.
6. Compare different communication systems by analysing in time and frequency domain.

List of Experiments:

1. To generate amplitude modulated wave and determine the percentage modulation.
2. To generate frequency modulated signal and determine the modulation index and bandwidth for various values of amplitude and frequency of modulating signal.
3. To generate SSB using phase method and detection of SSB signal using Synchronous detector.
4. To generate DSB using phase method and detection of DSB signal using Synchronous detector
5. To generate the pulse amplitude modulated and demodulated signals
6. To implement the pulse width modulated and demodulated signals
7. To Design & generate the pulse position modulated and demodulated signals
8. To Study Differential PULSE Code Modulation & Demodulation
9. Implement and Study the AM Superhetrodyne radio receiver
10. To construct the frequency division multiplexing and demultiplexing circuit and to verify its operation
11. To perform the AM DSB-SC signal Generation and Detection using Scilab Simulink.
12. To perform the FM signal Generation and Detection using Scilab Simulink.
13. Quadrature Amplitude Modulation and Demodulation.
14. Time Division Multiplexing and Demultiplexing.
15. Study of phase modulator.

ET3L004	Digital Circuits and Microprocessor Lab	1 Credit

Course Objectives:

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To prepare students to perform the analysis and design of various digital electronic circuits.
3. To study programming based on 8085 microprocessor

Course Outcomes:

Students will be able to:

1. Find and prevent various hazards and timing problems in a digital design.
2. Understand the fundamental of basic gates and their use in combinational and sequential circuits Outline the use of digital components as a switching elements.
3. Develop ability to handle arithmetic operations using assembly language programming.
4. Analyze basic arithmetic and logical circuits required in microcomputer systems.
5. Examine the structure of various number systems and its application in digital design.
6. Design various combinational and sequential circuits and develop skill to build, and troubleshoot cost effective digital circuits.

List of Experiments:

1. Verification and interpretation of truth table for AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates.
2. Construction of half / full adder using XOR and NAND gates and verification of its operation.
3. To Study & Verify Half and Full Subtractor.
4. Verify the truth table of RS, JK, T and D flip-flops using NAND & NOR gates.
5. Implementation and verification of decoder/de-multiplexer and encoder using logic gates.
6. Implementation of 4x1 multiplexer and 1x4 demultiplexer using logic gates.
7. Design and verify the 4- Bit Synchronous/ Asynchronous Counter using JK flip flop.
8. Verify Binary to Gray and Gray to Binary conversion using NAND gates only.
9. Verify the truth table of one bit and two bit comparator using logic gates.
10. Write a Program Using 8085 & Verify for:

a. Addition of Two 8-Bit Numbers.

b. Addition of Two 16-Bit Numbers. (With Carry)

11. Write a Program Using 8085 & Verify for:

a. Subtraction of Two 8-Bit Numbers. (Display of Borrow)

b. Subtraction of Two 16-Bit Numbers. (Display of Borrow)

12. Write a Program Using 8085 & Test for Typical Data:

a. Multiplication of Two 8-Bit Numbers by Bit Rotation Method

b. Division of Two 8-Bit Numbers by Repeated Subtraction Method

13. Write a Program to Move a Block of Data Using 8085 & Verify

14. Write a Program to Arrange Number in Ascending Order Using 8085 & Verify.

15. Write a Program to Check Number of 1's and 0's in Given Number Using 8085 &Verify.

ET3T008	Innovation and Entrepreneurship Development	Audit

Course Objectives

1. To understand the importance of Innovation and Idea Generation
2. To understand the concept of entrepreneurship.

Course Outcomes

At the end of the course students will be able to

1. Identify and validate of ideas.
2. Remember Patent registration of Innovation.
3. Understand roles and responsibilities of Entrepreneurship.

Module 1: Innovation **[06Hrs]**

Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.

Module2: Entrepreneurship **[06Hrs]**

Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship

Module 3: Role of Entrepreneurial Bodies **[06Hrs]**

Theory of achievement, motivation, Medelland's. Experiment, Women entrepreneurship, Role of SSI, its advantages & limitations, policies governing small scale industries, Procedure to set up small scale industrial unit, Advantages and limitations of SSI.

Module4: Role of Entrepreneurial Support **[06 Hrs]**

Factors governing project selection, Market survey, Preparation of project report. Financial, technical & market analysis of project. Entrepreneurial support systems, Role of consultancy organization like, District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time.

Text Book

1) Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.

Reference Book

1) Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business Publishers.

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Department of Electronics and Telecommunication Engineering

"Rectifying Ideas, Amplifying Knowledge"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

Fourth Semester B. Tech. in Electronics and Telecommunication Engineering

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	BSC	ET4T001	Partial differential equation and Numerical Methods	2	1	0	20	20	60	100	3
2	ESC	ET4T002	Basics of Python Programming	3	0	0	20	20	60	100	3
3	ESC	ET4T003	Electrical Machines and Instruments	2	1	0	20	20	60	100	3
4	ESC	ET4T004	Electronic Devices and circuits-II	2	1	0	20	20	60	100	3
5	PCC	ET4T005	Signal and system	3	0	0	20	20	60	100	3
6	PCC	ET4T006	Electromagnetic Field	3	1	0	20	20	60	100	4
7	ESC	ET4L003	Electrical Machines and Instruments lab	0	0	2	60	0	40	100	1
8	ESC	ET4L004	Electronic Devices and circuits-II	0	0	2	60	0	40	100	1
9	PCC	ET4L005	Signal and system lab	0	0	2	60	0	40	100	1
10	Internship	ET4F006	Field Training-2	0	0	0	20	0	30	50	1
11	MC	ET4T007	Universal Human Values	2	0	0	10	15	25	50	Audit
			Total	**17**	**4**	**6**	**330**	**135**	**535**	**1000**	**23**

ET4T001	Partial Differential Equation and Numerical Methods	3 Credit

Course Objectives:

1. To prepare students for successful career in industries, for Post Graduate programme 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.

Course Outcomes:

At the end of course students will be able to

1. Understand calculation and interpretation of various errors in numerical methods and partial differential equations.
2. Familiar with finite precision computation.
3. Solve nonlinear equations in a single variable and find numerical solutions.
4. Apply Numerical analysis which has enormous application in the field of science and some fields of Engineering.
5. Analyze the numerical integration and differentiation, numerical solution of ordinary differential equation.
6. Design mathematical model for various electronic applications.

Course Contents:

Module-1: Error Analysis **[6 Hrs]**

Significant figures, round-off, precision and accuracy, approximate and true error, truncation error and Taylor series, machine epsilon, data uncertainties, error propagation, importance of errors in computer programming.

Module-2: Solution of Transcendental / Polynomial Equations and System of Linear Equation **[6 Hrs]**

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, Matrixtriangularisation (LU decomposition), Cholesky, Gauss Seidel and Jacobi methods.

Module-3: Interpolation and Polynomial Approximation **[6 Hrs]**

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.

Module-4: Numerical Integration and Differentiation **[5 Hrs]**

Numerical Integration: Methods based on interpolation such as Trapezoidal rule, Simsons 1/3and 3/8 rules. Numerical differentiation: Euler's method, Modified Euler's method, Taylor'sseries, RungeKutta 2ndand 4th order, Stability analysis of above methods.

Module-5: Advance Partial Differential equations **[6 Hrs]**

Introduction Partial differential equation, method of separation of variables, Application of partial differential equations. (Heat equation, wave equation, Laplace Equation)

Module-6: Object Oriented Programming **[6 Hrs]**

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.

Texts Books:

1. Steven C Chapra, Reymond P. Canale, “Numerical Methods for Engineers”, Tata McGraw Hill Publications, 2010.

2. E. Balaguruswamy, “Numerical Methods”, TataMcGraw Hill Publications, 1999.

References Books:

1. V. Rajaraman, “Fundamental of Computers”, Prentice Hall of India,NewDelhi, 2003.

2. S. S. Sastri, “Introductory Methods of Numerical Methods”, Prentice Hall of India, NewDelhi 3rd edition, 2003.

3. K. E. Atkinson, “An Introduction to Numerical Analysis”, Wiley,1978.

4. M.J. Maron, “Numerical Analysis: A Practical Approach”, Macmillan, New York, 1982D.Ravichandran, "Programming with C++", TMH

5. E. Balagurusamy, "Object-Oriented Programming with C++", TMH, New Delhi,2001, 2nd Edition

6. YeshwantKanetkar, "Let us C++, BPB Pub.", Delhi, 2002, 4thEdition

ET4T002	Basics of Python Programming	3 Credits

Prerequisites: The prerequisite for learning Python is basic knowledge of concepts like Variables, Loops, and Control Statements etc.

Course Objectives:

To make students aware about

1. To understand the role computation can play in solving problems.
2. To understand why Python is a useful scripting language for developers.
3. To learn how to design and program Python applications.
4. To learn how to read and write files in Python
5. To learn how to design object□oriented programs with Python classes.
6. To learn how to use exception handling in Python applications for error handling.

Course Outcomes:

Students will be able to

1. Remember variables, types, operators, data structures, arguments, object oriented programming and libraries.
2. Understand assignment, keyword, expressions, lists, modules, exceptions and standard libraries.
3. Apply variables, types, operators, data structures, arguments, object oriented programming and Libraries.
4. Analyse modern updates in python for keyword, expressions, lists, modules, exceptions, standard libraries.
5. Evaluate storage space required to program python scripts, variables, types, operators and data structures.
6. Create python code to make functional Electronics hardware.

Course Contents:

Module-1: Introduction **[6 Hrs]**

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

Module-2: Types, Operators and Expressions **[6 Hrs]**

Types – Integers, Strings, Booleans; Operators - Arithmetic Operators, Comparison(Relational) Operators, Assignment Operators, Logical Operators, Bit-wise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while break, continue, pass.

Module-3: Data Structures **[6 Hrs]**

Lists, Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

Module-4: Default Arguments **[6 Hrs]**

Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function- Global and Local Variables. Modules: Creating modules, import statement, from. Import statement, name spacing, Python packages, Introduction to PIP, Installing Packages via PIP, Using Python Packages.

Module-5: Object-Oriented Programming OOP in Python **[6Hrs]**

Classes, self-variable Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding, Error, and Exceptions: Difference between an error and Exception, Handling Exception, try except for block, Raising Exceptions, User Defined Exceptions.

Module-6: Brief Tour of the Standard Library **[6 Hrs]**

Operating System Interface – String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics Testing: Why testing is required ?, Basic concepts of testing, Unit testing in Python, Writing Test cases, Running Tests.

Text Books:

1 Python Programming: A Modern Approach, Vamsi Kurama, Pearson

2. Learning Python, Mark Lutz, Orielly

Reference Books:

1 Think Python, Allen Downey, Green Tea Press

2. Core Python Programming, W.Chun, Pearson

3. Introduction to Python, Kenneth A. Lambert, Cengage

E-Resources:

1.https://www.python.org/

2.https://swayam.gov.in/nd1_noc19_cs41/preview

3. https://www.codecademy.com/learn/learn-python

4. https://www.learnpython.org/

5. https://developers.google.com/edu/python/
6. https://www.datacamp.com/tracks/python-programming
7. https://www.udemy.com/courses/search/?q=python+programming
8. https://docs.python.org/3/tutorial/index.html
9. http://www.pythonchallenge.com/
10. https://www.tutorialspoint.com/python/index.htm

ET4T003	Electrical Machines and Instruments	3 Credit

Course Objectives:

1. Develop a basic foundation of Electrical Machines.
2. Understand the basic principle, construction &operation, of ac and dc machines and electrical Instruments.
3. Understand the performance characteristics of ac and dc machines and electrical Instruments
4. Understand the applications of ac and dc machines as well as electrical Instruments in day today life.

Course outcomes:

Students will be able to:

1. Remember basic principles & construction, of electrical instruments and ac & dc machines.
2. Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3. To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4. Analyse the performance indices of electrical instruments and ac & dc machines. Dc machines during various conditions..
5. Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6. Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

Course Contents:

Module-1: DC Machines **[5 Hrs]**

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).

Module-2: Synchronous Machines **[5 Hrs]**

Construction, types, armature reaction, circuit model of synchronous machine, determination of synchronous reactance, phasor diagram, power angle characteristics, parallel operation of synchronous generators, synchronous motor operation, synchronous condenser.

Module-3: Three phase Induction (Asynchronous) Motor **[5 Hrs]**

Types of induction motor, flux and mmf waves, development of circuit model, power across air gap, torque and power output, starting methods, cogging and crawling, speed control, deep bar/ double cage rotor, induction generator, efficiency .of induction motors

Module-4: Special Machines **[5 Hrs]**

Construction, working and application of steeper motor, variable reluctance motor, servo motor, FHP motor, hysteresis, repulsion, linear IM.

Module-5: Electrical Instruments **[6 Hrs]**

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.

Module-6: Applications of Electrical Instruments **[5 Hrs]**

Measurement of electrical telemetry thickness vibration,, 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.

Text Books:

1. Electrical Machines by Ashfaqu Husain, Dhanpatrai and publication

2. Instrumentation Devices System edition C. S. Rajan, G. R. sharma.

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. Abhijit Chakrabarti & Sudipta Debnath, "Electrical Machines", Tata McGraw-hill Publication.

4. William H Hayt, Jack E Kimmerly and Steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill.

5. A.E. Fitzgerald, Charles Kingsley & Jr. Stephen D. Umans, "Electrical Machinery", TataMcGraw-hill Publication 6th Edition.

6. I.J Nagarath& D.P Kothari, "Electrical Machines", Tata McGraw-hill Publication 4th Edition.

7. T. J. E. Miller, "Brushless permanent-magnet and reluctance motor drives", OxfordUniversity Press (1989).

8. B. L. Theraja, "Electrical technology" volume 2, S. Chand.

ET4T004	Electronics Devices and Circuits-II	3 Credit

Prerequisites: Basic knowledge of Semiconductor Physics

Course Objectives:

1. To introduce semiconductor devices MOSFET, it's characteristics, DC analysis, biasing and applications
2. To analyze and interpret MOSFET circuits for small signal
3. To study the different types of voltage regulators
4. To design different electronic circuits

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Explain the working principle, operation and characteristics of Semiconductor devices such as MOSFET
2. Apply Knowledge of semiconductor devices and concepts to implement various electronic circuits.
3. Analyze different amplifier configurations.
4. Evaluate the small signal model and performance parameters of the device.
5. Design different oscillator circuits for various frequencies
6. Build and test the performance of electronic circuits

Course Contents:

Module-1: MOSFET **[6 Hrs]**

Structure, Symbol, Construction of n-channel E-MOSFET, MOS Transistor operation, EMOSFET Characteristics& parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects, N-MOS, P-MOS and CMOS devices

Module-2: MOSFET Biasing and its DC Analysis **[5 Hrs]**

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

Module-3: CMOS Inverter **[5 Hrs]**

Principle of operation, dc characteristics, transient characteristics, noise margin, static loadMOS inverter, transmission gate

Module-4: Study of CMOS Logic **[6 Hrs]**

Study of Combinational logic, gates, compound gates, multiplexers, and memory elements using CMOS technology

Module-5: Oscillators **[5 Hrs]**

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

Module-6: Voltage Regulators **[5 Hrs]**

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 Books:

1. Neil Weste and David Harris, Addison-Wesley "CMOS VLSI Design – A Circuits and Systems Perspective", Fourth edition, Pearson
2. R.L.Boylestad & Nashlesky, "Electronic devices and Circuits Theory" Nineth Edition, Prentice Hall of India
3. Donald Neaman, "Electronic Circuit Analysis and Design", Third Edition,TataMcGraw Hill
4. Millman, Halkias, "Integrated Electronics- Analog and Digital Circuits and Systems",Second Edition , Tata McGraw Hill

Reference Books:

1. BrijeshIyer, S. L. Nalbalwar, R. Dudhe, "Electronics Devices & Circuits", SynergyKnowledgeware Mumbai, 2017. ISBN:9789383352616
2. David A. Bell,"Electronic Devices and Circuits", Fourth Edition, PHI
3. Floyd," Electronic Devices", Seventh Edition, Pearson
4. Sedra and Smith, "Microelectronic Circuits", Oxford University Press, 2004

E-Resources:

1. https://nptel.ac.in/content/storage2/courses/117101058/downloads/
2. http://www.nesoacademy.org/electronics-engineering/analog-electronics/analog
3. https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open
4. http://www.electronics-tutorials.ws/transistor/tran_1.html
5. http://www.allaboutcircuits.com/textbook/semiconductors/chpt-1/active-versus-passivedevices/

ET4T005	Signal and System	3 Credit

Prerequisites:

1. Basic Idea of Transform and its mathematical descriptions (Laplace, Fourier and ZTransform)
2. Differential equations and Integrals (advanced level)
3. Ordinary differential equations
4. Series and expansions
5. Fourier analysis and complex Fourier Series/transform
6. Applications of Fourier series, Fourier Transform to circuits.

Course Objectives:

1. To develop a strong foundation of continuous and discrete time signal and system.
2. Introduce ideas for analysis of various types of continuous & discrete time system.
3. Learn fundamental concepts and transforms as relevant to time and frequency domain Signals.
4. Understand the process of sampling and interpolation in real time signal transmission.

Course Outcomes:

1. Understand different types of signals & systems.
2. Familiar with the properties of LTI (Linear Time Invariant System) system and process involved in analysis of signals before transmission.
3. Solve various complex mathematical problems for signal analysis and conversion of signals from one domain to another.
4. Apply knowledge of sampling and interpolation to sample and reconstruct signals during real time signal transmission and reception.
5. Analyze continuous and discrete systems in time and frequency domain.
6. Design Various Mathematical models to Investigate stability of the system.

Course Contents:

Module-1: Basics of signals and system **[6 Hrs]**

Introduction and Classification of signals, Definition of signal, 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, time scaling, time shifting and time folding, Systems Definition, Classification, linear and non-linear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.

Module-2: Time Response Analysis **[6 Hrs]**

Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Continuous-Time and Discrete-Time Systems, Basic System Properties, Discrete-Time LTI (Linear Time Invariant System) Systems, the Convolution Sum, Continuous-Time LTI Systems, the Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems Described by Differential and Difference Equations.

Module-3: Fourier Series Analysis **[6 Hrs]**

The Response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier Series, Properties of Continuous-Time Fourier Series, Fourier Series Representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier Series and LTI Systems, Examples of Continuous-Time Filters Described by Differential Equations, Examples of Discrete-Time Filters Described by Difference Equations.

Module-4: Fourier Transform Analysis **6 Hrs**

The Continuous-Time Fourier Transform, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Differential Equation, The Discrete-Time Fourier Transform, Representation of Aperiodic Signals, The Fourier Transform for Periodic Signals, Properties of the Discrete-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Difference Equations.

Module-5: Frequency Response Analysis **[6 Hrs]**

The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Concept ofFrequency Response, Group Delay, Phase Delay, Time-Domain Properties of Ideal Frequency-Selective Filters, Time- Domain and Frequency-Domain Aspects of Non ideal Filters, First-Order and Second-Order Continuous-Time Systems, Discrete-Time System, Representation of a Continuous-Time Signal by its Samples, the Sampling theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Aliasing effect, Discrete-Time Processing of Continuous-Time Signals.

Module-6: Laplace and Z-Domain Analysis **[6 Hrs]**

The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Properties of the Laplace Transform, Analysis and Characterization of LTI Systems Using Laplace Transform, System Function Algebra and Block Diagram Representations, The Unilateral Laplace Transform, The z-Transform, Region of Convergence for the z-Transform, Inverse z-Transform, Properties of z-Transform, Analysis and Characterization of LTI Systems Using z-Transforms, System Function Algebra and Block Diagram Representations, The Unilateral z-Transform.

Text Books:

1. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia), Private Limited,
2. B. P. Lathi, “Linear Systems and Signals”, OXFORD University Press.
3. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall,1983.
4. “Signals and Systems”, A. NagoorKanni, 2nd Edition, McGraw Hill.

Reference Books:

1. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi,2001.
2. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB",TMH, 2003.
3. Signals Systems and Transforms, 3rd Edition, 2004, C. L. Philips, J.M.Parr and EveA.Riskin ,Pearson education.
4. S.S. Soliman& M.D. Srinath, “Continuous and Discrete Signals and Systems”, Prentice-Hall, 1990.
5. ShailaDinkarApte “Signals and Systems” Principles and Applications”,CambridgeUniversityPress.

E-Resources:

1. NPTEL link principal of signals and system.
https://www.youtube.com/watch?v=xrVWB9VYZ64&list=PLq-Gm0yRYwTjwxaqapPsSAHzs4_nkQLVr
2. E-BOOK Signal and Systems Simon Haykin Wiley
https://www.academia.edu/38588821/Signal_and_Systems_Simon_Haykin_Wiley
3. E-BOOK B. P. Lathi, “Linear Systems and Signals”,
https://india.oup.com/productPage/5591038/7421214/9780198062271

ET4T006	Electromagnetic Fields	4 Credits

Course Objectives:

Learners can be able to explore their knowledge in the area of EM Waves and its analysis.

1. To learn basic coordinate system, significance of divergence, gradient, curl and its applications to EM Waves.
2. To understand the boundary conditions for different materials /surfaces.
3. To get insight on finding solution for non-regular geometrical bodies using Finite
4. Element Method, Method of Moments, Finite Difference Time Domain.
5. To get the basics of microwave, transmission lines and antenna parameters.
6. Students get acquainted with different physical laws and theorems and provide basic platform for upcoming communication technologies.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Use sections of transmission line sections for realizing circuit elements
4. Characterize uniform plane wave
5. Calculate reflection and transmission of waves at media interface
6. Analyze wave propagation on metallic waveguides in modal form
7. Understand principle of radiation and radiation characteristics of an antenna

Course Contents:

Module-1: Maxwell's Equations **[6 Hrs]**

Maxwell's Equations Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface

Module-2: Uniform Plane Wave **[6 Hrs]**

Uniform Plane Wave Uniform plane wave, Propagation of wave, Wave polarization, Poincare"s Sphere, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Surface current and power loss in a conductor.

Module-3: Transmission Lines **[6 Hrs]**

Equations of Voltage and Current on TX line, Propagation constant and characteristic impedance, and reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

Module-4: Plane Waves at a Media Interface **[6 Hrs]**

Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection, wave polarization at media interface, Reflection from a conducting boundary.

Module-5: Wave propagation **[6 Hrs]**

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide

Module-6: Radiation **[6 Hrs]**

Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

Text/Reference Books

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
4. David Cheng, “Electromagnetics”, Prentice Hall.
5. Sadiku, "Elements of Electromagnetics", Oxford.
6. Krauss, "Electromagnetics", McGraw Hill, New York, 4th edition.
7. W. H. Hayt, "Engineering Electromagnetics", McGraw Hill, New Delhi, 1999.
8. Edminister, Schaum series, "Electromagnetics", McGraw Hill, New York, 1993, 2nd edition.
9. Sarvate, "Electromagnetism", Wiley Eastern.

ET4L003 **Electrical Machines and Instruments Lab** **1 Credit**

Course Outcomes:

Students will be able to:

1. Remember basic principles & construction, of electrical instruments and ac & dc machines.
2. Understand the operation, performance and characteristics of electrical instruments and ac & dc machines.
3. To identify the different issues related to the electrical instruments, speed control and torque improvement in ac & dc machines.
4. Analyse the performance indices of electrical instruments and ac & dc machines.
5. Evaluate the operation of ac and dc machines along with the testing of electrical instruments.
6. Solve the different problems related to operation, & performance indices of electrical instruments ac and dc machines.

List of Experiments:

1. To study the construction of field and armature of DC Machine.
2. To determine external characteristics of DC Generator
3. To perform Load test on DC shunt motor.
4. To perform speed control of DC shunt motor using armature and field control method.
5. To perform Load test on DC shunt generator.
6. .To study and perform the voltage build up in the DC shunt Generator
7. To study the internal construction of three phase induction motor.
8. To perform no Load and block rotor tests on squirrel cage induction motor
9. To study various starting methods of three phase induction motor
10. To control speed of induction motor by V/F control
11. To control speed of slip ring induction motor by rotor resistance control
12. To study the internal construction of three phase synchronous machine.
13. Determination of sequence impedance of salient pole synchronous machine
14. To perform speed control of Stepper motor
15. To study various electrical instruments with their industrial applications.

ET4L004	Electronic Circuit and Devices-II Lab	1 Credit

Prerequisites: Basic knowledge of Semiconductor Physics and theoretical knowledge of respective practical.

Course Objectives:

1. To identify Basic electronic components and devices
2. To observe the characteristics of MOSFET, CMOS Inverter, UJT
3. To analyze different amplifier configurations and their Frequency response
4. To design and Simulate Electronic circuits

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. Acquire the basic concepts of different semiconductor components and understand theuse of semiconductor devices in different electronic circuits.
2. Plot and study the characteristics of semiconductor devices like MOSFET, UJT
3. Simulate Electronic circuits using SPICE.
4. Calculate different performance parameters of transistor.
5. Design, build, and test the performance of various circuits.

List of Experiments:

1. To Plot Drain and Transfer characteristics of N- Channel E- MOSFET
2. To design NMOS Common source amplifier
3. To obtain the frequency response of MOSFET amplifier in common source configuration with given specifications
4. To Study MOSFET as a Switch
5. To assemble and characterize MOSFET current mirrors
6. To design and plot the static (VTC) and dynamic characteristics of a digital CMOS inverter using Virtual lab
7. To design and plot the dynamic characteristics of 2-input NAND and NOR logic gates using CMOS technology using Virtual lab
8. Implement 2:1 Multiplexer using transmission gate
9. Implementation of NAND and NOR gate
10. To Design and Simulate Wein Bridge oscillator using FET
11. To Design and Simulate RC Phase shift oscillator using FET
12. To Design and Simulate Hartley Oscillator using FET

13. To Design and Simulate Colpitts Oscillator using FET
14. To Study the operation of UJT as a Relaxation Oscillator
15. To Design adjustable Voltage Regulated Power Supply using LM317

ET4L005	Signal and System Lab	1 Credit

Course Objectives:

1. Develop a strong foundation of continuous and discrete time signal and system analysis using Scilab.
2. Understand the various continuous and discrete time signals generation methods.
3. Understand the basic operations on the signals.
4. Understand the Design and analysis of linear time-invariant (LTI) systems.
5. Understand the spectral characteristics of signals using Fourier analysis.
6. Develop a strong foundation of systems using Laplace transform and Z-transform

Course Outcomes:

Upon successful completion of this course the students will be able to:

1. Understand basics of Scilab syntax, functions and programming.
2. Familiar With characterization of various continuous and discrete time signals.
3. Solve the Problems on basic operations on the signals.
4. Apply Knowledge of linear time-invariant (LTI) systems for computing its response.
5. Analyze the spectral characteristics of signals using various transforms.
6. Design the Mathematical model of systems using various transforms.

List of Experiments:

1. Introduction to Scilab.
2. To create user defined functions for generating Continuous and Discontinues time sinusoidal signal.
3. To create user defined functions for generating Continuous and Discontinues time delta signal and unit step signal.
4. To create user defined functions for generating Continuous and Discontinues time Exponential and RAMP Signal.
5. To create user defined functions for signal operation: signal addition, subtraction, and multiplication.
6. To create user defined functions for signal operation: time shifting, time scaling and time inversion.
7. To compute convolution of two signals and verify its properties.
8. To compute auto-correlation of two signals and verify its properties.
9. To compute cross-correlation of two signals and verify its properties.
10. To obtain the response of LTI system defined by linear constant coefficient difference equations.
11. To synthesize the periodic signal using Fourier series.

12. To analyze the spectrum of the signal using Fourier transform and verify its properties.

13. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform

14. To compute and plot the impulse response and pole-zero diagram of transfer function using Z-transform.

15. Program for calculating Inverse z-transform of Given function.

16. Program for calculating Inverse Laplace-transform of Given function

17. To Analyze discrete-time signals with the (discrete) Fast Fourier transform

18. To find whether the system is linear or nonlinear for the given signal.

ET4T007	Universal Human Values	Audit

Course Objective:

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Contents:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me.

Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

An Autonomous Institute, with NAAC "A" Grade

At: Khandala, Post- Valni, Kalmeshwar Road, Nagpur

Department of Information Technology

"A Place to Learn, A Chance to Grow"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

B. Tech. Information Technology Programme

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VISION AND MISSION OF INSTITUTE

VISION

To be a centre of excellence imparting professional education satisfying societal and global needs.

MISSION

Transforming students into lifelong learners through quality teaching, training and exposure to concurrent technologies. Fostering conducive atmosphere for research and development through well-equipped laboratories and qualified personnel in collaboration with global organizations.

VISION AND MISSION OF DEPARTMENT

VISION

To Produce Competent Professionals equipped with technical knowledge and commitment for satisfying the needs of society.

MISSION

1. To impart advanced knowledge with an inclination towards Research with well equipped Lab.
2. To develop an ability to work ethically and Responsive towards the need of society

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEOs	ATTRIBUTES
PEO 1	Students will have In-depth knowledge of trending technologies, effective communication skills, lifelong learning with leadership qualities in order to work in any multidisciplinary areas in a team or individually.
PEO 2	Students will be able to interpret and analyze the requirements of the software design and development to provide efficient engineering solutions with novel product designs within the jurisdiction of humanity and social constraints
PEO 3	Students will have the attitude to pursue higher studies or research work or initiate entrepreneurial activity

PROGRAM OUTCOMES (PO's)

POs	ATTRIBUTES
1	An Understanding of IT architecture, software and hardware concepts, functionalities and applications
2	An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages.
3	Competency of business domains and functional processes that employ IT systems and applications
4	Practical use of communication protocols and their applications in the field of internet and world wide web.
5	Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century .
6	An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains.
7	Thought leadership to design and implement practical solutions for global industry needs.
8	An Acumen to embrace and adopt futuristic IT technological developments.
9	Sound knowledge of entrepreneurship traits to succeed.
10	Adoption of practices that are ethical ensuring transparency and accountability.
11	Capability to provide solutions that are socially empowering and environment friendly.
12	Effective communication and collaboration techniques with stakeholders to achieve best results.

PROGRAM SPECIFIC OUTCOMES (PSOS):

At the end of Electronics and Telecommunication program the student will have following Program specific outcomes.

PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity

PSO2: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: The ability o employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning & a zest for higher studies and also acts as good citizen by inculcating in them moral values & ethics.

Recommendations for conducting one theory course of curriculum through online Teaching / Learning

1. Only Swayam / NPTEL platform is allowed.

2. One defined subject per semester in online mode and BOS should declare that one subject for online mode based on availability of NPTEL offering before commencement of the semester.

3. Student will be allowed to appear for NPTEL / Institute level / University Examination as applicable.

4. In order to ensure learning, NPTEL lectures to be telecast in the class by including it in regular time table if required.

5. 75% assignment submission is mandatory for these online classes also like regular lecture attendance.

6. One faculty to be allotted for this subject, who will discuss and solve student's doubts. Allot 3 hrs/week load to teacher who is allotted to work as facilitator of online course.

7. For Autonomy Students: For online mode the student should submit all assignment given by nptel then his/her score has weightage of 40% for CA & MSE. And if student clear the nptel final exam and producing certificate then 60% weightage should be given as ESE, otherwise he/she has to appear for Makeup exam of Institute.

If student cannot enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II and End sem exams of the Institute.

8. For DBATU students: For online mode he has to appear for CA-I, CA-II, Mid sem exam of the institute and End sem exam of University.

If student can't enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II of the institute and End sem exams of the University.

10. If the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

This system will ensure real learning; avoid any problem arising due to cancellation of NPTEL exam as it happened in this semester. At least for first year and in the unpredictable situation of covid pandemic these provisions will avoid any last moment chaos.

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- I [First Year]

1st Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/Ext. Pra.	Total	
1	HSMC	HU1T002	Introduction to Computer programming	2	0	0	20	20	60	100	2
2	BSC	MA1T001	Engineering Mathematics - I	3	1	0	20	20	60	100	4
3	BSC	IT1T005	Engineering Physics	3	1	0	20	20	60	100	4
4	ESC	IT1T006	Energy and Environment Engineering	3	0	0	20	20	60	100	3
5	HSMC	HU1L002	Introduction to Computer programming Lab	0	0	4	60	0	40	100	2
6	ESC	WS1L001	Workshop Practices	0	0	4	60	0	40	100	2
7	BSC	IT1L005	Engineering Physics Lab	0	0	2	60	0	40	100	1
8			Induction Programme	3 Weeks							
9	ESC	IT1T007	Basic Electrical and Electronics Engineering	2	0	0	10	15	25	50	Audit
				13	**2**	**10**					**18**

HU1T002	Introduction to Computer Programming	4 Credit

Course Objectives:

1. To understand the importance of Programming
2. To understand the application of C Programming.
3. To investigate the key concepts of C Programming.
4. To enable students build a applications based on C programming

Course Outcome:

CO1: Define the algorithms, flowcharts, array, pointer, structure, function, and python.

CO2: Discuss and differentiate between variables, operators, statements, loops, array dimensions.

CO3: Demonstrate working programs using functions, loops, conditional statements, array, pointer, structure and files in C and python language.

CO4:Distinguish between different steps of programming and prioritize levels of programming.

CO5:Find errors and predict outcome in C and python programming.

CO6:Compose and develop any application using C and python programming.

Unit I: Basic of Programming Language [6 Hrs]

HLL, LLL, Language translator, Error checking, Debugging, Programming processes, Flowcharts, Algorithms along with asymptotic notation.

Unit II: Types, Operators and Expressions in C language [6 Hrs]

Variable names, Data types, sizes, constants, declarations, arithmetic operators, relational and logical operators, type conversions, increment and decrement operators, bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation.

Unit III: Control Flow: [6 Hrs]

Statements and Blocks. If-else, else-if, switch, Loops: while and for, do-while break and continue go to and Labels. Initializing arrays, Initializing character arrays, multidimensional arrays, Introduction to pointers.

Unit IV: Functions and Pointers in Python **[6 Hrs]**

Functions and Program Structure: Basic of functions, functions returning non-integers external variables scope rules.

Pointers in Python: Pointers to integers, characters, floats, arrays.

Unit V: **[6 Hrs]**

Structures in Python: Basics of structures, structures with functions, arrays of structures.

File handling in Python: Basics of file handling.

Text Books

1. Let Us C by Yashavant Kanetkar.
2. Let Us C Solutions by Yashavant Kanetkar
3. Data Structure through C by Yashavant Kanetkar.

Reference Books

1. C Programming: A Modern Approach (2nd Edition) - K. N. King (2008). A good book for learning C.
2. Programming in C (4th Edition) - Stephen Kochan (2014). A good general introduction and tutorial.
3. C Primer Plus (5th Edition) - Stephen Prata (2004)
4. A Book on C - Al Kelley/Ira Pohl (1998).
5. The C Book (Free Online) - Mike Banahan, Declan Brady, and Mark Doran (1991).

MA1T001	Engineering Mathematics-1	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyse a problem

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe rank, Bernoulli's theorem, Taylor's and Maclaurin's theorems for functions of two variables, – Euler's Theorem for functions containing two and three variables, Lagrange's theorem
2. Illustrate the examples of ordinary differential equation, partial differential equation, matrices.
3. Solve questions related to ordinary differential equation, partial differential equation, matrices and their applications.
4. Apply the knowledge of matrices, ordinary differential equation, partial differential equation, and their applications to real world problems.
5. Interpret the results of matrices, ordinary differential equation, partial differential equation and their applications.
6. Design a method or modal on matrices, ordinary differential equation, and partial differential equation.

Unit 1: Linear Algebra- Matrices [09 Hours]

Determinants & Matrix, Inverse of Matrix by adjoin method, Inverse by partitioning method, solution of system of linear equations, Rank of Matrix, Consistency of linear system of equation.

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications [09 Hours]

Linear equations; Reducible to linear equations (Bernoulli's equation); Exact differential equations; Equations reducible to exact equations; Applications to orthogonal trajectories, mechanical systems and electrical systems.

Unit3: Linear Differential Equations with Constant Coefficients [09 Hours]

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

Unit 4:Partial Differentiation **[09 Hours]**

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 5:Applications of Partial differentiation **[09 Hours]**

Jacobians - properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers.

Text Books

1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.
2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.
3)A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, 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. RajnishVerma, 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.

ET1T005	**Engineering Physics**	**4 Credit**

COURSE OBJECTIVES:-

1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
2. To understand and study the Physics principles behind the developments of Engineering materials.

COURSE OUTCOMES

At the end of the course students will be able to

1. Define the concept of laser, optical fiber, Hall effect, electron Ballistics, Bethe’s law, Brewster law, polarization, electromagnetic wave.
2. Illustrate different types of laser, and optical fiber, Band-theory, Effect of electric and magnetic fields, Electric and Magnetic focusing, Interference in thin films, Interference in Wedge shape thin film and electromagnetic wave.
3. Apply the concept of Three and four level laser, pumping, population inversion, Numerical aperture, Attenuation and dispersion, V-I characteristics of PN-junction diode, CRO, Interference in thin films and electromagnetic waves.
4. Analyze the different types of laser and optical fiber, semiconductors, Motion of charged particles in uniform electric and magnetic fields, polarization, relation between electric and magnetic fields of an electromagnetic wave.
5. Interpret different types of laser, and optical fiber, PN- junction diode, Bipolar Transistor action, Velocity filter, polarization, wave plate.
6. Develop models based on laser, optical fiber.

Unit-I: Laser & Optical Fibre **[08 Hrs]**

Interaction of radiation with matter, Population Inversion and Optical resonance cavity , Three and four level laser, Ruby laser, He-Ne laser, Semiconductor laser , Properties and engineering applications of laser.

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.. Applications: I) As a Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor. II) As a Detectors- i) PIN detector ii) Avalanche Detector.

Unit-II: Semiconductor Physics **[09Hrs]**

Band-theory based classification of solids into insulators, semiconductors and conductors, Fermi-Dirac distribution Function, Intrinsic semiconductors: Germanium and silicon; Fermi- energy, Typical energy band diagram of an intrinsic semi-conductor, Extrinsic semiconductors, Current conduction in semiconductors.

PN- junction diode; Unbiased, Forward biased& Reverse biased mode with Energy band diagram , Diode rectifier equation, Bipolar Transistor action, Hall effect, Hall coefficient & Hall Angle

Unit-III: Electron Ballistics **[08 Hrs]**

Lorentz force, Motion of charged particles in uniform electric and magnetic fields (parallel, perpendicular and at an acute angle), Effect of electric and magnetic fields on kinetic energy of charged particle, Crossed electric and magnetic field configurations, Velocity filter, Electrostatic and magneto static deflection.

Bethe's law, Electric and Magnetic focusing, Construction & working of Electrostatic lens, Devices: CRT, CRO, Block Diagram, Function & working of each block.

Unit-IV: Wave Optics **[08 Hrs]**

Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating, advanced applications of interference in thin film.

Polarization by reflection, Brewster's law, polarization by double refraction, Nicol prism, elliptically and circularly polarized light, Quarter wave plate and half wave plate.

Unit-V: Electromagnetic waves **[06 Hrs]**

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples.

Text Books:

1. Fundamentals of Physics: David Halliday, Robert Resnick and Jerle Walker, John-WileyIndia (8e, extended)

2. A text book of Engineering Physics: M. N. Avadhanulu, S. Chand & Co.
3. Nano the Essentials: Understanding Nanoscience and Nanotechnology, T.Praddep; TMH Publications.
4. Introduction to Nanotechnology:Pooly& Owens; Willey Publication
5. Text Book of Optics: Brijlal and Subramanyam (S. Chand and Company)
6. Laser: M. N. Avadhanulu, S. Chand & Co.

Reference Books:

1. LASERS: Theory and Applications: Thyagarajan K and Ghatak A.K.
2. Nanomaterials& Nanotechnologies and Design:M.F.Ashby, Paulo Ferreira and Daniel L.Schodek, Elsevier Publications.
3. University Physics: Young and Freedman (Pearson Education).
4. Optics: Jenkins and White (Tata Mcgraw Hill)

ET1L005	Engineering Physics Lab	1 Credit

List of Experiment

2. Newton's rings - Determination of radius of curvature of Plano convex lens / wavelength

of light

3. Wedge Shaped film - Determination of thickness of thin wire
4. Laser - Determination of wavelength of He-Ne laser light
5. Magnetron Tube - Determination of ‘e/m’ of electron
6. Hall Effect - Determination of Hall Coefficient
7. Measurement of Band gap energy of Semiconductors
8. Study of I-V characteristics of P-N junction diode
9. Experiment on fibre optics
10. Input, output and current transfer characteristics of PNP/NPN transistor in CB and CE mode
11. Study of Cathode Ray Oscilloscope

ET1T006	Energy and Environment Engineering	3 Credit

COURSE OBJECTIVES

1. To understand the importance of Energy and Environment
2. To understand the application of energy saving tool in real life.
3. To investigate the key concepts of Energy and Environment

COURSE OUTCOMES

At the end of the course students will be able to

1) Describe different kind of pollution eg. Water pollution, air pollution, soil pollution etc.

2) Understand the importance of ecosystem for human beings..

3) Discover innovative method of power generation.

4) Correlate the cost of various method of power generation.

5) Judge the quality of air.

Unit 1 [**4 hrs]**

Air Pollution: Environment and Human health - Air pollution, Particulate emission: sources-effects- control measures -, air quality standards, and measurement of air pollution. Disposal of solid wastes, Bio-medical wastes effects- control measures

Unit 2 [**4 hrs]**

Water Pollution and Conservation: Water pollution- types of pollutants, effects- control measures, Water conservation and its methods, rainwater harvesting, methods of rainwater harvesting Surface runoff harvesting, Rooftop rainwater harvesting, Noise pollution –effects and control measures, -Thermal pollution – Soil pollution –Nuclear hazard.

Unit 3 [**4 hrs]**

Conventional Power Generation: Steam power station, Nuclear power plant – Gas turbine power plant- Hydro power station: Schematic arrangement, advantages and disadvantages, Thermo electric and thermionic generators, Environmental aspects for selecting the sites and locations of power plants.

Unit 4 [**4 hrs]**

Renewable Power Generation: Solar, Wind, Biogas and Biomass, Ocean Thermal energy conversion (OTEC), Tidal, Geothermal energy, Magneto Hydro Dynamics (MHD): Schematic arrangement, advantages and disadvantages.

Unit 5 [**4 hrs]**

Energy conservation: Scope for energy conservation and its benefits Energy conservation Principle – Maximum energy efficiency, Maximum cost effectiveness, Methods and techniques of energy conservation in ventilation and air conditioners, refrigerator, compressors, pumps, fans and blowers, Energy conservation in electric furnaces, ovens and boilers, lighting techniques. Tariffs and economic aspects in power generation.

Reference/Text Books:

1. A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, A Text book of Power System Engineering, DhanpatRai Publication.
2. Rai. G. D., Non-Conventional Energy Sources, Khanna Publishers, Delhi, 2006.
3. Rao S., Parulekar B.B., Energy Technology-Non conventional, Renewable and Conventional, Khanna Publishers, Delhi, 2005.
4. Glynn Henry J., Gary W. Heinke, Environmental Science and Engineering, Pearson Education, Inc, 2004.
5. J. M. Fowler, Energy and the Environment, McGraw-Hill, 2nd Edition, 1984.
6. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Prentice Hall, 2003.

HU1L002	Introduction to Computer Programming Lab	2 Credit

List of Practical:-

1. A simple program to display a message “Hello World” on screen.
2. Write a Program to print addition, subtraction Multiplication and Division of a entered number.
3. Write a Program to LCM of the entered number..

4	Write a program to find GCD of the entered number.
5	Write a program to find the greatest among three number.
6	Write a any menu driven program using if…else statement.
7	Write a any menu driven program using Switch case statement.
8	Write a program to find count of even no ,count of odd number , sum of even no and sum of odd number between 1 to 50.
9	Write a Program to generate prime number up to inputted number.
10	Write a program to check entered no is Armstrong no or not.
11	Write a program to find transpose of a matrix.
12	Write a Program to find multiplication of a two matrix elements.
13	Write a Program to find length of a string.(with and without using a library function)
14	Write a Program to find addition of two numbers using pointer.
15	Open ended Program. (How to execute C program on Linux operating system)
16	Write a Python program to print “Hello World”.
17	Write a Python program to display the current date and time.
18	Write a Python program which accepts the radius of a circle from the user and compute the area.
19	Write a Python program to find reverse of the entered number.
20	Write a Python program to get the Python version you are using

WS1L001	Workshop Practices	2 Credit

Instructions to the student:

Each student is required to maintain a „workshop journal" consisting of drawing / sketches of the jobs and a brief description of tools, equipment, and procedure used for doing the job.

Contents:

a**) Carpentry:** Technical Terms related to wood working, Types of wood, Joining materials, Types of joints - Mortise and Tenon, Dovetail, Half Lap, etc., Methods of preparation and applications, Wood working lathe, safety precautions.

b) Welding: Arc welding - welding joints, edge preparation, welding tools and equipment, Gas welding - types of flames, tools and equipment, Resistance welding - Spot welding, joint preparation, tools and equipment, safety precautions.

c) Fitting: Fitting operation like chipping, filing, right angle, marking, drilling, tapping etc., Fitting hand tools like vices, cold chisel, etc. Drilling machine and its operation.

e) Machine shop: Lathe machine, types of lathes, major parts, cutting tool, turning operations (Demo), safety precautions

List of Practical:

1. Wood sizing exercises in planning, marking, sawing, chiselling and grooving to make half lap joint and cross lap joint.
2. A job involving cutting, filing to saw cut, filing all sides and faces, corner rounding, drilling and tapping on M. S. plates.
3. Exercise in Arc welding (MMAW) to make a square butt joint.
4. A demo job on turning of a Mild Steel cylindrical job using centre lathe.

Electrical workshop:-

1) To wire for a stair case arrangement using a two-way switch.

2) To measure electrical quantities-voltage current, power & power factor in RLC circuit.

ET1T007	Basics of Electrical and Electronics Engineering	Audit

COURSE OBJECTIVES

1. To provide a basic information and use of electrical and electronics components.
2. To understand and study the materials used for the preparation of electrical and electronics components.
3. To provide basic knowledge of operation and functionality of electrical and electronics components.

COURSE OUTCOMES:

CO1: Define fundamentals of electrical system and choose measuring instruments for measurement of electrical quantities & describe the concept PN junction diode and its characteristics.

CO2: Classify wiring system and compare energy resources for electrical energy generation & elaborate the transistor configuration in CE, CB & CC mode.

CO3: Plan and organize the utilization of energy resources of electrical system & apply transistor characteristics to construct Amplifier devices.

CO4: Compare different sources of electrical system & distinguish various logic gates and simplify the Boolean's equations.

CO5: Justify the utilization of various electrical and electronics components into electrical and electronics circuitries.

CO6: Construct various circuits using Resistors, capacitors, inductors, PN junction diode, Zener diode, transformers, transistors and logic gates.

Unit 1: Elementary Electrical Concepts and Circuit Components [8 Hrs]

Fundamental of Electrical system: Potential difference, Ohm's law, Effect of temperature on resister, resistance temperature coefficient, **Electrical wiring system**: Study of different wire gauges and their applications in domestic and industry. **Resistors:** colour code, type of resistors, material used for resistors, resistance wires, resistance standards, frequency errors in resistors. **Capacitors:** Capacitance standards, variable capacitors, frequency errors in capacitors. Loss angle and power factor of capacitors. **Inductors:** standards of inductance, mutual inductance, self-inductance, variable inductance, inductors for high and low frequency work, frequency errors in inductors.

Unit 2: Measurement of Electrical Quantities, Measuring Instruments & Energy Resources [7 Hrs]

Measurement of Voltage, Current, and Power (1ph and 3ph), Introduction to PMMC instrument, Ohmmeter, galvanometer, potentiometers, power factor meter and frequency meters. Study of circuit breakers & Actuators (MCB & Fuse, Power Contactors & Aux contactors, Electro-Mechanical & Solid state Relays). **Energy Resources and Utilization**: Conventional and nonconventional energy resources; Introduction to electrical energy generation from different resources, transmission, distribution and utilization, Concept of Supply Demand, Power Factor, Need of unity factor.

Unit3: Introduction to diodes, diode circuit and Transducers [8 Hrs]

The P-N Junction Diode, V-I characteristics, Diode as Rectifier, specifications of Rectifier Diodes, Half Wave, Full wave, Bridge rectifiers, Equations for IDC VDC VRMS, IRMS, Efficiency and Ripple Factor for each configuration. Zener Diode, Characteristics, Specifications, Zener Voltage Regulator, Types of Diodes: LED, Photodiode. Introduction to transducer, Classification of transducers, characteristics and choice of transducers.

Unit 4: Semiconductor Devices and Applications: [7 Hrs]

Transistors: Introduction, Classification, CE, CB, and CC configurations, α, β, concept of gain and bandwidth. Operation of **BJT** in cut-off, saturation and active regions (DC analysis). BJT as an amplifier, biasing techniques of BJT, BJT as a switch.

Introduction to Digital Electronics: Number System, Basic logic Gates, Universal Gates, Boolean

Postulates, De-Morgan Theorems

Reference/Text Books:

1. V. N. Mittal and Arvind Mittal, Basic Electrical Engineering, McGraw-Hill Publication.
2. Brijesh Iyer and S. L. Nalbalwar, A Text book of Basic Electronics, Synergy Knowledgeware Mumbai, 2017. ISBN:978-93-8335-246-3
3. Vincent DelToro, Electrical engineering Fundamentals, PHI Publication, 2nd Edition, 2011.
4. A Textbook of Basic Electrical and Electronics Engineering, J.B.Gupta, Katson Publication.
5. A Textbook of Basic Electrical Engineering by S.B. Bodkhe, N.M.Deskar, Professional Publishing House Pvt. Ltd
6. D. P. Kothari and Nagrath, Theory and Problems in Electrical Engineering, PHI Publication, 2011.

7. B. L. Theraja, Basic Electronics, S. Chand Limited, 2007.
8. Millman Halkias, Integrated Electronics-Analog and Digital Circuits and Systems, McGraw-Hill Publication, 2000.
9. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
10. Donald Neaman, Electronic Circuit Analysis and Design, McGraw-Hill Publication, 3rd Edition.
11. Printed Circuit Boards Design & Technology, Walter C. Bosshart, McGraw-Hill Publication.

Note: Students are advised to use internet resources whenever required

Curriculum for Semester- II [First Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/ Ext.	Total	
1	HSMC	HU2T001	Communication Skills	2	0	0	60	0	40	100	2
2	BSC	MA2T001	Engineering Mathematics-II	3	1	0	20	20	60	100	4
3	BSC	CS2T002	Engineering Chemistry	3	1	0	20	20	60	100	4
4	ESC	CS2T003	Engineering Graphics	1	0	0	20	20	60	100	1
5	HSMC	HU2L001	Communication Skills Lab.	0	0	4	60	0	40	100	2
6	BSC	CS2L002	Engineering Chemistry Lab	0	0	2	60	0	40	100	1
7	ESC	CS2L003	Engineering Graphics Lab	0	0	4	60	0	40	100	2
8			Societal Internship/ Field	Report submission						50	1
9	ESC	CS2T004	Basic Civil and Mechanical Engineering	2	0	0	10	15	25	50	Audit
				11	**2**	**10**					**17**
				23							

HU2T001	**Communication Skills**	**4 Credit**

Course Objectives:

The main objective of the subject is to enhance the employability skills of engineering students as well as communication skills at work place.

The sub-objectives are:

1) To develop students' reading skills and pronunciation.
2) To develop technical communication skills through drafting, letter writing, and précis writing.
3) To develop literary skills through essay writing.
4) To develop public speaking skills of the students.
5) To expose the students to the ethics of English language by teaching grammar

Course Outcomes:

At the end of the course students will be able to

1) Better reading comprehension, pronunciation, and functional English grammar.
2) Write letters and resumes
3) Organize their thoughts for effective presentation and writing.
4) Learn skills to present themselves well in an interview, and handle a Group Discussion

Unit 1: Communication and Communication Processes [06 hrs]

Introduction to Communication, Types and functions of Communication, Barriers to Communication and overcoming them, Role of Communication Skills in Society

Reading: Introduction to Reading, Barriers to Reading, Types of Reading: Skimming, Scanning, Intensive and Extensive, Strategies for Reading Comprehension.

Listening: Importance of Listening, Types of Listening, and Barriers to Listening.

Unit 2: Study of Sounds in English and Vocabulary Building [06 hrs]

Introduction to phonetics, Study of Speech Organs, Study of Phonemic Script, Articulation of Different Sounds in English.

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Use of prefixes and suffixes from foreign languages in English to form derivatives, Synonyms, antonyms, and standard abbreviations

Unit 3: English Grammar **[06 hrs]**

Grammar: Forms of Tenses, Articles, Prepositions, Use of Auxiliaries and Modal Auxiliaries, Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Common Errors. Misplaced modifiers

Unit 4: Professional Verbal Communication **[06 hrs]**

Components of an effective talk, Idea of space and time in public speaking, Tone of voice, Body language, Timing and duration of speech, Audio-Visual Aids in speech. Presentation Skills, Group Discussion and Job Interviews

Unit 5: Developing Business Writing Skills, Styles and Practice **[06 hrs]**

Writing Emails, Report Writing: Format, Structure and Types, Letter Writing**:** Types, Parts, Layouts, Writing Job Application Letter and Resume.

Nature and Style of sensible Writing and Practice: Describing, Defining, Classifying, Providing examples or evidence, writing introduction and conclusion, Writing Practices: Comprehension, Précis Writing, Essay Writing

Text book:

Mohd. Ashraf Rizvi, Communication Skills for Engineers, Tata McGraw Hill

Reference Books:

1) Sanjay Kumar, PushpLata, Communication Skills, Oxford University Press, 2016

2) Meenakshi Raman, Sangeeta Sharma, Communication Skills, Oxford University Press, 2017

3) Teri Kwal Gamble, Michael Gamble, Communication Works, Tata McGraw Hill Education, 2010

4) Anderson, Kenneth. Joan Maclean and Tossny Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.

5) Aswalthapa, K. Organisational Behaviour, Himalayan Publication, Mumbai (1991).
6) Atreya N and Guha, Effective Credit Management, MMC School of Management, Mumbai (1994).
7) Balan, K.R. and Rayudu C.S., Effective Communication, Beacon New Delhi (1996).
8) Bellare, Nirmala. Reading Strategies. Vols. 1 and 2. New Delhi. Oxford University Press, 1998.
9) Bhasker, W. W. S &Prabhu, N. S.: English through Reading, Vols. 1 and 2. Macmillan, 1975.
10) Black, Sam. Practical Public Relations, E.L.B.S. London (1972).
11) Blass, Laurie, Kathy Block and Hannah Friesan. Creating Meaning. Oxford: OUP, 2007.
12) BoveeCourtland,L and Thrill, John V. Business Communication, Today McGraw Hill, New York, Taxman Publication (1989).

MA2T001	Engineering Mathematics-II	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyse a problem

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus.
2. Illustrate the concept of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus by using examples.
3. Apply the knowledge of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
4. Analyse the problems and results of complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
5. Evaluate the problems by using complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.
6. Create the methods or model by using complex numbers, integral calculus & multiple integrals, Fourier series & transform, vector differential calculus, vector integral calculus to solve the engineering problems.

Unit 1: Complex Numbers **[09 Hrs]**

Definition and geometrical representation; De-Moivre's theorem (without proof); Roots of Complex numbers by using De-Moivre's theorem; Circular functions of complex variable – definition; Hyperbolic functions; Relations between circular and hyperbolic functions; Real and

Imaginary parts of circular and hyperbolic functions; Logarithm of Complex quantities.

Unit 2: Integral calculus & Multiple Integrals **[09 Hrs]**

Beta, Gamma functions; tracing of the curves given in Cartesian, parametric & polar forms. Double integration in Cartesian and polar co-ordinates; Evaluation of double integrals by changing the order of integration and changing to polar form; Triple integral

Unit3: Fourier Series & Transform **[09 Hrs]**

Fourier Series , Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equations.

Unit4: Vector Differential Calculus **[09 Hrs]**

General rules of vector Differentiation; Scalar and vector fields: Gradient, divergence and curl; Solenoidal and irrotational vector fields; Vector identities

Unit5: Vector Integral Calculus **[09 Hrs]**

Vector Integration: line integral, surface integral and volume integral; Green's lemma, Gauss' divergence theorem and Stokes' theorem (without proofs).

Text Books

1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.

2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.

3)A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware, 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. RajnishVerma, 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., NewDelhi.

ET2T002	Engineering Chemistry	4 Credit

COURSE OBJECTIVES

1. To understand the importance of Chemistry
2. To understand the application of Chemistry in engineering and in real life.
3. To investigate the key concepts of Chemistry knowledge
4. To enable students to analyse a Chemistry problem so that appropriate problem solving techniques may be applied

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe various properties of water, fuel, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, polymer and batteries
2. Illustrate the various types of water, Ostwald's theory of acid-base indicator, polymer, various batteries, and fuel cell.
3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various batteries and fuel cell.
4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, fuel cell and batteries..
5. Develop a Modal on softening of water, standardization of acid and base by various instruments, polymers, fuel cell and batteries..
6. Organize water as per quality, and fuel, types of electrodes, polymers and fuel cell and batteries.

Unit-1 **[6 Hrs]**

Water Treatment: Introduction, hard and soft water, softening of water – Zeolite process, Ion exchange process, Hot Lime –Soda process, water characteristics- Hardness, Domestic water treatment

Unit-2 **[6 Hrs]**

Fuels: Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel-Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum.

Unit-3 **[8 Hrs]**

Electrochemistry: Introduction-basic concepts, Transport number and its determination by Moving Boundary method, Debye-Hückel theory, Conductometric titrations, Ostwald's theory of acid-base indicator, Quinonoid theory, Electrodes – Glass electrode, Quinhydrone electrode.

Unit-4 **[8 Hrs]**

Advanced Polymeric Materials: Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications

Unit-5Battery Technology: **[6 Hrs]**

Classification of batteries: Primary, Secondary- Electricity storage density, power density, energy efficiency, cycle life, shelf life. Rechargeable alkaline storage batteries, Ni-metal hydride, Lithium ion batteries and H2-O2 Fuel cell.

Text Books:

1. A Text book of Engineering Chemistry, Dr. S. S. Dara, Dr. S. S. Umre, S. Chand and Company Ltd., Twelfth/ 2011
2. Selected Topics in Inorganic Chemistry, Dr. Wahid U. Malik, Dr. G. D. Tuli and Dr. R. D. Madan, S. Chand and Company Ltd., Seventh/2001

Reference Books:

Engineering Chemistry, P. C. Jain and Monika Jain, Dhanpatrai Publishing Company Ltd., 15^{th} Ed/ 2009

Principles of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan S. Pathania, Vishal Publishing Company, First/2002

Chemistry, John E McMurry and Robert C Fay, Pearson, First/2008

ET2T003	Engineering Graphics	3 Credit

COURSE OBJECTIVES

1. To understand the concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient
2. To understand theory of projection and simple machine parts in first and third angle of projection systems.
3. To understand the key concepts CAD software.
4. To enable students to analyze a 2-dimensional & 3-dimensional problem.

COURSE OUTCOMES:

1. Define various concepts like dimensioning, conventions and standards related to engineering graphics in order to become professionally efficient.
2. Interpret drawings of simple machine component in first and third angle of projection systems
3. Apply theory of projections in projection of lines, projection of planes and projection of solid.
4. Classify solid geometry in different positions.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software

Unit I Introduction to Computer Aided Drawing [03 Hrs]

Theory of CAD software, Demonstration knowledge, layout of the software, standard tool bar/menus and description of most commonly used tools bars, Navigational tools. Creation of 2D/3D environment. Commands and creation of co-ordinate points, lines, axes, polyline, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, offset, mirror, rotate, trim, extend, break, chamfer, fillet, zoom, pan, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, lettering. Line properties, 3D modeling& topology of engineering component.

Unit II Drawing standards & Orthographic Projections: [03 Hrs]

Drawing standard SP: 46, type of lines, lettering, dimensioning. Basic geometrical construction, drawing of regular polygon, Theory of projection, introduction to orthographic projection, drawing of orthographic views of objects from their isometric views by using first angle method of projection.

Unit III Projections of Points & Projections of Straight Lines: [03 Hrs]

Projection of point lying in four quadrants. Projections of lines parallel and perpendicular to one or both planes, projections of lines inclined to one or both reference planes.

Unit IV Projections of Planes & Projections of Solids: [03 Hrs]

Projections of planes parallel and perpendicular to one or both planes, projection of planes inclined to one or both planes.

Types of solids, Projection of solid when axis is perpendicular to one of the reference planes, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes

Unit V Isometric Projections [03 Hrs]

Isometric projections: Isometric scale, drawing of isometric projections from given orthographic views.

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 46th Edition, 2003.

2. Dhananjay A. Jolhe, Engineering Drawing with an Introduction to AutoCAD, McGraw Hill Education, 2017

Reference Books:

1. K. V. Natarajan, A text book of Engineering Graphic, Dhanalakshmi Publishers, Chennai, 2006.

2. K. Venugopal and V. Prabhu Raja, Engineering Graphics, New Age International (P) Ltd, 2008.

3.Engineering Drawing, R. K. Dhawan, S. Chand Publication, 1998.

4. Engineering Graphics, A. R. Bapat, Allied Publishers, 2004.

5. Fundamentals of Engineering Drawing, Luzadder& Duff, Eastern Economy, 11^{th} Edition.

HU2L001	Communication Skills Lab	1 Credit

List of Practical Sessions (Any 10 PR sessions can be conducted):

1) Pronunciation, Intonation, Stress and Rhythm(02 hrs)
2) Introduction to Phonemic symbols (02 hrs)
3) Articulation of sounds in English with proper manner (02 hrs)
4) Practice and exercises on articulation of sounds (02 hrs)
5) Read Pronunciations/transcriptions from the dictionary (02 hrs)
6) Practice and exercises on pronunciations of words (02 hrs)
7) Introduce yourself (02 hrs)
8) Importance of Business Communication with the help of a case study.(02hrs)
9) Listening Skills/ Comprehension(02 hrs)
10) Common Everyday Situations: Conversations and Dialogues(02 hrs)
11) Communication at Workplace(02 hrs)
12) Rapid reading sessions (02 hrs)
13) Draft Email(02 hrs)
14) Resume Writing(02hrs)
15) Drafting Business Letter(02 hrs)
16) Preparing technical paper using IEEE format(02 hrs)
17) Extempore (02 hrs)
18) Elocution (02 hrs)
19) Group discussion (02 hrs)
20) Participating in a debate (02 hrs)
21) Presentation techniques (02 hrs)
22) Interview techniques – Job Interviews, Telephonic Interviews(02hrs)
23) Mock interviews and practice sessions(02 hrs)

EL2L002	**Engineering Chemistry Lab**	**4 Credit**

List of Experiments: (Perform any 8– 10 Experiments)

1. Determination of Hardness of water sample by EDTA method.
2. Determination of flash point by Pensky Martin Apparatus
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (any one type of Acid Base titration)
6. Conductometric Titration (any one type of Acid Base titration)
7. Surface tension: Determination of relative surface tension of liquid with respect to water using drop number method.
8. Viscosity:Determination of relative viscosity of liquid with respect to water using Ostwald's viscometer method.
9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with Na_2CO_3 solution.
10. To find out Morality, Normality and Strength of the given $KMnO_4$ solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.

Reference Books:

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara.

ET2L003	Engineering Graphics Lab	1 Credit

COURSE OBJECTIVES:

The objective of the course is to enable students to

1. Provide basic foundation in CAD software.
2. Understand the fundamentals used to create and manipulate geometric models.
3. Get acquainted with the basic CAD software for to design geometric modeling.

COURSE OUTCOMES:

1. Define basic structure of CAD workstation, CAD commands, Memory types, input/output devices and display devices to become professionally efficient to operate CAD software.
2. Explain drawing of simple machine component in CAD software.
3. Acquire the knowledge of geometric modeling in CAD software.
4. Analyze the steps required in CAD software for 2-dimensional and 3-dimensional models.
5. Assess the two dimensional and three dimensional drawing in CAD software.
6. Create the three dimensional engineering objects into two dimensional drawings and vice versa using CAD software.

List of Practical:

1. Introduction of CAD software and to study and practice basic draw commands exists in the CAD software.
2. Lines, lettering and dimensioning. (Drafting work)
   Identify the different types of Lines in the given object, draw lettering and give the Required dimensions in the given object.
3. Geometric Construction. (Drafting work)
4. Orthographic projections first sheet. (Using CAD software)
5. Orthographic projections second sheet. (Using CAD software)
6. Projections of straight lines. (Drafting work)
7. Projections of planes & solids. (Drafting work)
8. Isometric Projections first sheet. (Using CAD software)
9. Isometric Projections second sheet. (Using CAD software)
10. Design of basic hardware components using CAD Software.
11. Design of advance hardware components using CAD Software.
12. Design of assembly drawing using CAD Software.

13. Design of assembly drawing with animation and rendering using CAD Software.

ET2T004	**Basic Civil and Mechanical Engineering**	**Audit**

COURSE OBJECTIVES (Basic Mechanical Engineering)

1. To understand the basic stream of Mechanical engineering and Civil Engineering.
2. To understand the concepts of product manufacturing, Energy engineering, design engineering, Automobile engineering, construction technique and civil surveying.
3. To have basic knowledge of Casting, Machining, Designing, Manufacturing, different materials for building construction and surveying.

COURSE OUTCOMES: (Basic Mechanical Engineering)

Students would be able to

1. Define basic stream of Mechanical & Civil Engineering.
2. Explain the concepts of product manufacturing, Energy engineering, design engineering, Automobile engineering, construction technique and civil surveying.
3. Apply Basic knowledge of Casting, Machining, Designing, Manufacturing & Civil Construction technique.
4. Analyzed the different mechanical system and properties of construction & surveying material.
5. Interpret the problem in mechanical system and civil structure.
6. Solve the problem in mechanical system and civil structure.

Part I Basic Civil Engineering

Unit 1: Introduction to civil engineering

Various branches introduction to civil engineer in various construction activities basic engineer properties and various materials: earth bricks timber, stone, sand Aggregate cement motor steel bituminous glass FRP composite material.

Unit 2: Building component and planning material

Foundation and superstructure function of foundation type of shallow and deep foundation suitability in different situation plinth wall lintels beam column slab roof staircase floor door window and study of building plans ventilation and basic plumbing and sanitation

Unit 3: Surveying

Principal of surveying element of distance angular measurement plotting of area base line and off set introduction of plane table survey introduction to levelling concept of bench mark reduce level and counting

Part II Basic Mechanical Engineering

Unit 1: Introduction to Mechanical Engineering, Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, Basic terminology, 2 and 4 stroke IC engine working principle, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant, Automobiles: Basic definitions and objectives

Unit 2: Design Basics, Machine and Mechanisms, Factor of safety, Engineering Materials: types and applications, basics of fasteners, machining and machinability. Introduction to lathe machine, drilling machine, milling machine, basics of machining processes such as turning, drilling and milling. Introduction to casting

Text Books:

1. Anurag Kandya, "Elements of Civil Engineering", Charotar Publishing, Anand
2. M. S. Palani Gamy, "Basic Civil Engineering", Tata Mc-Graw Hill Publication
3. G. K. Hiraskar, "Basic Civil Engineering", DhanpatRai Publications
4. Gopi Satheesh, "Basic Civil Engineering", Pearson Education

Reference Books:

1. M. G. Shah, C. M. Kale, and S. Y. Patki, "Building Drawing", Tata McGraw Hill
2. Sushil Kumar, "Building Construction", Standard Publishers Distributors
3. Kanetkar T. P. and Kulkarni S. V., "Surveying and Levelling", Vols. I, II and III, Vidyarthi
4. Gruh Prakashan, Pune
5. B. C. Punmia, "Surveying", Vol.- I, Vol.-II, Vol.-III, Laxmi Publications
6. P. K. Nag "Engineering Thermodynamics", Tata McGraw Hill, New Delhi 3rd ed. 2005
7. A. Ghosh, A K Malik, "Theory of Mechanisms and Machines", Affiliated East West Press Pvt. Ltd. New Delhi.

8. Serope Kalpakaji and Steven R Schimd “A manufacturing Engineering and Technology” Addison WsleyLaongman India 6th Edition 200
9. V. B. Bhandari, “Design of Machine Elements”, Tata McGraw Hill Publications, New Delhi.

Curriculum for Semester- III [Second Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	HSMC	IT3T001	Organization Behavior	2	0	0	20	20	60	100	2
2	BSC	IT3T002	Mathematics-III	3	1	0	20	20	60	100	4
3	ESC	IT3T003	Digital Electronics & Fundamentals of Microprocessor	3	0	0	20	20	60	100	3
4	PCC	IT3T004	Computer Arhcitecture & Organsization	3	0	0	20	20	60	100	3
5	PCC	IT3T005	Data structure using OOPs	2	1	0	20	20	60	100	3
6	PCC	IT3T006	Computer Graphics	3	0	0	20	20	60	100	3
7	PCC	IT3L007	Data structure using OOPs(Lab)	0	0	2	60	0	40	100	1
8	ESC	IT3T008	Digital Electronics & Fundamentals of Microprocessor (Lab)	0	0	2	60	0	40	100	1
9	PCC	IT3L009	Computer Graphics (Lab)	0	0	2	60	0	40	100	1
10	HSMC	IT3T010	Universal Human Values	2	1	0	20	20	60	100	3
				18	3	6	320	140	540	1000	24

IT3T001	Organizational Behaviour	2 Credit

Course Objectives:

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions and understand why people behave as they do.
3. To provide the students to analyze specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

Course outcomes:

Students will be able to:

1. Outline the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.
2. Categorizing the applicability of analyzing the complexities associated with management of individual behaviour in the organization.
3. Analyze the complexities associated with management of the group behaviour in the organization
4. Validate how the organizational behaviour can integrate in understanding the motivation (why) behind behaviour of people in the organization

Course Contents:

Unit 1:Introduction to organization Behaviour [4Hrs]

Meaning, Fundamental concepts, Definition, Approaches to OB, Characteristics and limitations of OB, Challenges and Opportunities of OB, Models of OB, Impact of technology on organizational behaviour.

Organization 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.

Unit 2: Organizational Design, Change And Innovation [4 Hrs]

Designing an organizational structure, Division of labour, Delegation of authority, Departmental biases, Span of control, Dimensions of structure, Organizational design models, Multinational Structure and Design, Virtual Organizations.

Communication: The importance of communication, The communication process, Communicating within organizations, Information richness, How technology affects communication, Interpersonal communication, Multicultural communication, Barriers to effective communication, Improving Communication in organizations, Promoting ethical communications

Technical Report Writing : Characteristics of Technical Communication, Types of Technical Documents, Establishing Goals in Technical Writing, Technical Writing Process: Prewriting, writing, rewriting, Examples of Industries user manuals.

Unit3: Personality [4 Hrs]

Meaning of personality, 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.

Attitude: Attributes of personality- Transactional Analysis – Ego states – Johari window - Nature and dimensions of attitude – Developing the right attitude, ABC model of Attitude, Managerial Implications of Attitude

Unit 4: Groups and Organizations [4 Hrs]

Groups and Teams, Group Dynamics - Groups versus teams, Nature and types of groups and teams, five stages of group/team development, Determinants of group behaviour, 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 5: Motivation [4 Hrs]

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.

Power and Politics: The concept of power, Sources of power, Interdepartmental power, Illusion of power, Political strategies and tactics, Ethics, power and politics, using power to manage effectively.

Empowerment and Participation: The nature of empowerment and participation, How participation works, Programs for participation, Important considerations in participation.

Unit 6: Conflict Management [4 Hrs]

Definition. Traditional vs Modern view of conflict – Types of conflict – Intrapersonal, Interpersonal, and Organizational, Constructive and Destructive conflict, Conflict management

Stress and Counselling: What is stress? Stress model, Work stressors, Stress outcomes, Stress moderators, Stress prevention and management, Employee counselling, Types of counselling

Text Books:

1. Franklin Kuo, "Network Analysis & Synthesis", Wiley International.

2. Govind Daryanani, "Analysis and Synthesis of Filters".

Reference Books:

1. Kendall Su, "Analog Filters", Kluwer Academic Publisher, 2nd Edition, 2002.

2. John O’ Malley, “Basic Circuit Analysis”, Schaum’s series.
3. Van Valkenberg, “Network Analysis”, Pearson Education.

IT3T002	Mathematics-III	4 Credit

COURSE OBJECTIVES:

1. To understand the concept of Laplace Transform , Fourier transform, complex variables Numerical Linear algebra, Stochastic calculus, Computational graph theory.
2. To understand the application of Mathematics in engineering and in real life.
3. To enable students to apply mathematical tool to solve problems in real life.
4. To enable students to apply mathematical tool to analyze problems in real life

COURSE OUTCOMES:

1. Describe the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory
2. Illustrate the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory by using examples.
3. Apply the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory to solve the problem.
4. Analyze the problem by using the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.
5. Evaluate the problem base on the concept of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.
6. Create the new concept by using the theory of Laplace Transform, Fourier transform, complex variables, Numerical Linear Algebra, Stochastic calculus, Computational graph theory.

Unit1 **[6Hrs]**

Laplace transform: Definition ;Transforms of elementary functions; Properties of Laplace transform; Inverse Laplace transform; Convolution Theorem for finding inverse Laplace transforms ; Applications of Laplace transform to find the solutions differential equations. Introduction to Latex. Calculation of Laplace transform by using software.

Unit2 **[6Hrs]**

Fourier transform: Definitions – Fourier transforms ; Properties of Fourier transforms ; Fourier sine and cosine transforms ; Properties of Fourier transforms ; Parseval's identity for Fourier Transforms; Finite Fourier transform.

Unit3

[6Hrs]

Functions of complex variables : Analytic functions; Harmonic functions in Cartesian form; fundamental theorem of algebra; Cauchy's integral theorem; Cauchy's integral formula; Residues; Cauchy's residue theorem.

Unit4

[6Hrs]

Numerical linear algebra: Introduction to linear algebra; condition number of a matrix; sensitivity analysis; Norm ; stability of numerical algorithms; stability of nonlinear system; SVD; Power method; Google page rank algorithm.

Introduction about meta-heuristic method; Nature-inspired method : ant colony optimization .

Unit5

[6Hrs]

Stochastic calculus: Stochastic Processes: Definition and classification of random processes; Discrete-time Markov chains; Poisson process; Continuous-time Markov chains; Stochastic integration, Itôintegral , Itôformula. Stochastic differential equations. Application of stochastic calculus in computer science.

Unit6

[6Hrs]

Computational graph theory : Basic terminology in graph theory; Invariant of a graph; Adjacency matrix of a graph; Laplacian matrix of a graph; Algebraic connectivity of a graph;

Properties of eigenvalues and eigenvectors of an adjacency matrix and Laplacian matrix of a graph.

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 Knowledgeware, 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.

6. D. S. Watkins, Fundamentals of Matrix Computations, John Wiley, 1991.

7. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Edition, John Hopkins University Press, 1996.

8**.** S.M. Ross, Stochastic Processes, 2nd Edition, Wiley, 1996.

9. J. Medhi, Stochastic Processes, New Age International, 1994.

10. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.North-Holland, 1976.

11. J. M. Aldous. Graphs and Applications. Springer, LPE, 2007.

12. D. M. Cvetkovic, M. Doob and H. Sachs, Spectra of Graphs: Theory and Applications, Academic Press, 1980.

13. C. Godsil and G. Royale, Algebraic Graph Theory, Graduate Texts in Mathematics 207, Springer, 2001.

14. R. B. Bapat, Graphs and Matrices, Texts and Readings in Mathematics, Hindustan Book Agency, New Delhi, 2010.

Reference Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, NewDelhi.

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.

6. L. N. Trefethen and D. Bau III, Numerical Linear Algebra, SIAM, 1997.

7. J. W. Demmel, Applied Numerical Linear Algebra, SIAM, 1997.

8. S. Shreve, Stochastic Calculus for Finance, Vol. 2, Springer, 2004.

9. J. M. Steele, Stochastic Calculus and Financial Applications, Springer, 2001

10. R. M. Patne, G. R. Avachar, note on an adjacency matrix of a graph G, Advances in Mathematics: Scientific Journal, volume 9(3), 1281–1291,2020

11. D. Lamberton and B. Lapeyre, Introduction to Stochastic Calculus Applied to Finance, Chapmans & Hall/CRC, 2000.

12. M. Baxter and A. Rennie, Financial Calculus, Cambridge University Press, 1996.

13. F. Harary: graph theory, addison-wesley reading, Massachusetts, 1996.

IT3T003	Digital Electronics & Fundamentals of Microprocessor	3 Credit

Course Objectives:

1. Understanding basic knowledge of Boolean algebra and automaton theory as a core of computer science.
2. Theoretical and practical knowledge about synthesis of combinational and sequential circuits, and programmable structures.

Course Outcomes:

Students will be able to:

1. Define basic logical circuits, Boolean algebra, minimization methods, methods for writing Boolean functions, combinational and sequential circuits, flip-flops, digital automaton, and programmable structures.
2. Describe operation methods of combinational and sequential circuits, similarities and differences of writing the Boolean functions and minimizations.
3. Select appropriate methods for realization and circuit minimization.
4. Pattern recognition for specific circuit realization and error discovery during circuit design process.
5. Synthesis of appropriate combinational and sequential logic circuits.
6. Evaluation of own solutions and error discovery.

Course Contents:

Unit 1: Logic Simplification [6 Hrs]

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, 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: Combinational Digital Circuits [6 Hrs]

Standard representation for logic functions, K-map representation, and 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

Unit3: **Sequential circuits and systems** **6 Hrs**

A 1-bit memory, the circuit properties of Bi-stable 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.

Unit4: Fundamentals of Microprocessors **[6 Hrs]**

Fundamentals of Microprocessor, Comparison of 8-bit, (8085) 16-bit (8086), and 32-bitmicroprocessors (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: Memory Interfacing **[6 Hrs]**

Memory Interfacing. I/O Interfacing. Direct Memory Access. (DMA). Interrupts in 8086.

Unit 6: 8086 Instruction Set and Programming **[6 Hrs]**

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 Publications

Reference Books:

1. An approach to digital Design: Morris Mano, Pearson Publications.

2. Microprocessor Architecture, Programming and Applications with the 8085:Ramesh Gaonkar, Penram International Publications.

3. Engineering Approach to Digital Design: W. Fletcher, PHI Publications.

IT3T004	**Computer Architecture & Organization**	**3 Credit**

Course Objectives:

1. To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.

2. Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control. Explain how interrupts are used to implement I/O control and data transfers.

3. Identify various types of buses in Computer systems.

4. Understand memory hierarchy.

5. Understand various peripheral devices.

Course Outcomes:

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

1. Outcome- Interpret the functional architecture of computing systems. (Understanding) Classify and compute the performance of machines.

2. Explain addressing modes, instruction formats and program control statements.

3. Relate to arithmetic for ALU implementation. Understand the basics of hardwired and micro-programmed control of the CPU.

4. Build large memories using small memories for better performance. Write ISA level code for RISC and CISC machines.

5. Identify, compare and assess issues related to ISA, memory, control and I/O functions. (Applying, Analyzing, Evaluating)

6. Appreciate advancements to architecture like pipelining and superscalar operation

Course Contents:

Unit 1: Basic Structure of Computers **[6 Hrs]**

Basic Structure of Computers: Functional Units, Basic Operational Concepts, Bus Structures, Software, Multiprocessors and Multicomputer

Machine Instructions: Instruction Sets: Machine Instruction Characteristics, Types of Operands, Intel x86 and ARM Data Types, Types of Operations, Intel x86 and ARM Operation Type, Memory Locations and Addresses, Memory Operations, Machine program sequencing, addressing modes and encoding of information, Assembly Language, Stacks, Queues and Subroutine.

Unit 2: Instruction Sets **[6 Hrs]**

Addressing, x86 and ARM Addressing modes, Instruction Formats, x86 and ARM Instruction Formats, Assembly language.

Unit3: Micro-programmed Control **[6 Hrs]**

Control Unit Operation: Micro-operations, Control of the Processor, Hardwired Implementation, and Micro-programmed control, Basic Concepts, Microinstruction Sequencing & Execution, Microinstructions, grouping of control signals, Micro program sequencing, Micro Instructions with next Address field, Perfecting microinstruction, Emulation, Bit Slices, Introduction to Microprogramming, Macro Processor.

Unit 4: Arithmetic **[6Hrs]**

Number Representation, Addition of Positive numbers, Logic Design for fast adders, Addition and Subtraction, Arithmetic and Branching conditions, Multiplication of positive numbers, Signed Operand multiplication, fast Multiplication, Booth's Algorithm, Integer Division, Floating point numbers and operations. Reduced Instruction Set Computers (RISCs): Instruction Execution Characteristics, the Use of Large Register File, Compiler-Based Register Optimization, RISC Architecture, RISC Pipelining, RISC versus CISC

Unit 5: The Memory System **[6 Hrs]**

Some Basic Concepts, Semiconductor RAM Memories, Memory system considerations, Semiconductor ROM Memories, Memory interleaving, Cache Memory, Mapping techniques, Virtual memory, Memory Management requirements.

Unit 6: Computer Peripherals **[6 Hrs]**

I/O Devices, DMA, Interrupt handling, online storage, File services, Processors: Families of microprocessors Chips, Introduction to RISC & CISC Processors, Introduction to Pipelining. Parallel Processing: The Use of Multiple Processors, Symmetric Multiprocessors, Multithreading and Chip Multiprocessors, Clusters, Multicore Organization, Intel x 86 Multi-Core Organization

Text Books:

1. Computer Organization 4 th Edition, 2001 V. Carl Hamacher, McGraw Hill

2. William Stallings: "Computer Organization and Architecture", (8/e) Pearson Education.

Reference Books:

1. Behrooz Parhami: “Computer Architecture”, Oxford University Press
2. J. P. Hayes: “Computer Architecture and Organization” , McGraw Hill
3. D. A. Patterson, J. L. Hennessy: “Computer Architecture” Morgan Kauffmann, 2002
4. Hwang and Briggs: “Computer Architecture and Parallel Processing” McGraw-Hill

IT3T005	Data structure & OOP’s	4 Credit

Prerequisites: Basic knowledge of ‘C’ Language.

Course Objectives:

1. To understand the concepts of ADTs.
2. To learn linear data structures – lists, stacks, and queues

3. To understand sorting, searching and hashing algorithms.
4. To apply Tree and Graph structures.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the concept of ADT.
2. Identify data structures suitable to solve problems.
3. Develop and analyze algorithms for stacks, queues.
4. Develop algorithms for binary trees and graphs.
5. Implement sorting and searching algorithms.
6. Implement symbol table using hashing techniques

Course Contents:

Unit 1 **[6 Hrs]**

Complexity Analysis: Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.

Hashing: Implementation of Dictionaries, Hash Function, Collisions in Hashing, Separate Chaining, Open Addressing, Analysis of Search Operations

Unit 2 **[6 Hrs]**

ADT Array-Searching and sorting on arrays: Linear search, binary search on a sorted arrays. Bubble sort, Insertion sort, merge sort and analysis; Emphasis on the comparison based sorting model, Counting sort, Radix sort, and bucket sort

Unit 3 **[6 Hrs]**

Stacks and Queues: Abstract data types, sequential and linked implementations, exception handling in classes, representative applications such as parenthesis matching, towers of Hanoi, wire routing in a circuit, finding path in a maze, simulation of queuing systems, equivalence problem.

Unit 4 **[6 Hrs]**

Linked Lists: Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, exception and iterator classes for lists, doubly linked lists, circular lists, linked lists through simulated pointers, lists in STL, skip lists, applications of lists in bin sort, radix sort, sparse tables.

Unit 5 **[6 Hrs]**

Trees: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heap sort, heaps in Huffman coding, leftist trees, tournament trees, use of winner trees in merge sort as an external sorting algorithm, bin packing.

Unit 6 **[6 Hrs]**

Graphs: Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths, Warshall's Algorithm for finding Transitive Closure of a Graph, Floydd's Algorithm for All-Pairs Shortest Paths Problem.

Text Books:

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, ―Data Structures Using C, Second Edition, Oxford University Press, 2011.

Reference Books.

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, "Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, Data Structures and Algorithms‖, Pearson Education,1983.
3. Stephen G. Kochan, :Programming in C‖, 3rd edition, Pearson Education.

4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C, Second Edition, University Press, 2008.

IT3T006	**Computer Graphics**	**3 Credit**

Course Objective:

1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
2. To learn the basic principles of 3- dimensional computer graphics.

3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.

Course outcomes:

Students will be able to:

1. Understand the scope of computer graphics and also identified the field related to computer Graphics
2. Demonstrate on the concepts on transforms including translation, rotation, scaling, shearing and reflection.
3. Design algorithms for different geometric shapes, lines , circle, ellipse.

Course Contents:

Unit -1: Introduction to Computer Graphics [6 Hrs]

Overview of Computer Graphics, Computer Graphics Application and Software, Graphics Areas, Graphics Pipeline, Graphics API's, Numerical issues, Efficiency Display and Hardcopy Technologies, Display Technologies – Raster scan Display System, Video Controller – Vector scan display system, Random Scan Display Processor, Input Devices for Operator Interaction, Image Scanners.

Unit -2: Basic Raster Graphics [6 Hrs]

Algorithms for Drawing 2D primitives, aliasing and ant aliasing, Polygon filling methods: Scan Conversion Algorithms: Simple Ordered edge list, Edge Fill, Fence fill and Edge Flag Algorithm, Seed fill Algorithms: Simple and Scan Line Seed Fill Algorithm, Halftoning techniques.

Unit -3: Graphics Programming using OPENGL [6 Hrs]

Why OpenGL, Features in OpenGL, OpenGL operations, Abstractions in OpenGL – GL, GLU & GLUT, 3D viewing pipeline, viewing matrix specifications, a few examples and demos of OpenGL programs, Animations in open GL.

Unit -4:**2-D geometric transformations** **[6 Hrs]**

Basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions, Raster methods for transformations. Two- Dimensional viewing : viewing coordinates, Window-to viewport coordinate transformation, viewing functions, clipping : point, line, polygon, curve, text, exterior.

Unit -5: **Normalized Device Coordinates and Viewing Transformations** **[6 Hrs]**

3D System Basics and 3D Transformations, 3D graphics projections, parallel, perspective, viewing transformations.3D graphics hidden surfaces and line removal, painter's algorithm, Z -buffers, Warnock's algorithm.

Animations & Realism 10 Animation Graphics: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening.

Unit -6: Light sources: **[6 Hrs]**

basic illumination models , halftone patterns and dithering techniques; Properties of light, Standard primaries and chromaticity diagram; Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model, HSV colour model, HLS colour model; Colour selection.

Text Books:

1. Fundamentals of Computer Graphics, Peter Shirley and Steve Marschner, Third Edition. (A.K.Peters Publication house)
2. Procedural Elements of Computer Graphics III Edition, Rogers, McGraw Hill.
3. Computer Graphics - Principles and Practice, J. D. Foley, A. Van Dam, S. K. Feiner and J. F. Hughes, Second Edition in C, Pearson Education.

Reference Books:

1. Computer Graphics with OpenGL, Donald D. Hearn, M. Pauline Baker, Warren Carithers, Fourth

Edition, Pearson Education.
2.Computer Graphics, Hearn and Baker, PHI, India.

IT3L007	Data Structure using OOP's (Lab)	2 Credit

Course Objectives:

1. To impart the basic concepts of data structures and algorithms

2. To understand concepts about searching and sorting techniques

3. To Understand basic concepts about stacks, queues, lists, trees and graphs

4. To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures**.**

Course Objectives:

1. Ability to analyze algorithms and algorithm correctness.

2. Ability to summarize searching and sorting techniques.

3. Ability to describe stack, queue and linked list operation.

4. Ability to have knowledge of tree and graphs concepts.

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 (de queue) 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 the dequeue operation runs in linear time.

9. Write a program to implement a queue using two stacks such that the enqueue operation runs in linear time and the dequeue operation runs in constant time.

10. Write programs to implement the following data structures: (a) Single linked list (b) Double linked list

11. 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.

12. Write a program to implement a queue using a linked list such that the enqueue and dequeue operations of queue take O(1) time.

13. Case Study:-

Example (01): Simulation Case Study

Problem definition:

In this case study, consider the situation in which you are waiting in line for a service at a bank. In general, the more clerks there are, the faster the line moves. The bank manager wants to keep his customers happy by reducing their waiting time but at the same time he does not want to employ any more service clerks than he has to. Being able to simulate the effect of adding more clerks during peak business hours allows the manager to plan more effectively.

Example (02): Binary Tree Search ƒ

Problem definition:

a. Write a function binary Tree Search.

b. Attempt to locate a specified value in a binary search tree.
c. Input: a pointer to the root node of the binary tree and a search key to be located
d. Output: a pointer to that node (if found) or NULL (not found)

IT3L008	Digital Electronics & Fundamentals of Microprocessor (Lab)	1 Credit

Course Objectives:

1. Provide hands-on experience in digital circuits, which can be constructed by using standard integrated circuits (ICs). Investigate the operation of several digital circuits combinational and sequential.
2. To understand architecture and features of typical Microprocessors.
3. To learn interfacing of real world input and output devices.

Course Outcomes:

Students will be able to:

1. Describe and explain the operation of fundamental digital gates.
2. Analyze the operation of medium complexity standard combinational circuits like the encoder, decoder, multiplexer, de-multiplexer, and adder.
3. Analyze the operation of a flip-flop and examine relevant timing diagrams.
4. Learn importance of Microprocessors in designing real time applications.

5. Describe the 8085, 8086 & 80386 Microprocessors architectures and its feature.
6. Develop interfacing to real world devices.

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-3codeconversion & 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

IT3L009	Computer Graphics (Lab)	1 Credit

Course Objective:

1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
2. To learn the basic principles of 3- dimensional computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.
4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.
5. To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

Course Outcomes:

At the end of the laboratory work, students will demonstrate the ability to:

1. To list the basic concepts used in computer graphics.
2. To implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. To describe the importance of viewing and projections.
4. To understand a typical graphics pipeline.

List of Experiments:

1. Write a program to draw a rectangle using line function.
2. Write a program to draw a line using DDA's line drawing algorithm.
3. Write a program to draw a line using Bresenham'sline drawing algorithm.
4. Write a program to draw a circle using equation of circle.
5. Write a program to draw a circle using Bresenham's circle drawing algorithm.
6. Write a program to draw a line using Cohen Sutherland algorithm.
7. Write a program to translate triangle about origin.
8. Write a program to fill a circle using flood fill algorithm.
9. To design poster using photoshop software.
10. To create animated video using photoshop software.

IT3T010	**Universal Human Values**	**3Credit**

Course Objective:

The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (humanbeing), family, society and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society andnature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

Course Contents:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and ExperientialValidation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillmentof aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at variouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal ofPhysical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role othershave played in making material goods available to me.

Identifying from one’s own life. Differentiate between prosperity and accumulation. Discussprogram for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal valuesin relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order: a. At the level of

individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010

Reference Books:

1. JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Curriculum for Semester- IV [Second Year]

Sr. No.	Category of	Course Code	Course Name	Tea chin			Evalu ation				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	IT4T001	Theory of Computation	3	1	0	20	20	60	100	4
2	PCC	IT4T002	Java Programming	3	0	0	20	20	60	100	3
3	PCC	IT4T003	Operating System	3	0	0	20	20	60	100	3
4	PCC	IT4T004	Computer Networks	2	1	0	20	20	60	100	3
5	PCC	IT4T005	DBMS	3	0	0	20	20	60	100	3
6	PCC	IT4T006	Discrete Mathematics & Graph Theory	3	0	0	20	20	60	100	3
7	PCC	IT4L007	DBMS(Lab)	0	0	2	60	0	40	100	1
8	PCC	IT4L008	Computer Networks(Lab)	0	0	2	60	0	40	100	1
9	PCC	IT4L009	Java Programming(Lab)	0	0	2	60	0	40	100	1
10	MC	IT4L010	Consumer Affairs	2	0	0	15	10	25	50	Audit
				19	2	6	300	120	530	950	22

IT4T001	Theory of Computation	4 Credit

Course Objective:

1. To introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
2. To Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms

Course outcomes:

Students will be able to:

1. Students shall able to define the mathematical principles behind theoretical computer science.
2. Students shall able to Differentiate and give examples for the different types of automata like finite automata, push down automata, linear bounded automata and turing machine.
3. Students shall able to correlate the different types of automata to real world applications.
4. Students shall able to Choose and design appropriate automata for the different requirements outlined by theoretical computer science.

5. Students shall able to identify the different computational problems and their associated complexity.

Unit 1

[10Hrs]

Fundamentals : Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and nondeterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts of Automata Theory, DFA, NFA, and NFA & epsilon Machine. Conversions and Equivalence: Equivalence between NFA with and without epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

Unit 2 **[10Hrs]**

Regular Languages : Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions, Pumping Lemma for Regular Languages, Applications of the Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages.

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms, Right most and leftmost derivation of strings.

Unit 3 **[10Hrs]**

Context Free Grammars: Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tress, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push-Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence, Equivalence of CFL and PDA, interconversion, Introduction to DCFL and DPDA.

Unit 4: Turing Machine **[9Hrs]**

Definition of Recursive and Recursively Enumerable , Church's Hypothesis , Computable Functions , Methods for Turing Machine Construction, Modifications of the Basic Turing Machine Model, Multiple Tape , Multiple Tracks, Non-determinism, etc. Equivalence of the different TM Models and the Basic TM Model.

Unit 5: Computability Theory **[9 Hrs]**

Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0) grammar, decidability of, problems, Universal Turing Machine, undecidability, Posts Correspondence problem, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

TEXT BOOKS:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H. E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation – Sipser 2nd edition Thomson**.**

REFERENCES BOOKS:

1. Introduction to Formal languages Automata Theory and Computation Kamala Krithivasan Rama R.
2. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. Theory of Computation: A Problem - Solving Approach, Kavi Mahesh, Wiley India Pvt. Ltd.
4. Elements of Theory of Computation, Lewis H.P. & Papadimition C.H. Pearson /PHI.
5. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI.

IT4T002	JAVA Programming	3 Credits

COURSE OBJECTIVES

1	To learn the Advanced concepts in J2SE
2	To understand Web Application Development, Database Connectivity and itsImplementation using Servlets, JSP and JDBC
3	To introduce advanced Java frameworks for improving the web application design.

COURSE OUTCOMES

1	Student shall be able to Understand and implement advanced Java concepts.
2	Student shall be able to Develop Java based Web applications using Servlets and JSP
3	Student shall be able toIncorporate cutting-edge frameworks in web application development.

Syllabus

[Unit 1] **6 Hrs**

Basics of OOP: Abstraction, Inheritance, Encapsulation, Classes, subclasses and super classes, Polymorphism and Overloading, message communication Procedure-Oriented vs. Object-Oriented Programming concept

Introduction to Java Programming : Basics of Java, Background/History of Java, Java and the Internet, Advantages of Java , Java Virtual Machine & Byte Code , Java Environment Setup ,Java Program Structure

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[Unit 2] 6 Hrs

Primitive Data Types : Integers, Floating Point type, Characters, Booleans , User Defined Data Type , Identifiers & Literals , Declarations of constants & variables , Type Conversion and Casting , Scope of variables & default values of variables declared , Wrapper classes , Comment Syntax , Garbage Collection

Arrays of Primitive Data Types: Types of Arrays, Creation, concatenation and conversion of a string, Decision & Control Statements, Different Operators

[Unit 3] 6 Hrs

Class : Defining classes, fields and methods, creating objects, accessing rules, this keyword, static keyword, method overloading, final keyword

Constructor: Constructors: Default constructors, Parameterized constructors, Copy constructors, Passing object as a parameter, constructor overloading

[Unit 4] 6 Hrs

Basics of Inheritance: Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, Abstract Class

Package : Creating package, importing package, access rules for packages, class hiding rules in a package, Defining interface, inheritance on interfaces, implementing interface, multiple inheritance using interface

[Unit 5] 6 Hrs

Exception Handling : Introduction, Built in classes for Exception Handling, Mechanism of Exception Handling in Java, Error Handling Exception Classes

Multithreading : Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in threads

[Unit 6] **6 Hrs**

Java Applets Programming : local and remote applets, difference between applet and application, applet life cycle, developing executable applet code

Web Page Design : applet tag, adding applet to HTML file, running the applet, passing parameter to applet, various methods and component classes to develop basic applet

Textbook:

1) Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2) Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3) Complete Reference J2EE by James Keogh mcgraw publication.

Reference Books:

1) Black Book " Java server programming" J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath .
2) Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.
3) Spring in Action 3rd edition , Craig walls, Manning Publication.
4) Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication

IT4T003	**Operating Systems**	**3 Credit**

Course Objectives:

1. To understand the services provided by and the design of an operating system.
2. To understand the structure and organization of the file system.
3. To understand what a process is and how processes are synchronized and scheduled.
4. To understand different approaches to memory management.
5. Students should be able to use system calls for managing processes, memory and the file system.

6. Students should understand the data structures and algorithms used to implement an OS.

Course outcomes:

Students will be able to:

1. Identify the significance of operating system in computing devices.
2. Exemplify the communication between application programs and hardware devices through system calls.
3. Compare and illustrate various process scheduling algorithms.
4. Apply appropriate memory and file management schemes.
5. Illustrate various disk scheduling algorithms.
6. Understand the need of access control and protection in an operating system.

Course Contents:

Unit 1: Evolution of operating systems **[6 Hrs]**

Evolution of operating systems, Types of operating systems. The process concept, system programmer's view of processes, operating system's views of processes, operating system services for process management.

Unit 2: Processes and Threads **[6Hrs]**

Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Inter process Communication, Communication in Client – Server Systems, Multithreading Models, Threading Issues.

Unit -3: CPU Scheduling **[6 Hrs]**

Scheduling concepts, scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling.

Unit -4: Memory Management **[6 Hrs]**

Memory Management, Contiguous allocation, static-swapping, overlays, dynamic partitioned memory allocation, demand paging, page replacement, segmentation. Non-contiguous allocation, paging, Hardware support, Virtual Memory.

Unit -5: File Systems **[6Hrs]**

A Simple file system, General model of a file system, Symbolic file system, Access control verification, Logical file system, Physical file system, Allocation strategy module, Device strategy module, I/O initiators, Device handlers, Disk scheduling

Unit -6: Networks, Security and Design Principles **[6 Hrs]**

Network operating system, distributed operating system, external security, operational security, password protection, access control, security kernels, hardware security, layered approach, design principle.

Text Books:

1. J.L. Peterson and A. Silberchatz, “Operating System Concepts”, Addison Wesley.
2. Harvey M. Dietel, “An Introduction to Operating System”, Addison Wesley.
3. C. Crowley, “Operating Systems - A Design Oriented Approach”, Irwin Publishing

Reference Books:

1. W. Stallings, “Operating systems”, Prentice Hall.
2. A.S. Tannenbaum, “Modern Operating system”, PHI

IT4T004	Computer Network	3 Credit

Prerequisites:

1. Basic Idea of Transform and its mathematical descriptions (Laplace, Fourier and ZTransform)
2. Differential equations and Integrals (advanced level)
3. Ordinary differential equations
4. Series and expansions
5. Fourier analysis and complex Fourier Series/transform
6. Applications of Fourier series, Fourier Transform to circuits.

Course Objectives:

1. Discuss the physical and logical as well as the electrical characteristics of digital signals and the basic methods of data transmission.
2. Identify the importance of the ISO 7-layer reference model.
3. Identify and requirements hosted in communication protocols and give an overview of data communication standards, how these standards were developed and under which assumptions they were adopted.
4. Establish a solid knowledge of the layered approach that makes design, implementation, and operation of extensive networks possible.
5. Acquire the knowledge of the basic protocols involved in wired/wireless communication process.

Course Outcomes:

At the end of the course the student will be able to:

1. Defining, using and implementing Computer Networks and the basic components of a Network system, explain the importance of data communications, how communication works in data networks.
2. Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
3. Apply various network layer techniques for designing subnets and supernets and analyse packet flow on basis of routing protocols
4. Estimate the congestion control mechanism to improve quality of service of networking application.
5. Analyze the features and operations of various application layer protocols such as Http, DNS, Telnet, FTP and SMTP.
6. Apply the knowledge for finding security threats and solutions

Course Contents:

Unit-1: Basics of Digital Communications **[6 Hrs]**

Signals, noise, Nyquist's rate, Fourier transform of signals, harmonics. Baseband and broadband transmission: Modulation techniques fundamentals of modems local loop implementation, Introduction, history and development of computer networks, networks topologies. Layering and protocols.

Physical Layer: Different types of transmission media, errors in transmission: attenuation, noise. Repeaters. Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.).

Unit -2: Data Link Layer and Logical Link Control (LLC) sub-layer [6 Hrs]

Framing; Error control including Bit-parity , CRC and Hamming Codes; Reliable transmission and Automatic Repeat Request (ARQ) protocols including Stop-and-Wait, Go-back-N, and Selective Repeat. Performance analysis of ARQ protocols. Example protocols such as HDLC and PPP.

Medium Access Control (MAC) sub-layer: Shared media systems; Bus, Star and Ring topologies; TDMA, FDMA, CSMA, CSMA/CD, Ethernet and IEEE 802.3; IEEE 802.11 including CSMA/CA protocols; Performance analysis; Shared and Switched Ethernet; Related protocols such as ICMP, NAT, ARP and RARP.

Unit -3: Network Layer [6 Hrs]

Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms.

Unit -4: Transport Layer [6 Hrs]

Reliable end-to-end transmission protocols; UDP header; Details of TCP header and operation including options headers, Connection establishment and termination, sliding window revisited, flow and congestion control, timers, retransmission, TCP extensions, etc.

Unit -5: Application Layer [6 Hrs]

Application protocols for email, ftp, web, DNS

Unit -6: Advanced Networking [6 Hrs]

overview to network management systems; security threats and solutions – Firewalls, Access Control Lists, IPSec, IDS

Text Books:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. Kurose and Ross, "Computer Networking - A top-down approach", Seventh Edition, Pearson, 2017.
4. Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011

Reference Books:

1. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning

IT4T005	Database Management Systems	3 Credit

Course Objectives:

1. To learn and understand fundamentals of database management system 2. To analyze and interpret MOSFET circuits for small signal.
2. To exhibit the query development knowledge.
3. To learn modeling and normalization of databases.
4. To learn query processing and exhibit file organization.
5. To exhibit the knowledge of transaction and concurrency control.
6. To learn and understand Big Data and Hadoop.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Learn and understand fundamentals of database management system.
2. Exhibit the query development knowledge.
3. Learn modeling and normalization of databases.
4. Learn query processing and file organization.
5. Exhibit the knowledge of transaction and concurrency control.

6. Learn Big Data and Hadoop.

Course Contents:

Unit-1: Introduction to Database Systems [6Hrs]

Significance and advantages, Types of Databases, Limitations of File processing system, the DBMS Environment, Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Evolution of Data Models, Entity-relationship model, Relational integrity constraints, data manipulation operations.

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Unit-2: Relational query languages [6 Hrs]

Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS – MYSQL, ORACLE, DB2, SQL server.

Unit -3 Relational database design [6 Hrs]

Normalization of Database Tables: Need and Significance, Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Unit -4: Query processing [6 Hrs]

Evaluation of relational algebra expressions, Query equivalence, Join strategies.

File Organization and Indexing: Indices, B-trees, hashing

Unit -5: Transaction processing [6Hrs]

Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

Unit -6: Big Data and Hadoop [6 Hrs]

The rise of Big Data, What is Big Data, Big Data and it’s Challenges, Hadoop as a solution, What is Hadoop, Components of Hadoop, Use case of Hadoop

Text Books:

1. Henry Korth, Abraham Silberschatz & S. Sudarshan, *Database System Concepts*, McGraw-Hill Publication, 6th Edition, 2011.
2. Bipin Desai, An Introduction to Database System, West Publishing Company, College & School Division, 1990.
3. Raghu Ramakrishnan, Johannes Gehrke, *Database Management Systems*, McGraw-Hill Publication, 3rd Edition, 2003.
4. Big Data Simplified, Sourabh Mukherjee, Pearson India

Reference Books:

1. Joel Murach, *Murach's Oracle SQL and PL/SQL for Developers*, Mike Murach & Associates, 2nd Edition, 2014.
2. Wiederhold, *Database Design*, McGraw-Hill Publication, 2nd Edition, 1983.
3. Navathe, *Fundamentals of Database System*, Addison-Wesley Publication, 6th Edition, 2012.
4. J. D. Ullman, “Principles of Database and Knowledge – Base Systems”, Vol 1, Computer Science Press.

IT4T006	Discrete Mathematics & Graph Structures	Credit-3

Course Objective:

1.To develop logical thinking and its application to computer science

2. The subject enhances one's ability to reason and ability to present a coherent and mathematically accurate argument

Course Outcomes:

1.Be able to construct simple mathematical proofs and possess the ability to verify them ABET

2. Acquire ability to describe computer programs (e.g. recursive functions) in a formal mathematical manner

3. Be able to apply basic counting techniques to solve combinatorial problems

Course Contents:

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.

IT4L007	Database Management Systems (Lab)	1 Credit

Course Objectives:

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations. I
3. Describe the basics of SQL and construct queries using SQL.
4. To emphasize the importance of normalization in databases.
5. To facilitate students in Database design.
6. To familiarize issues of concurrency control and transaction management.

Course Outcomes:

The students will be able to

1. Apply the basic concepts of Database Systems and Applications.
2. Use the basics of SQL and construct queries using SQL in database creation and interaction.
3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
4. Analyze and Select storage and recovery techniques of database system.

List of Experiments:

1. Defining schema for applications.

2. Creating tables, Renaming tables, Data constraints (Primary key, Foreign key, Not Null), Data insertion into a table.
3. Grouping data, aggregate functions, Oracle functions (mathematical, character functions).
4. Sub-queries, Set operations, Joins.
5. Creation of databases, writing SQL and PL/SQL queries to retrieve information from the databases.
6. Assignment on Triggers & Cursors.
7. Normal Forms: First, Second, Third and Boyce Codd Normal Forms.
8. Assignment in Design and Implementation of Database systems or packages for applications such as office automation, hotel management, hospital management.
9. Deployment of Forms, Reports Normalization, Query Processing Algorithms in the above application project.
10. Large objects – CLOB, NCLOB, BLOB and BFILE.
    Distributed data base Management, creating web-page interfaces for database applications using servlet.

IT4L008	**Computer Networks (Lab)**	**1 Credit**

Course Objectives:

1. To understand the working principle of various communication protocols.
2. To analyze the various routing algorithms.
3. To know the concept of data transfer between nodes.

Course Outcomes:

Students will be able to:

1. Understand fundamental underlying principles of computer networking.
2. Understand details and functionality of layered network architecture.
3. Apply mathematical foundations to solve computational problems in computer networking.
4. Analyze performance of various communication protocols.
5. Compare routing algorithms.
6. Practice packet /file transmission between nodes.

List of Experiments:

1. Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped using NS.
2. Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion using NS.

3. Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination using NS.
4. Implement and study the performance of CDMA on NS2/NS3 (Using stack called Call net) or equivalent environment using NS.
5. Write a Program for ERROR detecting code using CRC-CCITT (16bit).
6. Write a program to find the shortest path between vertices using bellman-ford algorithm.
7. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS.
8. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration).

IT4L009	JAVA Programming (Lab)	1 Credit

Course Objective:

1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
3. Understand the principles of inheritance, packages and interfaces.

Course Outcome:

1. Identify classes, objects, members of a class and relationships among them needed for a specific problem
2. Write Java application programs using OOP principles and proper program structuring
3. Demonstrate the concepts of polymorphism and inheritance.
4. Write Java programs to implement error handling techniques using exception handling

List of Experiments

1. Install JDK, write a simple "Hello World" or similar java program, compilation, debugging, executing using java compiler and interpreter
2. Write a Java program that takes a number as input and prints its multiplication table upto 10.

3. Write a program in Java to find second maximum of n numbers without using arrays.
4. Designed a class that demonstrates the use of constructor and destructor.
5. Write a java program to demonstrate the implementation of abstract class.
6. Write a java program to implement single level inheritance.
7. Write a java program to implement method overriding
8. Create a package, Add the necessary classes and import the package in java class.
9. Write a java program to implement thread life cycle.
10. Develop minimum two basic Applets. Display Output with Applet Viewer and Browser

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- V [Third Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	ESC	IT5T001	Embedded System & IoT	3	0	0	20	20	60	100	3
2	PCC	IT5T002	Cyber Security & Cryptography	2	1	0	20	20	60	100	3
3	PCC	IT5T003	Design and Analysis of Algorithm	3	1	0	20	20	60	100	4
4	PCC	IT5O001	Open Elective-1	3	1	0	20	20	60	100	4
5	PEC	IT5TE01	Elective -I	3	0	0	20	20	60	100	3
8	ESC	IT5L004	Embedded System & IoT (Lab)	0	0	2	60	20	40	100	1
9	PCC	IT5L005	Cyber Security & Cryptography (Lab)	0	0	2	60	0	40	100	1
10	PCC	IT5L006	Design and Analysis of Algorithm (Lab)	0	0	2	60	0	40	100	1
6	PROJECT	IT5P007	Internship	0	0	0	0	0	0	0	1
7	MC	IT5T008	Innovation and Entrepreneurship Development	2	0	0	15	10	25	50	Audit
				16	3	6	300	120	450	850	21

COURSE OBJECTIVES:

1. To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modelling.

2. To introduce students a set of advanced topics in embedded IoT and lead them to understand research in network
3. To develop comprehensive approach towards building small low cost embeddedIoT system
4. To understand fundamentals of security in IoT
5. To learn to implement secure infrastructure for IoT
6. To learn real world application scenarios of IoT along with its societal and economic impact using case studies

COURSE OUTCOMES:

CO1 : On completion of the course, student will be able to

CO2: Implement an architectural design for IoT for specified requirement

CO3: Solve the given societal challenge using IoT

CO4: Choose between available technologies and devices for stated IoT challenge

Unit 1 : Introduction to Embedded System and Internet of Things: [6Hrs]

Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real-time scheduling, Processor basics and System-On-Chip, Introduction to ARM processor and its architecture. **IoT:** Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoTProtocols,Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications

Unit 2 :EmbeddedIoT Platform Design Methodology [6 Hrs]

Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification,Device and component integration, o Application development

Unit 3 :**Pillars of Embedded IoT and Physical Devices [6 Hrs]**

Horizontal, verticals and four pillars of IoT, M2M: The internet of devices, RFID: The internet of objects, WSN: The internet of transducer, SCADA: The internet of controllers, DCM: Device, Connect and Manage, Device: Things that talk, Connect: Pervasive Network, IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Exemplary device: Raspberry

Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Beagle board and Other IoT Devices.

Unit 4 :IoT Protocols and Security **[6Hrs]**

Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer. IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for Io

Unit 5 :Web of Things and Cloud of Things **[6Hrs]**

Web of Things and Cloud of Things ▪ Web of Things versus Internet of Things, Two Pillars of the Web, ▪ Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, ▪ The Cloud of Things Architecture.

Unit 6 :Cloud Offerings and IoT Case Studies **[6Hrs]**

IoT Physical Servers, Introduction to Cloud Storage Models, Communication API, WAMP: Autobahn for IoT, Xively Cloud for IoT, Python Web Application Framework: Django, Amazon Web Services for IoT, SkynetIoT Messaging Platform. Case Studies: Home Intrusion Detection, WeatherMonitoring System, Air Pollution Monitoring, Smart Irrigation.

Text Books:

1. Embedded System: Architecture, Programming and Design by Rajkamal,2nd edition,2010,Tata McGraw Hill

2. MSP430 Microcontroller Basics by John H. Davies Elsevier; First edition (2010)

3. Computer as Components: Principles of Embedded Computing System Design, Wayne Wolf,2nd edition,2008, Morgan Kaufmann Publication

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.

IT5T002	Cyber Security & Cryptography	4 Credit

COURSE OBJECTIVES:

1. To understand basics of Cryptography and Network Security.

2. To be able to secure a message over insecure channel by various means.

3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.

4. To understand various protocols for network security to protect against the threats in the networks..

COURSE OUTCOMES:

CO1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.

CO2. Develop policies and procedures to manage enterprise security risks.

CO3. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

CO4. Interpret and forensically investigate security incidents.

Unit 1: Introduction to Cyber Security& Cryptography [6Hrs]

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority,International convention on Cyberspace, Cyber Security Regulations, Roles of International Law.

Overview of Cryptography:Public versus private key cryptography, Stream Ciphers, Digital Signatures, Applications of Cryptography.

Unit 2:Cryptography and Network Security [6Hrs]

Cryptography, Stream Ciphers–One-time Pad(OTP),Perfect secrecy,Pesudo-Random Generators,Attacks on stream ciphers and OTP,Public key cryptosystems: RSA, ElGamal, Rabin,Ellipticcurve cryptosystemsPKC, key exchange, IBE, Lattice based cryptosystem.Authentication and signature protocols,Kerberos.Overview of Firewalls-Types of

Firewalls, Security Protocols: Security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS,PEM and S/MIME, PGP, Security at Network Layer-IPSec,

Unit 3: Cyber Security Vulnerabilities and Cyber Security Safeguards [6Hrs]
Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Ethical Hacking, Threats in network, Security policy, Threat Management

Unit 4: Securing Web Application, Services and Servers [6Hrs]
Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

Unit 5: Intrusion Detection and Prevention [6Hrs]
Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.Honeypots, password management.

Unit 6: Cyber Forensics [6Hrs]
Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

RESOURCES:
Video Lectures
1. http://nptel.ac.in/courses/106105031/lecture by Dr.DebdeepMukhopadhyayIITKharagpur
2.https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system engineering-spring-2009/video-lectures/ lecture by Prof. Robert Morris and Prof. Samuel Madden MIT.

Text Books
1. William Stallings, “Crpyptography and Network security Principles and Practices”, Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson.

3.J. Katz and Y. Lindell, Introduction to Modern Cryptography, CRC press, 2008.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.
2.Golreich O, Foundations of Cryptography, Vol.1.2, Cambridge University Press, 2004
3.Menezes, et.al, Handbook of Applied Cryptography, CRC Press, 2004.

IT5T003	Design and Analysis of Algorithm	4 Credit

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:

CO1. Develop efficient algorithms for simple computational tasks.

CO2 Gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.

CO3.Design standard algorithms such as sorting, searching, and problems involving graphs

CO4.Compute complexity measures of algorithms, including recursive algorithms using recurrence relations

Course Contents:

Unit 1 : [6 Hrs]

Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space, Order Notation (O, Θ, Ω Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm.

Unit 2]6 Hrs]

Introduction to Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Finding median, Closest Pair, Convex Hulls Problem.

Unit 3 [6 Hrs]

Greedy Methods, Fractional Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree – Kruskal's and Prim's Algorithm, Dijkstra's Shortest Path Algorithm.

Unit 4 [6 Hrs]

Introduction to Dynamic Programming, Elements of Dynamic Programming, Multistage Graphs, Traveling Salesman Problem, Matrix-chain multiplication, Optimal Polygon Triangulation, Longest common subsequence, Floyd-Warshall algorithm

Unit 5 [6 Hrs]

Introduction to Backtracking, N-Queen Problem, Combinational Search, Backtracking Strategies, Search & Traversal Techniques – BFS, DFS, Sum of Subsets, Graph coloring, Hamiltonian Circuit Problem, Tower of Hanoi Problem, State Space Tree, Branch & Bound, Least cost (LC) Search, Control Abstractions for LC search, FIFO Branch & Bound..

Unit 6 [6 Hrs]

Efficiency of Algorithms: Polynomial Time & Non-Polynomial Time Algorithms, NP-Complete, NP-Hard, Limitation of Algorithm, Worst and Average Case Behavior, Efficiency of Recursion, Complexity Calculation for Various Sorting Algorithms, Approximation of Algorithms, Time-Space Trade off in algorithms research.

Text Books:

1. Thomas H. Cormen, Charles E Leiserson, Introduction to Algorithms, PHI Publication, 3rd Edition.
2. Parag Dave, Himanshu Dave, Design and Analysis of Algorithm, Pearson Education India, 2nd Edition.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, India.

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.

IT5O001	Open Elective-1 Web Development & Design	4 Credit

COURSE OBJECTIVES:

1. Students will able to understand and illustrate HTML.
2. Students will be able to understand about CSS Properties.
3. Student will able to understand basic of Java Script
4. Student will able to design website

COURSE OUTCOMES: Student will able to

CO1. Remember the basic tags of HTML, CSS, and JavaScript

CO2. Understand thebasic tags of HTML, CSS, and JavaScript

CO3: Execute the different Syntax and Tags present in HTML, CSS, and JavaScript

CO4. Analyze difference between various web design Languages

CO5. Evaluate the design of Different Forms

CO6. Design the web site form

Course Contents:

Unit 1 - Introduction [8Hrs]

Introduction to Internet, World Wide Web Communication& Markup Language, HTTP Request / Response, The HTTP Request Circle.

Unit 2 -HTML Basic Tags [8Hrs]

HTML Basic Examples, HTML Editors, HTML Elements, HTML Attributes, HTML Documents, HTML Document Structure, HTML Headings, HTML Paragraphs, HTML Styles, HTML Text Formatting, HTML Quotation and Citation Elements, HTML Comments

Unit 3 -HTML Table [8 hrs]

HTML Colors, HTML Links, HTML Images, HTML Tables, HTML List, HTML frames, HTML Layout Elements and Techniques

Unit 4 - HTML form & Media [8Hrs]

HTML Form, Attribute, Element, Input Type, Input Attribute, Input Form Attribute

Unit 5 - CSS Introduction [8Hrs]

Concept of CSS: Introduction, Syntax, CSS Border, Background, CSS Text, Font, Link, Table, list ,Align, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts)

Unit 6 -Java Script Introduction **[8Hrs]**

JAVAScript Implementation, SyntaxBasics and Variable Types: History of a java script, java script Implementation, The language syntax, The character set, Data Types,

Reference Books:

1. Reference Book: Web Developer's Reference Guide. By: Joshua Johanan, Talha Khan, RicardoZea.

Reference Website:

2. Reference Website: W3 School web Developemt: https://www.w3schools.com/whatis/whatis_icons.asp

COURSE OBJECTIVES :

1. To Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
2. To Describe logic semantics and inference with OWL.
3. To Use ontology engineering approaches in semantic applications
4. To enable students build a applications based on semantic web

COURSE OUTCOMES:

CO1: Understand the fundamentals of Semantic web

CO2: Creating structured web documents in XML

CO3:Apply ontology engineering to various problems.

CO4:Understand Semantic Web query languages (SPARQL)

CO5:Program semantic applications with Java and Jena API.

Unit I: Semantic Web Vision: [6 Hrs]

Todays' web, Examples of semantic web from today's web, Semantic web technologies, layered approach

Structured web documents in XML: The XML language, Structuring, Namespaces, Querying and Addressing XML documents, Processing

Unit II: Describing Web Resources: [6Hrs]

Introduction, RDF: Basic Ideas,RDF: XML-Based Syntax,RDF serialization, RDF Schema: Basic Ideas,RDF Schema: The Language ,RDF and RDF Schema,Querying RQL.Logic and Inference Rules:

Introduction, Monotonic Rules syntax, semantics & examples, Nonmonotonic rules – syntax & examples, Encoding in XML

Unit III: Ontology Engineering: [6 Hrs]

Introduction, Manual construction of Ontology, Reusing existing ontology, using Semi-automatic methods, Knowledge semantic web architecture

Unit IV: SPARQL: [6 Hrs]

SPARQL simple Graph Patterns, Complex Graph Patterns, Group Patterns, Queries with Data Values, Filters OWL Formal Semantics,Emerging Semantic Web Ontology Languages using Protege tool.

Unit V: SchemaWeb Ontology Language: [6 Hrs]

SchemaWeb Ontology Language: Introduction, OWL language, Examples, OWL in OWL, Future extensions.

Unit VI: Trust and Applications: **[6 Hrs]**

Digital Signatures and Web of Trust, Applications in E-Commerce and Bio-Informatics, e-Learning, Web Services, Other Scenarios,Linked Open Data Cloud,Research in Semantic Web Mining.

Text Books

1. A Semantic Web Primer: Grigoris Antoniou and Frank Van Hermelen , MIT Press
2. Foundations of Semantic Web Technologies, Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, CRC Press
3. John Davies, Dieter Fensel and Frank Van Harmelen, “Towards the Semantic Web: Ontology-Driven Knowledge Management”, John Wiley and Sons, 2003.
4. Linked Data:Evolving the Web into a Global Data space by Tom Heath, Christian Bizer , Morgan & Claypool publication

Reference Books

1. Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, “The Semantic Web: A Guide to the Futureof XML, Web Services, and Knowledge Management”, Fourth Edition, Wiley Publishing, 2003.
2. John Davies, Rudi Studer, and Paul Warren John, “Semantic Web Technologies: Trends and Research in Ontology-based Systems”, Wiley and Son's, 2006.

IT5TE02B	Quantum Computing	3 Credits

COURSE OBJECTIVES:

1. The objective of this course is to provide the students an introduction to quantum computation.
2. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.
3. Analyze the behaviour of basic quantum algorithms.
4. Implement simple quantum algorithms and information channels in the quantum circuit model.
5. Simulate a simple quantum error-correcting code.
6. Prove basic facts about quantum information channels.

COURSE OUTCOMES:

CO1. The basic principles of quantum computing.

CO2. The fundamental differences between conventional computing and quantum computing.

CO3. Several basic quantum computing algorithms.

Co4. The classes of problems that can be expected to be solved well by quantum computers.

CO5.Quantum mechanics as applied in Quantum computing.

CO6. Understand how quantum parallelism is used in the simplest quantum algorithms such as Deutsch, period finding and quantum Fourier transform

Course Contents:

Unit 1 **[6Hrs]**

Introduction to Quantum Computation: Quantum bits, B loch sphere representation of a qubit, multiple qubits.

Unit 2 **[6Hrs]**

Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

Unit 3 **[6 Hrs]**

Quantum mechanics, Measurements in bases other than computational basis. 083 Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits.

Unit 4 **[6 Hrs]**

Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states, Quantum teleportation. Quantum Cryptography, no cloning theorem.

Unit 5 **[6Hrs]**

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search.

Unit 6 **[6Hrs]**

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation.

Text Books:

1. Nielsen M. A ., Quantum Computation and Quantum Information, Cambridge University Press.2002
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I : Basic Concepts, Vol I I: Basic Tools an d Special Topics, World Scientific.2004
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms.2000

Reference Books:

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008

2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010
3. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

IT5TE03C	Biomedical Informatics	3 Credit

COURSE OBJECTIVES:

1.Driven by efforts to improvehuman health and healthcare systems, this course will cover relevant topics at the intersection of people, health information, and technology.

2. Specifically, we will survey the field of biomedical informatics that studies the effective uses of biomedical data, information, and knowledge fromindividuals(patients), populations, biomolecules, and cellular processes,forscientific inquiry,problemsolving, and decision making.

3. We will explore foundations and methods from both biomedical and computing perspectives, including hands-on experiences with systems, tools, andtechnologies in the healthcareecosystem.

COURSE OUTCOMES:

CO1. Understand the different sub-disciplines of biomedical informatics (BMI)and identity an area of interestfor further study, research, and/or practice

CO2.Comprehend how to acquire, store and maintain, retrieve, analyse, and meaningfully use biomedical data

CO3.Apply biomedical and computational tools and technologies to solve problems in biomedicine and healthcare

CO4.Understand how technology, including health information systemsand medical devices, can improve or limit the ability to provide clinical care.

CO5.Critically think and develop own perspectives on ethical and legal considerations in use of contemporary technology and informatics in health care.

Course Contents:

Unit 1 **[6 Hrs]**

The Science and Pragmatics of Biomedical Informatics,Acquisition, Storage, and Use of biomedical data (including "big data"),Introduction Categories of Biological Databases, Microarray Technology: A Boon to Biological Sciences Introduction to Microarray Microarray Technique

Unit 2 **[6Hrs]**

Standards in Biomedical Informatics,Biomedical Decision Making,Natural Language Processing in Health care and Biomedicine.

Unit 3 **[6Hrs]**

Sequence alignment,Multiple Sequence Alignment methods (MSA), Scoring of a MSA, Progressive (CLUSTALW and PILEUP), Iterative (Genetic) and Hidden Markov Model (HMM) methods of MSA, Local MSA (Profile and BLOCK analysis, and Pattern searching, and Expectation Maximization (EM) Algorithm (MEME),Ethics in Biomedical and Health Informatics: Users, Standards, and Outcomes

Unit 4 **[6 Hrs]**

Markov Chains and HMM Frequent words in DNA, Consensus word analysis, Transaction and emission matrix, Development of training set, CpG island prediction using HMM, Application of HMM in gene finding, and Multiple sequence alignment by HMM method. Introduction to Methodologies in Biomedical Informatics

IT5L004	Embedded System and IOT-Lab	1 Credit

Unit 5 **[6 Hrs]**

Introduction to Biopython, sequence objects, sequence record objects. Sequence input and output:-parsing sequences, parsing sequences from the net, sequence files as dictionaries, writing sequence files. Multiple Sequence Alignment objects,BLAST using Biopython

Unit 6 **[6 Hrs]**

Phylogenetic analysis: Definition and description of phylogenetic trees, a primer on computational phylogenetic analysis. Computational gene prediction methods, analysis of codon usage bias, computational prediction and analysis of regulatory sites,Human Genome Project Genome Sequenced in the Public (HGP) and Private.

Text Books:

1. Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics),
2. Shortliffe EH, Cimino JJ. Fourth edition, 2014.
3. M.J. Bishop and C.J. Rawlings (editors), DNA and Protein Sequence Analysis---A Practical Approach IRL Press at Oxford University Press, ISBN 0 19 963464 7 (Pbk)
4. J. Pevsner (2002) Bioinformatics and Functional Genomics; Cold Spring Harbor Laboratory
   Press, Cold Spring Harbor, New York.
5. Jeff Chang, Brad Chapman, Iddo Friedberg, Thomas Hamelryck, BiopythonTutorial and Cookbook", http://biopython.org/DIST/docs/tutorial/Tutorial.html,2013

Reference Books:

1. Shortliffe, E. H., &Cimino, J. J. (2013). Biomedical Informatics: Computer Applications in Health Care and Biomedicine. Springer Science & Business Media, (4thEdition).
2. Selected readings from peer-reviewed literature in biomedical informatics, translational medicine, and healthcare systems engineering.
3. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press

COURSE OBJECTIVES :

To create an environment for research, design, development and testing of IoT solutions, in the field of energy management, communication systems, distributed sensor devices and advanced user interfaces

COURSE OUTCOMES:

Investigate a variety of emerging devices and technologies such as smart sensing, pervasive connectivity, virtual interfaces & ubiquitous computing and their potential applications in consumer, retail, healthcare and industrial contexts

List of Experiments:

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History& Elevation)

2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board

3. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.

4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs

5) Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.

6. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

7. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.

8. Study of different CPU frequency governors. Write an application to change CPU frequency of Raspberry-Pi /Beagle board

9. Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor.

10. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardwaresimulated traffic signal.

11. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardwaresimulated lift elevator

12. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.

IT5L006	Design and Analysis of Algorithm Lab	1 Credit

COURSE OBJECTIVES :

1. To analyze the running time of asymptotic algorithm.
2. To develop algorithms for sorting, searching, insertion and matching.
3. To identify and apply the concept of computational intractability.
4. To acquire knowledge in NP Hard and complete problem

COURSE OUTCOMES:

CO1. To design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2.To find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate) .

CO3.To apply classical sorting, searching, optimization and graph algorithms Apply classical sorting, searching, optimization and graph algorithms

CO4. To understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

CO6.To explain NP-Completeness and deal with NP-complete problems.

CO7 To synthesize efficient algorithms in common engineering design situations.

List of Experiments:

1. Introduction of Algorithm (Order Notation , Time & Space Complexity)
2. Write a program to implement Binary Search Algorithm
3. Write a program to implement Merge sort Algorithm

4. Write a program to implement Knapsack problem using greedy method
5. Write a program to implement Prim's Algorithm
6. Write a program to implement Kruskals Algorithm
7. Write a program to implement Dijkstras's algorithm
8. Write a program to implement Travelling Salesman Problem
9. Write a program to implement Tower of Hanoi problem for n number of disks.
10. Write a program to implement Warshall's algorithm.
11. Write a program to implement Quick Sort Algorithm
12. Write a program to implement Depth first Search Algorithm

13. Write a program to implement Spanning tree.
14. Write a program to implement Breath First Search Algorithm
15. Write a program to implement Selection Sort Algorithm
16. Write a program to implement Longest Common Subsequence Algorithm
17. Write a program to implement Bubble Sort algorithm.
18. Write a program to implement Insertion Sort Algorithm
19. Write a Program to Search a number from the given list of numbers using Linear Search
20. Write a program to implement Hamilton Algorithm

IT5T008	Innovation and Enterpreneurship Development	1 Credit

COURSE OBJECTIVES

1. To understand the importance of Innovation and Idea Generation

2. To understand the concept of entrepreneurship.

COURSE OUTCOMES

At the end of the course students will be able to

1. Identify and validate of ideas.

2. Remember Patent registration of Innovation.

3. Understand roles and responsibilities of Entrepreneurship.

Unit 1: Innovation **[06 Hours]**

Concept of creativity, innovation, invention, discovery. Methods for development of creativity, convergent & divergent thinking etc. Introduction to Intellectual Property Rights (IPR), Patent and laws related to patents.

Unit 2: Entrepreneurship [06 Hours]

Concept of entrepreneurship, its relations in economic developments, Eventuation of concept of entrepreneur, characteristics of an Entrepreneur, Types of entrepreneurs, Qualities of entrepreneur, Factors affecting growth of entrepreneurship.

Unit 3: Role of Entrepreneurial Bodies [06 Hours]

Theory of achievement, motivation, Medelland's. experiment, Women entrepreneurship, Role of SSI,

it's advantages & limitations, policies governing small scale industries, Procedure to set up small

scale industrial unit, Advantages and limitations of SSI.

Unit 4: Role of Entrepreneurial Support [06 Hours]

Factors governing project selection, Market survey, Preparation of project report. Financial, technical

& market analysis of project. Entrepreneurial support systems, Role of consultancy organization like,District Industrial Centre, State Industrial Development Corporation, Financial institution, Latest SSI schemes of DIC (to be confirmed from DIC from time to time.

Text Book

1) Entrepreneurship Development, S. S. Khanka, S. Chand Publishers.

Reference Book

1) Creativity Innovation & Entrepreneurship, Zechariah James Blanchard, Needle Rat Business

Publishers.

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- VI [Third Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	ESC	IT6T001	Adhoc Wireless Networks	3	0	0	20	20	60	100	3
2	PCC	IT6T002	Machine Learning	2	1	0	20	20	60	100	3
3	PEC	IT6TE02	Elective -II	3	0	0	20	20	60	100	3
4	PEC	IT6TE03	Elective-III	3	0	0	20	20	60	100	3
5	OEC	IT6O002	OPEN Elective 2	3	1	0	20	20	60	100	4
6	ESC	IT6L003	Adhoc Wireless Networks (Lab)	0	0	2	60	0	40	100	1
7	PCC	IT6L004	Machine Learning (Lab)	0	0	2	60	0	40	100	1
8	PCC	IT6L005	Multimedia (Lab)	0	0	2	60	0	40	100	1
9	PROJECT	IT6P006	Mini Project	0	0	4	25	0	25	50	3
10	MC	IT6T007	Intellectual Property Rights	2	0	0	15	10	25	50	Audit
11	PROJECT	IT6P007	CRT(Campus Recruitment Training)	0	0	2	60	0	40	100	1
				16	2	10	320	110	470	900	23

IT6T001	**Adhoc Wireless Network**	**3 Credit**

COURSE OBJECTIVES:

1. Explain fundamental principles of Ad-hoc Networks

2. Discuss a comprehensive understanding of Ad-hoc network protocols
3. Outline current and emerging trends in Ad-hoc Wireless Networks.
4. Analyze energy management in ad-hoc wireless networks.

COURSE OUTCOMES:

CO1. Design their own wireless network

CO2. Evaluate the existing network and improve its quality of service

CO3. Choose appropriate protocol for various applications

CO4. Examine security measures present at different level

CO5. Analyze energy consumption and management

Course Contents:

Unit 1 **[10 Hrs]**

Teaching Hours Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas.

Unit 2 **[8 Hrs]**

Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols.

Unit 3 **[9 Hrs]**

Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.

Unit 4 **[9Hrs]**

Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.

Unit 5 **[9 Hrs]**

Quality of Service and Energy Management in Ad-hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes.

Text Books:

1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

Reference Books:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.

2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.

IT6T002	Machine Learning	4 Credit

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 assumptionsthat underlies them.
5. To possess insights, concerning the relative strengths and weaknesses of various commonmachine learning methods.

COURSE OUTCOMES:

After learning the course the student will be able:

CO1. To demonstrate knowledge of the machine learning literature.

CO2. To describe how and why machine learning methods work.

CO3. To demonstrate results of parameter selection.

CO5. To select and apply appropriate machine learning methods to a selected problem.

CO6. Toimplement machine learning algorithms on real datasets.

Course Contents:

Unit 1 **[6 Hrs]**

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 2 **[6 Hrs]**

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 3 **[6 Hrs]**

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 4 **[6 Hrs]**

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, Ensemble Learning: Bagging, boosting, and DECORATE. Active learning with ensembles.

Unit 5 **[6 Hrs]**

Unsupervised Learning: Clustering:Learning from unclassified data, Hierarchical Aglomerative Clustering, k-means partitional clustering, Batchler and Wilkin's algorithm.

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.

IT6TE02A	Elective II- Cloud Computing and Storage Management Semester	Credit:3

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 centres.
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 centres 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. RajkumarBuyya, James Broberg, AndrzejGoscinski, “Cloud Computing Principles and Paradigms”, Wiley Publishers, 2011.
2. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishers 2010.
3. Tim Mather, SubraKumaraswamy, ShahedLatif, “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. RajkumarBuyya, Christian Vacchiola, S ThamaraiSelvi, “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.

IT6TE02B	**Expert Systems**	**3 Credit**

COURSE OBJECTIVES:

1. Students will be introduced to what is an Expert System.
2. Students will be able to understand First and Second Generation Expert Systems.
3. Students will study Artificial Intelligence.
4. Students will study Artificial Intelligence.
5. Students will study Different approaches to gain knowledge with different perspectives.

6. Students will study about Machine Learning and its importance.

COURSE OUTCOMES:

CO1. Students will be able to understand Knowledge Representation.

CO2. Students will be able to understand what is Machine Learning.

CO3. Students will be able to analyse a Hybrid Expert System for Insurance Policy.

CO4. Students will illustrate the Frame Problem.

CO5. Students will be Understand what is Neural Network

CO6. Students will be introduced with Machine learning concepts.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction to Expert System: Artificial Intelligence, Basic expert System concepts, Knowledge Engineering, First and second Generation Expert Systems, Advantages and disadvantages of Expert Systems, Expert System applications.

Unit 2 **[6 Hrs]**

Theoretical Foundations : Introduction, Propositional Logic, First order predicate calculus and Predicate Logic, Inference, Proof by Refutation Resolution, Green's Answer Terms, Knowledge Acquisition Bottleneck, Search Strategies, Non Monotonic Reasoning, Forward Backward Chaining.

Knowledge Representation: Presentation of Knowledge, Rules, Semantic Networks, Frames, Object Oriented Systems, Hybrid Representation, The Frame problem, Semantic Primitives..

Unit 3 **[6 Hrs]**

Knowledge Acquisition, Verification and Validation: The Expert System Development Process, Knowledge Elicitation, The Knowledge Level, Explanation in Second Generation Expert System, The Problem Solving Methods and Generic Tasks Approach, Verification and Validation.

Unit 4 **[6 Hrs]**

Uncertainty: Uncertainty in Expert Systems, The Bayesian Approach, Certainty Factors, Dempster Shafer Theory of Evidence, Fuzzy Sets and Fuzzy Logic, Bayesian Belief Networks.

Machine Learning: Introduction, Decision Trees and The ID3 Algorithm, Learning From Noisy Data, Version Space Search and Conceptual Clustering, Case Based Reasoning, Evolutionary Machine Learning.

Unit 5 **[6 Hrs]**

Neural Networks: Introduction, Artificial Neural Network, Perceptron, Hidden Layers, Multi layerPerceptrons, Hopfield Networks, Multilayered Nets AndBackpropagation.

Unit 6 **[6 Hrs]**

Hybrid Expert System: Introduction, Macie: A Connectionist Expert System, Generating Rules from Neural Nets, A Hybrid expert system for Investment Advising, A Hybrid Expert System for Insurance Policy.

Reference Book:

1. Nikolopoulos "Expert Systems" 1997
2. J. Giarratano and G. Riley, "Expert Systems -- Principles and Programming". 4th Edition, PWS Publishing Company, 2004
3. Peter J. Lucas "Principles of Expert Systems" January 1991
4. Joseph C. Giarratano "Expert systems"

IT5TE01A	Blockchain	3 Credit

COURSE OBJECTIVES:

1. To understand the concepts of blockchain
2. To understand various cryptocurrency and their working
3. To Use various algorithms for distributed consensus
4. To enable students build a applications based on blockchain technology

COURSE OUTCOMES:

CO1: Understand emerging abstract models for Blockchain Technology.

CO2: Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.

CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4: Apply hyperledger Fabric and Etherum platform to implement the Block chain Application

Unit I: Introduction : [6 Hrs]

Blockchain-History,Myths,Benefits,Limitations and Challenges of Blockchain, Structure of Blocks, Miners,Working of Blockchain,Types of Blockchain,Blockchain as Public Ledgers-Bitcoin, Blockchain 2.0, Smart Contracts, Transactions-Distributed Consensus, The Chain and the Longest Chain -Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain,

Unit II: Blockchain Architecture and Cryptographic**: [6Hrs]**

Crypto Primitives, Permissioned Blockchain,Consensusmechanism **,**Cryptographic -Hash Function,Properties of a hash function-pointer and Merkle tree. Public key cryptosystems, private vs public blockchain. Introduction to cryptographic concepts required,Hashing, public key cryptosystems, private vs public blockchain and use cases,

Unit III: Bitcoin Consensus: [6 Hrs]

Introduction to BitcoinBlockchain,Transactions,Bitcoin limitations, Bitcoin Consensus, Proof of Work (PoW)- HashcashPoW , BitcoinPoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

Unit IV:Cryptocurrency and Smart Contracts **[6 Hrs]**

Introduction, Ethereumblockchain, Elements of the Ethereumblockchain, IOTA,Namecoin.Legal Aspects Cryptocurrency Exchange, Black Market and Global Economy.Smart Contracts: Definition, DAO,Ricardian contracts,Precompiled contracts.

Unit V: HyperledgerFabric: [6 Hrs]

Architecture of Hyperledger fabric v1.1-Introduction to hyperledger fabric v1.1, chain code-Ethereum:Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, TruffleDesign and issue Crypto currency, Mining, DApps, DAO

Unit VI: BlockchainApplications : [6 Hrs]

Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, Finance, and others

Text Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016

2. Draft version of "S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.

3. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.

Reference Books

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popularBlockchain frameworks by Bashir, Imran,2017.
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoinandcryptocurrency, IEEE Symposium on security and Privacy, 2015.

IT6TE02D	**Big Data Analytic Technique**	**3 Credit**

COURSE OBJECTIVES:

1. Design applications using R, HADOOP.
2. Design applications using RHADOOP
3. Develop analytic applications for data Streams.
4. Develop Pig scripts for Big data applications.
5. Design Big data applications schema

COURSE OUTCOMES:

CO1. Understand basic concepts and techniques of Hadoop ecosystem and Big data.

CO2.Design different component of Hadoop ecosystem.

CO3. Understand the domain of data science and analysis of big data.

Course Contents:

Unit 1 : **[6 Hrs]**

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies.

Unit 2 : **[7 Hrs]**

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, master-slave replication, peer-peer replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning andcombining, composing map-reduce calculations.

Unit 3 : [7 Hrs]

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

Unit 4 : [7 Hrs]

Map Reduce workflows, unit tests with MR Unit, test data and local tests, anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats.

Unit 5 : [7 Hrs]

H base, data model and implementations, H base clients, H base examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Hive, data types and file formats, HiveQL data definition, Hive QL data manipulation, HiveQL queries.

Unit 6 : [6Hrs]

Big Data Issues: Privacy, Visualization, Compliance and Security,Structuredvs Unstructured Data.

Text Books:

1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, PreetiSaxena, McGraw Hill, 2018.

2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and AmbigaDhiraj, John Wiley & Sons, 2013

Reference Books:

1. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013

2. Hadoop: The Definitive Guide, Tom White ,Third Edition, O'Reilley, 2012.

3. Hadoop Operations, Eric Sammer, O'Reilley, 2012.

4. Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012.

5. H Base: The Definitive Guide, Lars George, O'Reilley, 2011.

6. Cassandra: The Definitive Guide, Eben Hewitt, O'Reilley, 2010.

IT6TE03A	Graph Analytic for Big data	3 Credit

COURSE OBJECTIVES:

1.To understand the concept of Big Data

2.To learn Big Data file systems and their storage methods

3.To understand the algorithms and

4.To learn to process Big Data information for analytics

5.To discuss and understand Big Data implementations within large corporations like Google and Facebook

COURSE OUTCOMES:

CO1.To model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.

CO2.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.

CO3.To explain trade-offs in big data processing technique design and analysis in written and oral form.

CO4.To explain the Big Data Fundamentals, including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.

CO5.To apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.

Course Contents:

Unit 1 **[6 Hrs]**

What is big data?, the four V's of big data, Distributed File System, functional programming vsobject oriented programming, advantages of scala, spark streaming

Unit 2 **[7 Hrs]**

Introduction, Parallel processing using Pig, Pig Architecture, Grunt, Pig Data Model-scalar and complex types. Pig Latin-Input and output, Relational operators, User defined functions.
Working with scripts

Unit 3 **[7 Hrs]**

Big Data Storage Models: Distributed Hash-table, Key-Value Storage Model (Amazon's Dynamo), Document Storage Model(Facebook's Cassandra), Graph storage models

Unit 4 **[7 Hrs]**

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 No SQL, Algorithms for detecting similaritems, Recommendation systems, Data stream analysis algorithms, Clustering algorithms, Detecting frequent items.

Unit 5 **[7 Hrs]**

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 Net fix Prize, Link Analysis with case studies of the PageRank algorithm and the Spam farm analysis, Crowd Sourcing

Unit 6 **[6 Hrs]**

Big graph Analytic Approaches: In memory big graph analytics, SSD-based big graph analytics, Disk based big graph analytics, centrality analysis: Degree, eignvectorkatz, page rank.

Text Books:

1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, PreetiSaxena, McGraw Hill, 2018.
2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and AmbigaDhiraj, John Wiley & Sons, 2013**.**

Reference Books:

1. An Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze
2. Data-Intensive Text Processing with Map Reduce, Jimmy Lin and Chris Dyer.

IT6TE03B	**Smart Sensors for Robotics**	**3 Credit**

COURSE OBJECTIVES:

1. To understand the different sesnsors used in robotics
2. To learn kinematics of robotics
3. To understand sensors used in industries

COURSE OUTCOMES:

CO1.Student shall be able to differentiate sensors uses..
CO2.Student shall be able to apply the knowledge of different sensors in different area of robotics.
CO3.Students shall able to understand the robotics assembly

Course Contents:

UNIT I: Introduction **[6 Hrs]**

An Introduction to sensors and Transducers, History and definitions, Smart Sensing, AI sensing, Need of sensors in Robotics.

UNIT II: Sensors In Robotics [**7 Hrs]**

Position sensors -optical, non-optical, Velocitysensors, Accelerometers, Proximity Sensors - Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors

UNIT III: Miscellaneous Sensors In Robotics [**8Hrs]**

Different sensing variables -smell, Heat or Temperature, Humidity, Light, Speech or Voice recognition Systems, Telepresence and related technologies. Range detectors, assembly aid devices,force and torque sensors, machine vision, ranging, laser, acoustic, magnetic, fiberopticand tactile sensors.

UNIT IV: Vision Sensors InRobtics [**6Hrs]**

Robot Control through Vision sensors, Robot vision locating position, Robot guidance with vision system, End effector camera Sensor

UNIT V: Multisensor Controlled Robot Assembly
[**7Hrs]**

Control Computer, Vision Sensor modules, Software Structure, Vision Sensor software, Robot programming, Handling, Gripper and Gripping methods, accuracy .

UNIT VI: Case Study [**6Hrs]**

Case Studies: Multiple robots, machine interface, robots in manufacturing and non-manufacturing applications, robot cell design, selection of robot.

Text Books:

1.Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", McGraw-Hill, Singapore, 1996.
2.Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998.
3.Paul W Chapman, "Smart Sensors", an Independent Learning Module Series, 1996
4.Richard D. Klafer, Thomas a. Chmielewski; Michael Negin, "Robotic Engineering -An integrated approach", Prentice Hall of India Private Limited, 1989

Reference Books:

1.K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics -Control Sensing, Vision and Intelligence", McGraw Hill InternationalEditions, 1987
2.Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G. Odrey, "Industrial Robotics -Technology, Programming and Applications", McGraw Hill, International Editions, 1986
3.SabricSoloman, "Sensors and Control Systems in Manufacturing", McGraw Hill, International Editions, 1994
4.Julian W Gardner, Micro Sensor MEMS and Smart Devices, John Wiley & Sons, 2001
5.Bijay K. Ghosh, Ning Xi, T.J. Tarn, Control in Robtics and Automation Sensor -Based integration, Academic Press, 1999
6.K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics Control, Sensing Vision and Intelligence, McGraw Hill Book Company, 1987

IT6TE03C	Human Computing Interface	3 Credit

COURSE OBJECTIVES

The student should be made to:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Gain an understanding and articulate the fundamental design concepts and practices associated with the design of human-computer interactions.

4. Analyze human factors such as cognition, affect and behaviour as they relate to the human-computer interaction and apply them in the development of human-computer interactions.
5. Evaluate the impact of new and emerging technology trends on human computer interactions and the user experience.
6. Synthesize sound (solid) design principles and aesthetics as they apply to the design of innovative interfaces.

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

CO1. Design effective dialog for HCI.
CO2.Design effective HCI for individuals and persons with disabilities.
CO3.Assess the importance of user feedback.
CO4 Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5 Develop meaningful user interface.

Unit 1: FOUNDATIONS OF HCI [6 Hrs]

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks.

Unit 2 :INTERACTIVE SYSTEM DESIGN [6 Hrs]

Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering .

Unit 3 : MODELS AND THEORIES [6 Hrs]

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit 4: MODEL BASED DESIGN AND EVALUATION [6 Hrs]

Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and HickHyman's law.

Unit 5: GUIDELINES IN HCI [6 Hrs]

Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Cognitive walkthrough.

Unit 6: TASK MODELING AND ANALYSIS [6 Hrs]

Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design.

TEXTBOOK:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, “Mobile Design and Development”, First Edition , O‟Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, First Edition, O‟Reilly, 2009.(UNIT-V)

REFERENCE BOOK:

1. Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.
2. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).

IT6TE03D	Machine Learning with Big Data	3 Credits

COURSE OBJECTIVES:

1. Understand the Big Data Platform and its Use cases.
2. Apply analytics on Structured, Unstructured Data.
3. Acquire a sharp understanding of how big data can be applied to concrete environments/sectors.
4. Approach dissemination actions targeting different stakeholders.
5. The student will learn to use tools to develop systems using machine-learning algorithms in big data.
6. The student will learn about problems and industrial challenges through domain-based case studies.

COURSE OUTCOMES:

CO1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

CO2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

CO3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

CO4. Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

CO5. Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

CO6. Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction: Types of Machine Learning , Machine Learning process, preliminaries, testing Machine Learning algorithms, turning data into probabilities, and Statistics for Machine Learning, Probability theory ,Probability Distributions ,Decision Theory.

Unit 2 **[6 Hrs]**

Supervised Learning: Linear Models for Regression , Classification, Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models , Decision Tree Learning , Bayesian Learning, Naïve Bayes , Ensemble Methods, Bagging, Boosting, Neural Networks , Multilayer Perception, Feed-forward Network, Error Back propagation ,Support Vector Machines.

Unit 3 **[6 Hrs]**

Unsupervised Learning: Clustering-K-means , EM Algorithm, Mixtures of Gaussians , Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis.

Unit 4 **[6 Hrs]**

Discriminative Models: Least Square Regression, Gradient Descent Algorithm, Univariate and Multivariate Linear Regression, Prediction Model, probabilistic interpretation, Regularization, Logistic regression, multi class classification, Support Vector Machines- Large margin classifiers, Nonlinear SVM, kernel functions, SMO algorithm.

Unit 5 **[6 Hrs]**

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Data Analytics Lifecycle, data analytics problems. Understanding features of R language, Understanding different Hadoop modes, Understanding Hadoop features, The HDFS and MapReduce architecture.

Unit 6 **[6 Hrs]**

Understanding the basics of MapReduce, The HadoopMapReduce, The HadoopMapReduce fundamentals, writing a HadoopMapReduce example, learning the different ways to write MapReduce in R. Integrating R and Hadoop – the RHIPE architecture and RHadoop.

Text Books:

1. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2016.
2. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
3. Tom Mitchell, “Machine Learning”, McGraw-Hill, 1997.
4. Big Data Analytics with R and Hadoop, VigneshPrajapati, PACKT Publishing, 2013.
5. Fundamentals of Business Analytics, R N Prasad and S Acharya, Wiley India, 2011

Reference Books:

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Stephen Marsland, “Machine Learning –An Algorithmic Perspective”, Chapman andHall, CRC Press, Second Edition, 2014.
3. Randal S, “Python Machine Learning, PACKT Publishing, 2016

IT6L003	AD-HOC WIRELESS NETWORKS LAB	Credit 1

1. To be able to understand importance of ad-hoc network, NS3 and assembly programming languages.

2. To be able to understand about importance of various Interfaces.

List of Experiments:

1. Program in NS 3 to connect WIFI TO BUS(CSMA)

2. Program in NS 3 to create WIFI SIMPLE INFRASTUCTURE MODE 3. Program in NS

3 To create WIFI SIMPLE ADHOC MODE

4. Program in NS 3 to connect WIFI TO WIRED BRIDGING

5. Program in NS 3 to create WIFI TO LTE(4G) CONNECTION

6. Create a simple dumbbell topology, two client Node1 and Node2 on the left side of the dumbbell and server nodes Node3 and Node4 on the right side of the dumbbell. Let Node5 and Node6 form the bridge of the dumbbell. Use point to point links.

7. Program in NS3 for CREATING A SIMPLE WIFI ADHOC GRID

8. Create a wireless mobile ad-hoc network with three nodes Node1, Node2 and Node3. Install the OLSR routing protocol on these nodes

9. Setup a 5x5 wireless adhoc network with a grid. You may use examples/wireless/wifi-simple-adhoc-grid.cc as a base

10. Setup a 2-nodes wireless adhoc network. Place the nodes at a fixed distance in a 3d scenario

IT6L004	**Machine Learning Lab**	**Credit 1**

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.

List of Experiments:

1. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples. 3. Write a program to demonstrate the working of the decision tree based ID

3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

IT6L005	**Multimedia (Lab)**	**Credit 1**

COURSE OBJECTIVES:

1. Students will Gain an understanding of how to use Multimedia Software's.
2. Students will Understandhow to create an Animation.
3. Students will study Animation Techniques.
4. Students will Study Animation Software.

COURSE OUTCOMES:

1. Students will be able to understand how to create their own Animations by using different Multimedia software.
2. Students will understand Flash8 software.
3. Students will understand background given techniques while creating Animation.
4. Students will understand how to simulate movement.

List of Practicals:

1. Create an Animation to Represent the Growing Moon.

2. Create an Animation to Indicate a Ball Bouncing on Steps.

3. Create an Animation to Simulate Movement of a Cloud.

4. Create Procedure to Draw the Fan Blades and to Give Proper Animation.

5. Create an Animation to Display the Background Given(Filename: Tulip.jpg) Through Your Name.

6. Create an Animation to Simulate a Ball Hitting Another Ball.

7. Create an Animation to Create an Animated Cursor UsingStartdrag("Ss", True); Mouse.hide();

8. Design a Visiting Card Containing At Least One Graphic and Text Information.

9. Take a Photographic Image. Give a Title for the Image. Put the Border. Write Your Names. Write the Name of Institution and Place.

10. Prepare Cover Page for The book in Your Subject Area. Plan Your Own Design.

11.Software: Flash8, adobe Photoshop 7.0

IT6P006	**Mini Project**	**Credit 1**

Evaluation Criteria: The total term work shall be of 50 marks. The 30 marks shall be distributed over internal assessments / reviews (at least 02 reviews) during the semester by a review committee. The remaining 5 marks shall be distributed for attendance. The Head of the Department shall constitute the review committee. The student shall make presentation on the progress made before the committee. The 20marks of the practical will be awarded based on

the performance in the practical exam conducted by the University at the end of the semester.

General Suggestions and Expectations / Guidelines

• The project shall be developed in C++/JAVA/PYTHON

• The students may choose the theory concepts they studied in different subjects as project topic.

• Interdisciplinary project proposals and innovative projects are encouraged and more appreciable.

• The project topic can be suggested by the staff member or it can be proposed by the students.

• The project topic shall be approved by the project in-charge.

• The Guides are advised to give projects and suggest project titles focusing more on the current field ofresearch and ensure the level of innovation.

• A project team shall contain a maximum of 2 members.

• The project work should be properly distributed among the team members.

• Students should submit the project documentation at the beginning of the semester consisting of: Title, AbstractModules Split-upDeliverables for each reviewData Model (If Any)Details of Team Members

• Reviews for the project work will be conducted at regular intervals by the panel of examiners formed by theHead of the Department.

• The student failing to attend the project review will be subject to strict action as decided by the Head of theDepartment.

• Throughout the semester at any point of time if students are found to be involved in any of the following:

Using project codes available on the Internet

Using project codes developed by someone elseUsing project work which is already submitted in other institute or university Such students shall bedeclared failed or penalized as decided by the Examiners.

• The students must arrange regular meetings with the guide and present progress of project work.

• A Spiral bound Project report to be prepared as per the guidelines and format given by the Department

• The guides are advised to check for the formatting of the presentation and project report.

- Students must submit a report well before the end of the semester.

IT6T007	**Intellectual Property Right (IPR)**	**1 Credit**

Course Objectives :

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.

2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects

3. To disseminate knowledge on copyrights and its related rights and registration aspects

4. To aware about current trends in IPR and Govt. steps in fostering IPR

Course Outcome :

CO 1: To provide an understanding of the law relating to Intellectual Property and Competition in India.

CO2: To understand the concept of Intellectual Property and Intellectual Property Rights with special reference to India.

CO3:To appreciate the significance of Intellectual Property in modern times, in the light of its international legal regime.

CO4:To study the important Agreements, Treaties and Conventions relating to Intellectual Property Rights.

CO5:To understand the intricacies of grant of Patent, Patentability, Licensing and Revocation at National and International levels.

Course Contents :

UNIT1: Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad Function of IPR. Public good, Incentive theory, different forms of IPR , Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT 2: Practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad .Introduction to competition Law, Anti-competitive agreements, Abuse of dominance, Regulation of combinations,

UNIT3: International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT 4: The relationship and Interaction between IPR and competition law The economics of US Anti trustlaw,IP and competition issues,Technology transfer agreements. The EU experience with IP and Competition Law

UNIT5: Market allocation, Horizontal agreements, Vertical agreements, licensing issues.Indian Competition Act and IPR protection. Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

Text Books :

1. Fundamentals ofIP for Engineers: K.Bansl&P.Bansal

2. Intellectual property right, Deborah, E. BoDcboux, Cengageleam'ng.

3. Inrelletul property right - Unleasbing the knowledgeconomy, PmbuddhaGanguli, Tata MccrawHiU Publishing Company Ltd.

Refrence Books:

1. Eleclronic resource guide ERc published online by the American Society of Intellectual Propery Rights md Develolment Policy: Repod of rhe

2. Commission on InrellectualPrcpertyRidls, London Sepiedber 2002

IT6P007	**Campus Recruitment Training**	**1 Credit**

About CRT Training Campus Recruitment training (CRT) at is designed to aid candidates in their preparation for Recruitment through Campuses or outside campuses (i.e On campus or off campus). Students in their final step of graduation looking for placement in reputed organizations can make use of this training to get trained to deliver their best in the selection processes of organizations.

COURSE OBJECTIVES

1. To enhance the problem solving skills, to improve the basic mathematical skills and to help students who are preparing for any type of campus recruitment drive.
2. To groom the students to the corporate level
3. To ensure that all eligible students are employed by the end of the final year of study.

COURSE OUTCOMES

At the end of the course students will be able to

1. Solve the problems easily by using Short-cut method with time management which will be helpful to them to clear the competitive exams for better job opportunity.
2. Analyze the Problems logically and approach the problems in a different manner.
3. Students will be able to apply mathematical analysis of data to make connections, draw conclusions and solve problems.
4. Students will learn a series of techniques through practical activities to develop presenting skills and enhance confidence to expand the potential of the individual.
5. Students can produce a resume that describes their education, skills, experiences and measurable achievements with proper grammar, format and brevity.
6. Students demonstrate an ability to target the resume to the presenting purpose
7. Demonstrate professional behavior(s) including preparedness, professional attire, and respectful presentation during interviews.

PART I: - QUANTITATIVE ABILITY

Unit 1: - 03 hrs

Speed Maths Calculation, Number Systems, Ratio & Proportion, Percentage

Unit 2: - 03 hrs

Profit – Loss & Discount, Simple Interest & Compound Interest, Simple Equation and Age's

Unit 3:- 03 hrs

Averages Mixture & Allegation, Time and work, Time Speed & Distance, Permutation – Combination & Probability

PART II: - REASONING ABILITY

Unit 1: - 03 hrs

Coding Decoding, Blood Relation, Direction sense, Number Series, Analogy

Unit 2: - 03 hrs

Sitting Arrangement, Puzzles.

Unit 3:- 03 hrs

Syllogism, Statement course of action, Statement arguments, Statement Assumptions, Miscellaneous Type of Reasoning

PART III: - Employability Skills

Unit 1: - Presentation Skills (02 hrs)

What is a presentation? Essential characteristics of Good presentation.

Preparation of presentation: Identify the purpose, Analyze the audience, Design and organize the information, Medium of presentation and Visual aids

Delivering Presentation: rehearsal, body Language, Handling questions, Tips to fight stage fear.

Unit 2: - Job Interview Skills (02 hrs)

Types of interviews, Focus of interview, dress code, importance of body language.

Probable interview questions, Telephonic and video interview, Strategies for success at interview.

Unit 3: - Resume Building (02 hrs)

Meaning, Difference among Bio-data, Curriculum vitae and Resume.

CV writing tips, The content of Resume, Structure of Resume

Books

1. Prashant Sharma, SOFT SKILLS PERSONALITY DEVELOPMENT FOR LIFE SUCCESS. BPB Publication.
2. P. D. Chaturvedi & Mukesh Chaturvedi, Business Communication: Concepts, Cases, and Applications 2nd Edition. Pearson Education.
3. Barun Mitra, Personality Development and Soft Skills. Oxford University Press.
4. Dr.K.Alex, *Soft Skills Know yourself and Know the World*. S.ChandPublishing, 2014
5. R.S Agrawal, Quantitative Aptitude.
6. Arun Sharma, How to Prepare for Quantitative Aptitude.
7. R. S Agrawal, Verbal and Non Verbal Reasoning.
8. R.V.Praveen,Quantitative Aptitude and Reasoning, 2nd Revised Edition 2013, Prentice-Hall of India Pvt.Ltd.
9. G. K. Ranganath, C. S. Sampangiram and Y. Rajaram, A text Book of business Mathematics, 2008, Himalaya Publishing House

JAIDEV EDUCATION SOCIETY'S

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Department of Information Technology

"Progress Beyond Excellence"

Session: 20220-23

Course Structure and Syllabus (Autonomous)

For

B. Tech. Information Technology Programme

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- VII [Fourth Year]

7th Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	ESC	IT7T001	Data Science	2	1	0	20	20	60	100	3
2	PCC	IT7T002	Artificial Intelligence & Cognitive Robotics	3	0	0	20	20	60	100	3
2	PEC	IT7TE04	Elective-IV	2	1	0	20	20	60	100	3
3	PEC	IT7TE05	Elective -V	2	1	0	20	20	60	100	3
5	OEC	IT7O003	OPEN Elective -III	3	0	0	20	20	60	100	4
6	ESC	IT7L002	Data Science using R (Lab)	0	0	2	60	0	40	100	1
7	PEC	IT7L003	Middleware Technolgies(Lab)	0	0	2	60	0	40	100	1
8	PROJECT	IT7P004	Project Phase I	0	0	6	50	0	50	100	3
9	MC	IT7T005	Research Methodology	2	0	0	15	10	25	50	Audit
				14	**3**	**10**	**285**	**110**	**455**	**850**	**21**

Open Elective-3 : Cloud Computing & Storage Management

IT7T001	Data Science	3 Credit

COURSE OBJECTIVES:

1. To Understand the basic concepts used in data Science
2. To Understand data collection and pre-processing
3. To Understand problems solving using data science

4 To Introduce concepts of Data Collection and Data Pre-Processing

5. To develop skills in students to solve applications based problems on Data Science

COURSE OUTCOMES:

After learning the course the student will be able:

1. To build the fundamentals of Data Science.
2. To apply Data Collection and Data Preprocessing Strategies.
3. To compare and choose data visualization method for effective visualization of data
4. To implement regression models, model evaluation and validation
5. To test Multiple Parameters by using Grid Search

Course Contents:

Unit 1 **[7 Hrs]**

Introduction to Data Science : What is Data Science, importance of data science, Big data and data Science, The current Scenario, Industry Perspective Types of Data: Structured vs. Unstructured Data, Quantitative vs. Categorical Data, Big Data vs. Little Data, Data science process, Role Data Scientist.

Unit 2 **[7 Hrs]**

Data Collection and Data Pre-Processing : Data Collection Strategies, Data Pre-Processing Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization.

Unit 3 **[7 Hrs]**

Exploratory Data Analytics : Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Heat Map, Correlation Statistics.

Unit 4 **[8 Hrs]**

Model Development : Simple and Multiple Regression, Model Evaluation using Visualization, Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making, Feature Engineering

Unit 5 **[7 Hrs]**

Model Evaluation : Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection, Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search

Text Books:

1. JojoMoolayil, “Smarter Decisions: The Intersection of IoT and Data Science”, PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

Reference Books:

1. Cathy O’Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O’Reilly.
2. Jure Leskovek, Anand Rajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,Cambridge University Press.
3. Laura Igual and Santi Segui, Introduction to Data Science: A Python Approach to Concepts, Techniques

IT7T002	Artificial Intelligence and Cognitive Robotics	3 Credit

Course Objective:

1. Learn about knowledge for the design of robotics.
2. Understand robot kinematics and robot programming.
3. Understand application of Robots.
4. Learn about force and torque sensing.
5. To learn about application of robot.

Course Outcomes:

Upon Completion of this course the student will be able to:

1. List the objectives and functions of modern Artificial Intelligence.
2. Categorize an AI problem based on its characteristics and its constraints.
3. Have a glance at machine learning algorithms and extracting knowledge models from data.
4. Learn different logic formalisms and decision taking in planning problems.
5. Learn how to analyze the complexity of a given problem and come with suitable optimizations.

Unit -I: Introduction to Artificial Intelligence ,Features of AI , Agents and Environments, structure of agents, problem solving agents, problem formulation, AI techniques- search knowledge.

[7 Hrs]

Unit- II: Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

[7 Hrs]

Unit -III: Knowledge Representation& Learning, Uncertainty, probabilistic reasoning-Bayesian Network, probabilistic reasoning over time-Inference in temporal Model, Hidden Markov models-Kalman filters, Dynamic Bayesian Network, speech recognition **[8 Hrs]**

Unit IV: Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. Programming Language: Introduction to programming Language. Handling Uncertainties: Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic

[7 Hrs]

Unit -V: AI in Cognitive Robotics: Robotic perception, localization, mapping- configuring space, planning uncertain movements, dynamics and control of movement, Ethics and risks of artificial intelligence in robotics. Case study of AI in robotics. **[7 Hrs]**

References:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A modern approach, Pearson Education, India.

2. Negnevitsky, M, Artificial Intelligence: A guide to Intelligent Systems,. Harlow: Addison-Wesley,2002.

3. E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed..

4. Nilsson, N. J. (1986). Principles of artificial intelligence. Morgan Kaufmann.

5. Craig, J. J. (2009). Introduction to robotics: mechanics and control, 3/E. Pearson Education India.

6. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 1992.

7. Peter Jackson, "Introduction to Expert Systems", AWP, M.A., 1992.

8. R.J. Schalkoff, "Artificial Intelligence - an Engineering Approach",

IT7TE04A	Computational Intelligence	3 Credit

Course Objectives:

1. Understand the basic techniques, theory and computational models of Fuzzy and Soft computing.

2. Understand several neural network algorithms over real-time problems to get optimized outcome

Course Outcomes: After completing the course, the students will be able to
CO1: To provide a strong foundation on fundamental concepts in Computational Intelligence.
CO2: To enable Problem-solving through various searching techniques.
CO3: To apply these techniques in applications which involve perception, reasoning and learning.
CO4: To apply Computational Intelligence techniques for information retrieval
CO5: To apply Computational Intelligence techniques primarily for machine learning.
CO6: To Apply fuzzy principles and thinking to deal with vulnerability and tackle realtime issues

Unit 1 **[7 Hrs]**

Introduction to Computational Intelligence:
Computational Intelligence Paradigms, Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design.

Unit 2 **[7 Hrs]**

Artificial Neural Networks:

Artificial Neuron, Supervised Learning Neural Networks, Unsupervised Learning Neural Networks, Performance Issues (Supervised Learning), Performance Measures, Accuracy, Complexity, Convergence.

Unit 3 **[7 Hrs]**

Evolutionary Computation:

Introduction to Evolutionary Computation, Genetic Algorithms: Crossover, mutation, selection, Differential evolution algorithm, Hybrid Differential Evolution Strategies, Differential Evolution for Discrete-Valued Problems.

Unit 4 **[7 Hrs]**

Multi-objective Optimization Problem Solving:

Concept of multi-objective optimization problems (MOOPs) and issues of solving them, MultiObjective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Paretobased approaches to solve MOOPs, Some applications with MOEAs.

Unit 5 **[8 Hrs]**

Applications of Computational Intelligent Techniques:

In solving single- objective and multi-objective optimization, scheduling problem, Parameter Estimation for Frequency-Modulated (FM) Sound Waves, Lennard-Jones Potential Problem, Gear Train Problem, Pressure vessel optimization problem, Welded beam design optimization problem

Text Books:

1. A. P. Engelbrecht, Computational Intelligence: An Introduction, John Wiley & Sons, 2007.

2. Fuzzy Logic with Engineering Applications (3rd Edn.), Timothy J. Ross, Willey, 2010.

Reference-Books:

1. NeuralNetworks: A Comprehensive Foundation, SimonHaykin. Prentice Hall

2. Neural Network Design, M. T. Hagan, H. B. Demuth, Mark Beale, Thomson Learning, Vikash Publishing House.

IT7TE04B	Computer Forensics	3 Credit

Course Objectives:

• To study the fundamentals of Computer Forensics

• To learn, analyze and validate Forensics Data

Course Outcomes:

Upon completion of the course students would be able to:

1. Conduct a computer forensics investigation, including the concept of the chain of evidence.
2. Report findings from digital forensic investigations.
3. Perform recovery of digital evidence from various digital devices using a variety of software utilities.
4. To explain the tools and tactics associated with Cyber Forensics

Unit-1 **[7 Hrs]**

Digital forensic Computer forensics and investigations as a profession, Understanding computer forensics, computer forensics versus other related disciplines, History of computer Forensics, Understanding case laws, Developing computer forensics resources, Preparing for computer investigations, Understanding law enforcement agency investigations and legal process, Understanding corporate investigations, Establishing company policies, Displaying warning Banners.

UNIT – 2 **[7 Hrs]**

Windows Systems and artifacts Windows Systems and Artifacts: Introduction, Windows File Systems, File Allocation Table, New Technology File System, File System Summary, Registry, Event Logs, Prefetch Files, Shortcut Files, Windows Executables.

UNIT – 3 **[7 Hrs]**

Linux Systems and artifacts Linux Systems and Artifacts: Introduction, Linux File Systems, File System Layer, File Name Layer , Metadata Layer, Data Unit Layer, Journal Tools, Deleted Data, Linux Logical Volume Manager, Linux Boot Process and Services, System V , BSD, Linux System Organization and

Artifacts, Partitioning, File system Hierarchy, Ownership and Permissions, File Attributes, Hidden Files, User Accounts , Home Directories.

UNIT – 4 **[7 Hrs]**

Current Computer Forensics Tools Evaluating Computer Forensics Tool Needs, Types of Computer Forensics Tools, Tasks Performed by Computer Forensics Tools, Tool Comparisons, Command-Line Forensics Tools, UNIX/Linux Forensics Tools, Other GUI Forensics Tools, Computer Forensics Hardware Tools, Forensic Workstations, Write-Blocker, Cyber forensics tools and case studies.

Unit-5 **[8 Hrs]**

Identification of data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: Digital Detective, Types of File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks ,Router Forensics.

Text book:

Davis, Philipp, and Cowen, Hacking Exposed: Computer Forensics, McGraw-Hill Education

References:

1. Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, Syngress imprint of Elsevier.

2. Bill Nelson, Amelia Phillips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Fourth Edition, Course Technology.

3. Angus M.Marshall, “Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.

IT7TE04C	Robotics & Automation	3 Credit

Course Learning Objectives:

The students will be able to
1. Understand the concepts of robotics and automation.
2. Impart the knowledge of robotic programming and robotic operation control
3. Selection and analysis of robot configuration and kinematics
4. Importance of automation manufacturing techniques and processing industries
5. Development of automation system for manufacturing and processing industries

Course Outcomes:

After completing the course, the students will be able to
CO1: Understand the characteristics and working principle of robots.
CO2: Apply the related mathematical model to formulate the kinematics and trajectory planning of industrial robot.
CO3: Analyse the machine vision for effective Flexible Manufacturing Systems.
CO4: Develop model and integrate drives for industrial robots and automation systems.
CO5: Understand distributed data processing in FSM.
CO6: Work on the robotic automation.

Unit 1 **[6Hrs]**

Introduction:
Basics of kinematics, Anatomy of robot, Robot configuration, Robot joints, Sensors and drive system, Control modes, Specification of robots, Robot programming methods.

Unit 2 **[7Hrs]**

Robot-Kinematics :
Position and orientation of objects, Objects coordinate frame, Rotation matrix, Euler angles roll, pitch and yaw angles coordinate transformations, Joint variables and position of end effector, Homogeneous transformation. D-H parameters and conventions, D-H matrix, Direct kinematic and inverse analysis of planar and 3 DoF robots.

Unit 3 **[8Hrs]**

Trajectory planning:
Introduction, Path versus trajectory, Joint-space versus Cartesian-space descriptions, Basics of trajectory planning, Joint-space trajectory planning, Third-order and Fifth-order polynomial trajectory planning.
Automation in Production Systems - Manufacturing support systems, Automation principles and strategies, Levels of Automation, Production Concepts and Mathematical models, Numericals

Unit 4 **[8Hrs]**

Machine Vision:
Object recognition by features, Basic features used for object identification, Moments, Template matching,Discrete Fourier descriptors, Computed Tomography (CT), Depth measurement with vision systems, Scene analysis versus mapping, Range detection and Depth analysis, Stereo imaging, Scene analysis with shading and sizes, Specialized lighting, Image data compression, Intraframe spatial

domain techniques, Interframe coding, Compression techniques, Colour images, Heuristics, Applications of vision systems.

Unit 5 **[7 Hrs]**

Robotics Hands on :- Design of Robotics Arm in proteus using Arduino programming , Line following robot using Arduino in proteus with Arduino code, Design of robotic car using Proteus.

Text Books:

1 Mohsen Shahinpoor, “A Robot Engineering Textbook”, Harper & Row Publishers, 3rd Edition, New York, ISBN:006045931X
2 John J. Craig, “Introduction to Robotics”, Pearson Education International, 3rd Edition, ISBN:109876543, 1-13-123629-6

Reference-Books:

1. Mikell P Groover, “Automation, Production Systems, and Computer-integrated Manufacturing”, Pearson Publishing, 3rd Edition, 2014, ISBN 978 81 203 3418 2
2. Joseph Talavage, “Flexible Manufacturing Systems in Practice Design: Analysis and Simulation”, CRC Press, 1987, ISBN 9780824777180

IT7TE04D	Natural Language Processing	3 Credit

Course Learning Objectives:

1. To familiarize the concepts and techniques of Natural language Processing for analyzing words based on Morphology and CORPUS.
2. To relate mathematical foundations, Probability theory with Linguistic essentials such as syntactic and semantic analysis of text.
3. To apply the Statistical learning methods and cutting-edge research models from deep learning.

Course Outcomes:
After completing the course, the students will be able to

1. Apply the principles and Process of Human Languages such as English and other Indian Languages using computers.
2. Realize semantics and pragmatics of English language for text processing.
3. Create CORPUS linguistics based on digestive approach (Text Corpus method)
4. Check a current methods for statistical approaches to machine translation.
5. Perform POS tagging for a given natural language and Select a suitable language modelling technique based on the structure of the language.
6. Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural language with respect to morphology

Unit 1: Introduction to NLP **[7 Hrs]**

Introduction to NLP - Various stages of NLP –The Ambiguity of Language: Why NLP Is DifficultParts of Speech: Nouns and Pronouns, Words: Determiners and adjectives, verbs, Phrase Structure. Statistics Essential Information Theory : Entropy, perplexity, The relation to language, Cross entropy.

Unit 2: Text Preprocessing and Morphology **[7 Hrs]**

Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis. Inflectional and Derivation Morphology, Morphological analysis and generation using Finite State Automata and Finite State transducer.

Unit 3: Language Modelling **[7 Hrs]**

N gram models, Smoothing, Part of speech tagging, Hidden Markov models, Viterbi algorithm, Forward - backward algorithm, EM training, Models for Named Entity Recognition, Neural Language Models - Recurrent Neural Networks and Long Short term Memory networks

Unit 4: Word Sense Disambiguation **[8 Hrs]**

Methodological Preliminaries, Supervised Disambiguation: Bayesian classification, An informationtheoretic approach, Dictionary-Based Disambiguation: Disambiguation based on sense, Thesaurusbased disambiguation, Disambiguation based on translations in a second-language corpus.

Unit 5: Markov Model and POS Tagging **[7 Hrs]**

Markov Model: Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation. The Information Sources in Tagging: Markov model taggers, Viterbi algorithm, Applying HMMs to POS tagging, Applications of Tagging

Text Books:

1. Christopher D. Manning and Hinrich Schutze, " Foundations of Natural Language Processing" , 6 th Edition, The MIT Press Cambridge, Massachusetts London, England, 2003
2. Daniel Jurafsky and James H. Martin "Speech and Language Processing", 3rd edition, Prentice Hall, 2009.

References:

1. NitinIndurkhya, Fred J. Damerau "Handbook of Natural Language Processing", Second Edition, CRC Press, 2010.
2. James Allen "Natural Language Understanding", Pearson Publication 8th Edition. 2012..
3. Chris Manning and HinrichSchütze, "Foundations of Statistical Natural Language Processing", 2nd edition, MITPress Cambridge, MA, 2003.
4. Hobson lane, Cole Howard, Hannes Hapke, "Natural language processing in action" MANNING Publications, 2019.

IT7TE05A	Advanced Computer Vision	3 Credit

Course Learning Objectives:

1. To build an understanding on detailed models of image formation.
2. To expose the students to image feature detection and matching.
3. To introduce fundamental algorithms for pattern recognition.
4. To introduce various classification techniques.
5. To expose the students to various structural pattern recognition and feature extraction techniques.

Course Outcomes:

After completing the course, the students will be able to

1. Appreciate the detailed models of image formation.
2. Analyse the techniques for image feature detection and matching.
3. Apply various algorithms for pattern recognition.
4. Examine various clustering algorithms.
5. Analyze structural pattern recognition and feature extraction techniques.
6. Explain various image models

Unit 1 **[6 Hrs]**

Image formation and Image model- Components of a vision system- Cameras- camera model and camera calibration- Radiometry- Light in space- Light in surface - Sources, shadows and shading **.**

Unit 2 **[7 Hrs]**

Multiple images-The Geometry of multiple views- Stereopsis- Affine structure from motion- Elements of Affine Geometry Affine structure and motion from two images- Affine structure and motion from multiple images- From Affine to Euclidean images.

Unit 3 **[7 Hrs]**

High level vision- Geometric methods- Model based vision- Obtaining hypothesis by pose consistency, pose clustering and using Invariants, Verification.

Unit 4 **[8 Hrs]**

Introduction to pattern and classification, supervised and unsupervised learning, Clustering Vs classification, Bayesian Decision Theory- Minimum error rate classification Classifiers, discriminant functions, decision surfaces- The normal density and discriminant-functions for the Normal density.

Unit 5 **[8 Hrs]**

Linear discriminant based classifiers and tree classifiers
Linear discriminant function based classifiers- Perceptron- Minimum Mean Squared Error (MME) method, Support Vector machine, Decision Trees: CART, ID3.

Text Books:

1. Bernd Jahne and Horst HauBecker, Computer vision and Applications, Academic press, 2000.
2. David A. Forsyth & Jean Ponce, Computer vision – A Modern Approach, Prentice Hall, 2002.

References

1. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, John Wiley, 2001.
3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, 2004.
4. S. Theodoridis and K. Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009.

IT7TE05B	AI in Digital Forensic	3 Credit

Course Objective:

On completion of the course, Students will be able to–

1. Understand the basic digital forensics concepts and techniques for conducting the forensic examination on different digital devices.
2. Understand how to examine digital evidences gathered through such as the data acquisition, identification analysis.
3. Understand the basics of Computer forensics and cyber forensics, mobile phone forensics, network forensics, Email forensics and web forensics etc.

Course Outcomes: Student will be able to

1. Describe digital forensics and relate it to an investigative process.
2. Explain the legal issues of preparing for and performing digital forensic analysis based on the investigator's position and duty.
3. Perform basic digital forensics.
4. Demonstrate use of digital forensics tools.
5. Guide a digital forensics exercise.
6. Recognize the state of the practice and the gaps in technology, policy, and legal issues.

Unit I **[7 hrs]**

Basic Definitions and terminology of AI:, Foundation and History of AI, Overview of AI problems, Evolution of AI,- Applications of AI, Classification/Types of AI. Artificial Intelligence vs Machine learning. Intelligent Agent: Types of AI Agent, Concept of Rationality, nature of environment, structure of agents. Turing Test in AI.

Unit II **[7 hrs]**

Search Algorithms in Artificial Intelligence: Terminologies, Properties of search Algorithms, Types of search algorithms: uninformed search and informed search, State Space search Heuristic Search Techniques: Generate-and-Test; Hill Climbing; Properties of A* algorithm, Best-first Search; Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back tracking search for CSPs; Local Search for CSPs; structure of CSP Problem.

Unit III **[8 hrs]**

Knowledge-Based Agent in Artificial intelligence: Architecture, Approaches to designing a knowledge- based agent, knowledge representation: Techniques of knowledge representation, Propositional logic, Fundamentals of Digital Forensics Foundations of Digital Forensic: Digital evidence, Awareness, Principles of Digital Forensic, Challenging aspects of digital evidence, Cybertrail. Language of Computer Crime Investigation: Role of Computers in crime, Cybercrime law, offenses, jurisdiction. Traffic analysis, Fraud, IT Act.

Unit IV **[7 hrs]**

Processing Computer Crime : Introduction to Crime Scenes, Seizing and storing digital evidence at scene, Documenting the Scene and the Evidence , Dealing with Live Systems and Dead Systems, Using Hashing to Verify the Integrity of Evidence

Unit V **[7 hrs]**

Data Acquisition and Data Recovery - Understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools Data Recovery : Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution Hiding and Recovering Hidden Data , Data Handling tools

Textbooks:

1. Digital Evidence Computer Crime – Forensic science, Computers & The Internet', Eoghan Casey, 3rd edition
2. 'Computer Forensics Computer Crime scene investigation', 2nd edition, Johm R. Vacca
3. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall

Reference Books:

1. 'Computer Forensics Investigating Network Intrusions & Cybercrime', EC–Council press, Cengage Learning
2. Guide to Computer Forensics & Investigations, 4th edition, Bill Nelson, Amelia Phillips & Christopher Steuart, Cengage Learning
3. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI., 2010 2. S Kaushik, Artificial Intelligence, Cengage Learning, 1st ed.2011.

IT7TE05C	Brain Machine Interface & Interaction	3 Credit

Course Learning Objectives:
1. Understand the basic concepts of brain computer interface, interface types, EEG signals.
2. Study the state of art in neuroimaging-based approaches and their related applications and Brain Computer Interface system.
3. Analyse the different Non-invasive Electromagnetic Methods.
4. Demonstrate the concept of Data Streaming and Data Processing using suitable tool.
5. Understand the ethical issues pertaining to the development and use of Brain Computer Interface technology.
6. Understand the brain interactive system and techniques.

Course Outcomes: After completing the course, the students will be able to
CO1: Study the utilization of drives system related to the electroencephalogram (EEG) signals for neuro rehabilitation.
CO2: Understand the concept of Brain Computer Interface Systems that can be designed and developed with the overall goal of supporting a wide range of users for a wide range of applications.
CO3: Process multi-channel EEG data using a suitable tool in the computing environment which will be helpful for developing, prototyping and testing Brain Computer Interface approaches.
CO4: Solve the interoperability and standardization issues of Brain Computer Interface software platforms.
CO5: To identify and design new applications of Brain Computer Interface.
CO6: Understand the brain interactive system and techniques.

Unit 1 **[7 Hrs]**

Basics of Brain Computer Interface: Introduction, Brain Anatomy, Brain Computer Interface Types, Types of BCI Signals, Components of Interest, Monitoring Brain Activity Using EEG, BCI System, BCI Monitoring Hardware and Software, Brain Computer Interface applications, BCI Trends.

Unit 2 **[7 Hrs]**

Brain Computer Interface: A Review: Introduction, Neuroimaging-Based Approaches in the BCI, Control Signals in BCI Systems- EEG Signal Processing for BCI, Pre-processing Techniques, Feature Extraction, Classification Methods and Post-processing, Classification Performance Metrics.

Unit 3 **[7 Hrs]**

Non-invasive Electromagnetic Methods for Brain Monitoring: A Technical Review Introduction, Human Brain Anatomy, Brain Diseases, Non-invasive Brain Monitoring, Electromagnetic Brain Monitoring Methods.

Unit 4 **[8 Hrs]**

Tools for BCI Research: Introduction, Data Streaming- Field-Trip, Data-Suite: Data-River and Mat-River, Data River, Mat River, EEG LAB, Online Data Processing-A Minimalistic BCI Script, BCI LAB, Other Classification Tools, Other existing, Paradigms of interaction for BCIs Tools.

Unit 5 **[7 Hrs]**

Applications for Brain-Computer Interfaces: Introduction, BCIs for Assistive Technology, BCIs for Recreation, BCIs for Cognitive Diagnostics and Augmented Cognition, Rehabilitation and Prosthetics.

Text Books:

1. Brain-Machine Interfaces Methods and Perspectives, **Maureen Clerc,Laurent Bougrain, Fabien Lotte**, ISBN: 978-1-848-21826-0, Wiley-ISTE.
2. Brain-Computer Interfaces Current Trends and Applications, Aboul Ella Hassanien, Ahmad Taher Azar,Volume 74, Springer International Publishing2015, ISBN: 978-3-319-10977-0, DOI:10.1007/978-3-319-10978-7
3. Brain Computer Interfaces-Applying Your Minds to Human-Computer Interaction, Desney S. Tan,Anton Nijholt, ISBN: 978-1-84996-271-1, DOI: 10.1007/978-1-84996-272-8

ReferenceBooks:

1.Brain–Computer Interfaces Handbook-Technological and Theoretical Advances, Chang S. Nam,AntonNijholt, Fabien Lotte, Taylor & Francis 2018, ISBN: 13: 978-1-4987-7343-0
2. Brain-Computer Interfacing -an Introduction, Rajesh P.N.Rao,2013, ISBN: 978-0-521-76941-9

IT7TE05D	Virtual Reality	3 Credit

Course Objective:
1. Understand how the design of VR technology relates to human perception and cognition.
2. Discuss applications of VR to the conduct of scientific research, training, and industrial design.
3. Gain first-hand experience with using virtual environment technology, including 3D rendering software, tracking hardware, and input/output functions for capturing user data.
4. Learn the fundamental aspects of designing and implementing rigorous empirical experiments using VR.
5. Learn about multimodal virtual displays for conveying and presenting information and techniques for evaluating good and bad virtual interfaces.

Course Outcomes:
CO1:Describe how VR systems work and list the applications of VR.
CO2:Understand the design and implementation of the hardware that enables VR systems tobe built.
CO3:Understand the system of human vision and its implication on perception and rendering.
CO4: Explain the concepts of motion and tracking in VR systems.
CO5:Describe the importance of interaction and audio in VR systems.

Course Contents:

Unit I: Introduction to Virtual Reality [8 Hrs]

Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

Unit II:Representing the Virtual World [7 Hrs]

Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR

Unit III: The Geometry of Virtual Worlds &The Physiology of Human Vision [7 Hrs]

Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.
7

Unit IV: Visual Perception & Rendering [7 Hrs]

Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates

Unit V:- Motion & Tracking [7 Hrs]

Motion in Real and Virtual Worlds- Velocities and Accelerations, The Vestibular System, Physics in the Virtual World, Mismatched Motion and Vection Tracking- Tracking 2D & 3D Orientation, Tracking Position and Orientation, Tracking Attached Bodies

Text Books:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)”. Morgan Kaufmann Publishers, San Francisco, CA, 2002
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.

Reference Books:

1. Gerard Jounghyun Kim, “Designing Virtual Systems: The Structured Approach”, 2005.
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, “3D User Interfaces, Theory and Practice”, Addison Wesley, USA, 2005.
3. Oliver Bimber and Ramesh Raskar, “Spatial Augmented Reality: Meging Real and Virtual Worlds”, 2005.
4. Burdea, Grigore C and Philippe Coiffet, “Virtual Reality Technology”, Wiley Interscience, India, 2003.

IT7O003	**Cloud Storage Management-III(Open Elective)**	**4 Credit**

Course Objectives:
1. To learn the concept of cloud Computing and Storage Management.
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: [9 Hrs]
Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, Deployment models and service models, Cloud Storage Virtualization technologies and architectures, Cloud Storage Virtualization of data centers and Issues with Multi-tenancy.

UNIT II Implementation: [10 Hrs]
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 III Storage Virtualization: [10 Hrs]
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 IV Cloud Business Storage Continuity and Recovery: [9 Hrs]
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 V. Cloud Storage Security and Management: [10 Hrs]

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

IT7L002	Data Science using R(Lab)	1 Credit

COURSE OBJECTIVES:

The course should enable the students to:

1. Understand the R Programming Language.

2. Exposure on Solving of data science problems.

3.. Understand The classification and Regression Model.

COURSE OUTCOMES:

After learning the course the student will be able:

1. To Apply Data Collection and Data Preprocessing Strategies.

2.To Compare and choose data visualization method for effective visualization of data

3. To Implement regression models, model evaluation and validation

List of Experiments:

1. R AS CALCULATOR APPLICATION

a. Using with and without R objects on console

b. Using mathematical functions on console

c. Write an R script, to create R objects for calculator application and save in a specified location in disk

2. DESCRIPTIVE STATISTICS IN R

a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.

b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.

3. READING AND WRITING DIFFERENT TYPES OF DATASETS

a. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location.

b. Reading Excel data sheet in R.

4. VISUALIZATIONS

a. Find the data distributions using box and scatter plot.

b. Find the outliers using plot.

c. Plot the histogram, bar chart and pie chart on sample data.

5. REGRESSION MODEL

Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. Require (foreign), require (MASS).

6. MULTIPLE REGRESSION MODEL

Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.

Reference Books:

Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012

Web References:

1.http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/

2.http://www.ats.ucla.edu/stat/r/dae/rreg.htm

3.http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html

4. http://www.ats.ucla.edu/stat/r/data/binary.csv

SOFTWARE: R Software , R Studio Software

IT7L003	**Middleware Technolgies(Lab)**	**1 Credit**

Course Outcomes:

1. To study how to create distributed server
2. To understand how to create a Java Bean.
3. To understand how to develop an enterprise.
4. To study how to develop a component.
5. To understand how to create a control.

Syllabus:

Program 1: Create a distributed name server (like DNS) RMI.

Program 2: Create a Java Bean to draw various graphical shapes and display it using or without using BDK.

Program 3: Develop an Enterprise Java Bean for student Information System.

Program 4: Develop an Enterprise Java Bean for Library operations.

Program 5: Create an Active-X control for Timetable.

Program 6: Develop a component for converting the currency values using COM / .NET

Program 7: Develop a component for browsing CD catalogue using COM / .NET

Program 8: Develop a component for retrieving information from message box using DCOM/.NET

Program 9: Develop a middleware component for retrieving Stock Market Exchange information using CORBA

Program 10: Develop a middleware component for retrieving Bank Balance using CORBA.

IT7P004	Project Phase I	3 Credit

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%).

IT7T005	**Research Methodology**	**Audit**

Course Objectives:

1. To know the basic data collection methods with emphasis on secondary and survey research.
2. To understand the format of primary data collection instruments.
3. To understand and use basic data analysis techniques.
4. To familiar with ethical issues in educational research, including those issues that arise in using quantitative and qualitative research.
5. To identify the overall process of designing a research study from its inception to its report.

Course Outcomes:

1. Identify a research problem stated in a study
2. Obtain skills to identify a business problem/ need, translate it into a research question, and design an appropriate way to answer it.
3. Develop skills to design a research project and collect data.
4. Develop skills to critically evaluate the quality of other researchers‘ findings and the process used to obtain them.
5. Identify the overall process of designing a research study from its inception to its report.

Unit-I Fundamentals of research;

Meaning, Objectives, Research process, Methods and Methodology, Criteria of good research, Review of literatures: Primary source, Secondary source, Identifying gap areas from literature review, Searching e- resources, using search engines, Searching data base.

Unit-II

Types of Research; Pure research, applied research, Exploratory Research, Descriptive research, Diagnostic research, Quantitative and Qualitative research etc.

Unit-III

Research Sampling and Design: Sampling of data: Concept of sampling, Probability sampling techniques , Non probability sampling techniques , Sampling error, Research Design: Meaning, Need, Types of research design-Exploratory Research Design, components of research design and features of good research design,

Unit-IV

Methods, Collection and Analysis of Data: Types of data, Methods of data collection- Interview Method, Mailing Method, Observation Method, Survey Method etc.; Primary and secondary sources of data, Sampling- meaning and methods, Classification and Tabulation, Graphical presentation, Application of computer in research data analysis.

Unit-V

Presentation of Research: Citation Styles- APA, MLA etc., Research ethics and Plagiarism, Indexing of journal and research output, Report writing steps in report writing, layout of report writing, reference and bibliography.

Text Books:

1. Research Methodology, Methods and Techniques by C.R Kothari, 2nd Edition.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes. 4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

Reference Books:

3. The Science of Education Research, Eurasia Publishing House, New Delhi by George J. (1964),
4. Advanced focus Group Research, Sage Publication, India Ltd, New Delhi by Fern Edward F. (2001)
5. Research Methodology in Management, Himalaya Publishing House, New Delhi by Michael V.P.

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Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- VIII [Fourth Year]

8th Semester

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE	Total	
1	PEC	IT8TE06	Elective –VI	3	0	0	20	20	60	100	3
2	OEC	IT8O004	OPEN Elective - IV	3	1	0	60	20	40	100	4
3	PROJECT	IT8P001	Project Phase II	0	0	6	75	0	75	150	5
4	PCC	IT8T002	NPTEL Courses	0	0	0					2
				6	**1**	**6**	**155**	**40**	**175**	**350**	**14**

Open Elective-4 : Big Data Analytics

IT8TE06A	BITCOIN AND CRYPTOCURRENCY	3 Credit

Course Objectives:

1. To Understand the concepts of blockchain
2. Understand the core functionality and utility of Bitcoin and Cryptocurrency technologies.
3. To Understand various cryptocurrency and their working
4. To use various algorithms for distributed consensus
5. To Build a applications based on blockchain technology

Course Outcomes:

1. Understand how Bitcoin and Cryptocurrency work,
2. Understand how securely interact with them,
3. Design, build, and deploy smart contracts and distributed applications
4. Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
5. Analyze the conceptual understanding of the function of Blockchain as a method of securing distributed ledgers.

UNIT I- **[7 Hrs]**

INTRODUCTION Basic of Blockchain Architecture – Challenges – Applications – Block chain Design Principles -The Blockchain Ecosystem - The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Proof of Work (PoW) - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS), Proof of Burn, Difficulty Level, Sybil Attack.

UNIT II- **[7 Hrs]**

BITCOIN MECHANICS: Cryptographic basics for crypto currency - a short overview of Hashing, cryptographic algorithm – SHA 256,signature schemes, encryption schemes and elliptic curve cryptography- Introduction to Hyperledger- Hyperledger framework - Public and Private Ledgers.

UNIT III- **[7 Hrs]**

BIT COIN: How Does Bitcoin Work,Bitcoin's Ecosystem,Bitcoin in Practice

Bitcoin's Predecessors, Bitcoin's Early History, Bitcoin's Price, Storing Bitcoins:

Software Wallets, Hardware Wallets,Buying and Selling Bitcoins Exchanges,Merkley Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bit coin. Bitcoin blockchain, the challenges, and solutions, alternatives to Bitcoin consensus, Bitcoin scripting language and their uses.

UNIT IV- **[8 Hrs]**

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin, Cryptocurrency Regulation: Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy

UNIT V- **[7 Hrs]**

ETHEREUM Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts. Ethereum and Smart Contracts- The Turing Completeness of Smart Contract Languages and verification challenges- comparing Bitcoin scripting vs. Ethereum Smart Contracts

Text Books:

1. Melanie Swan, "Block Chain: Blueprint for a New Economy", O"Reilly, first edition – 2015.

2. Daniel Drescher, "Block Chain Basics", Apress; 1stedition, 2017

3. Anshul Kaushik, "Block Chain and Crypto Currencies", Khanna Publishing House, Delhi.

4. Imran Bashir, "Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, first edition – 2012.

Websites:

1. https://developer.ibm.com/patterns/create-and-deploy-block chain-network-usingfabric-sdk-java/

2.https://docs.docker.com/get-
started/https:/console.ng.bluemix.net/docs/services/block%2520chain/index. html

IT8TE06B	Full Stack Development	3 Credit

Course Learning Objectives:

1. Use their learned skills, knowledge and abilities to develop web sites for the internet.
2. Apply basic design principles to present ideas, information, products, and services on Websites.
3. Apply basic programming principles to the construction of websites.
4. Effectively manage website projects using available resources.
5. Create visualizations in accordance with UI/UX theories.
6. Develop a fully functioning website and deploy on a web server.

Course Outcomes: After completing the course, the students will be able to

CO1: Understand the formalistic (aesthetic) aspects of design and visual communication.

CO2: Develope cross-platform (web, mobile, broadcast, print) storytelling skills.

CO3: Become familiar with graphic design and/or game theory and be able to apply this theory to real world projects.

CO4:Develop and understand information design and usability as it applies to interactive media projects.

CO5: Utilize coding and software tools to analyze and present data in a professional manner that could be translated to web-based or app-based media.

Unit 1 **[7 Hrs]**

Basic HTML, Advanced HTML :

HTML-Introduction , HTML-Basic Formatting Tags , HTML-Grouping Using Div Span, HTML-Lists , HTML-Images , HTML-Hyperlink , HTML-Table, HTML-Iframe , HTML-Form, Adding audio, Drag & drop, User location: geolocation, Saving ,information - localStorage, Saving information - sessionStorage.

Unit 2 **[8 Hrs]**

CSS

What Is CSS? How to write CSS: syntax, Using style sheets, Using external style sheets, Identities and classes, Style entire elements, CSS Comments, Change background colors, Setting background images, Change text color, Text formatting using CSS, Font Properties, Text Properties, Styling hyperlinks using CSS, Styling lists using CSS, Setting element width and height, Adding borders, Spacing: margin & padding, Change the mouse type: cursor, Hide, show and display elements,

What to do with overflowing content.

CSS Advanced: Grouping & Nesting, Maximum & Minimum Dimensions, Move an element from its default position, Relative location & layering, Floating, Clear, Pseudos, Alignment Sprites: the most efficient way to load images, Make elements translucent: opacity, Different media types, Style elements based on their attributes, Browser prefixes.

Unit 3 **[7 Hrs]**

Javascript Basics

JavaScript Essentials, What is JavaScript?, JavaScript: Internal vs. External, JavaScript comments, document.write(); Display info from the browser: alert & confirm, Prompting the user for Information, Programming fundamentals: Variables, Add two sentences together: concatenation, Basic math in JavaScript, Redirecting users and opening ne6w windows, creating empty hyperlinks, String Manipulation, Comparing variables and values, Programming fundamentals: If...Else Statements, Else...If Statements, Switch Statements, Functions; JavaScript Events, Selecting HTML Elements using getElementById(), Escaping content, Programming fundamentals: Arrays, For Loops, While Loops, Breaking Out Of Loops, Skipping A Loop Cycle.

Unit 4 **[7 Hrs]**

ReactJS

Introduction , Templating using JSX ,Components, State and Props , Lifecycle of Components ,Components, State and Props , Lifecycle of Components ,Rendering List and Portals ,Error Handling ,Routers , Redux and Redux Saga , Immutable.js , Service Side Rendering ,Unit Testing , Webpack .

Unit 5 **[7 Hrs]**

PHP

Overview Of PHP, Basic Scripting and Looping Constructs Conditional Constructs, Modularity through Include Files, PHP Operators, PHP Functions, New Features, Arrays in PHP,Basic OOP in PHP,Writing OOP PHP

Text Books:

1. Web Development for beginners: Learn HTML/CSS/Javascript step by step with this Coding uide, Programming Guide for beginners, Website development, White Belt Mastery, ISBN 9781667003771.
2. The Road to React: Your journey to master React.js in JavaScript (2021 Edition), Kindle Edition.

3. Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5, Publisher Shroff Publishers & Distributers, ISBN-13 978-9352130153

ReferenceBooks:

1.Mastering Html, Css & Javascript Web Publishing , BPB Publications , ISBN-13 978-8183335157
2. A Complete Overview On: Web-development, Notion Press, ISBN-13978-1685098407.

IT8TE06C	Advance Tools for Software	3 Credit

COURSE OUTCOMES:

CO1. Ability to understand Cyber Security Tools concepts.
CO2. Ability to understand and apply Business Management Strategy.
CO3. Ability to understand and use automated test generation techniques
CO4. Ability to use various Business analaysis tools/frameworks.
CO 5 Ability to understand various CRM Software Tools,

Unit 1: Cyber Security Software Tools [7 Hrs]
Introduction, How Important Is Cybersecurity , Types of CyberSecurity Tools , Comparison of Top CyberSecurity Software List of Best CyberSecurity Tools SolarWinds Security Event Manager Syxsense System Mechanic Ultimate Defense Acunetix Netsparker

Unit 2: Business Management Software [7 Hrs]
What Is Business Management Software?, Benefits of Business Management Software, List of Best Business Management Software, Comparison of Top Business Management Software monday.com , Studio Creatio, Oracle NetSuite, Keap , Process Bliss, HubSpot ,Additional Business Management Tools
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Unit 3: CRM Software Tools [7 Hrs]
Introduction to CRM Tool , Features of CRM System, Benefits:, several famous CRM toolslike Salesforce CRM, SAP CRM, ZOHO CRM, Oracle CRM, Microsoft Dynamics CRM, Nimble CRM, Sugar CRM, Hubspot CRM, PIPEDRIVE CRM, CRM Creatio **,**

Unit 4: Business Analysis Tools [8 Hrs]
Introduction, Importance of Business Analysis , Business Analysis Techniques , Business Analysis Process – Sequentially , How Do Business Analysts Analyze BusinessRequirements? , Most Popular Business Analysis Tools :- Pipedrive (CRM) , Oracle NetSuit, Xplenty , Wrike, Business Process Diagramming, Wire framing, Flowcharts, Model Building Designing , Requirements Management**.**

Unit 5: Test Tools and Automation Testing Tools [7 Hrs]
Introduction, Tool Selection, . Tool Lifecycle, Tool Metrics, Automation testing Tools :-Selenium Webdriver Tools ,QTP/UFT,Load Runner & QC AutoIT, Rest Assured Framework,Agile Scrum Methodology, Appium. Framework TestNG ,POM .

Text Books:

1. Advanced Software Testing - Vol. 2, 2nd Edition, 2nd Edition. O'REILLY MEDIA, INC
2. Paul C. Jorgensen, Software Testing: A Craftsman‟s Approach, 3rd Edition, CRC Press, 2007.
3. Learning Path Learn Selenium , O'Reilly Media, INC.

Reference Books
1. Boris Beizer, Software Testing Techniques, Dreamtech, 2009

IT8TE06D	Advanced Distributed Database System	3 Credit

Course Outcomes:

1. Understand theoretical and practical aspects of distributed database systems.

2. Study and identify various issues related to the development of distributed database system.

3. Understand the design aspects of object-oriented database system and related development.

4. To understand the difference between the centralized and distributed database systems.

5. To introduce the students to the needed techniques that are used to design and manage a distributed database, such as fragmentation, query processing, recovery and replication.

Course Objectives:

1 .The aim of this module is to build on the previous background of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies.

2 The need for distributed database technology to tackle deficiencies of the centralized database systems.

3 Introducing the concepts and techniques of distributed database including principles, architectures, design, implementation and major domain of application.

Unit 1 **[7Hrs]**

Introduction:

Introduction: Distributed Data Processing, Distributed Database System, Promises of DDBSs, Problem areas.
Distributed DBMS Architecture:
Architectural Models for Distributed DBMS, DDMBS Architecture.
Distributed Database Design:
Alternative Design Strategies, Distribution Design issues, Fragmentation, Allocation.

Unit 2

Query processing and decomposition **[7Hrs]**

Query processing and decomposition:
Query processing objectives, characterization of query processors, layers of query processing, query decomposition, localization of distributed data.
Distributed query Optimization:
Query optimization, centralized query optimization, distributed query optimization algorithms.

Unit 3 **[7 Hrs]**

Transaction Management

Transaction Management:

Definition, properties of transaction, types of transactions, distributed concurrency control: serializability, concurrency control mechanisms & algorithms, time - stamped & optimistic concurrency control Algorithms, deadlock Management.

Unit 4 **[7 Hrs]**

Distributed DBMS Reliability:

Reliability concepts and measures, fault-tolerance in distributed systems, failures in Distributed DBMS, local & distributed reliability protocols, site failures and network partitioning.

Parallel Database Systems:

Parallel database system architectures, parallel data placement, parallel query processing, load balancing, database clusters.

Unit 5 **[8 Hrs]**

Distributed object Database Management Systems:

Fundamental object concepts and models, object distributed design, architectural issues, object management, distributed object storage, object query Processing.

Object Oriented Data Model:

Inheritance, object identity, persistent programming languages, persistence of objects, comparison OODBMS and ORDBMS

TEXT BOOKS:

1. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.

2. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOKS:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: "Database Systems: The Complete Book", Second Edition, Pearson International Edition

IT8P001	Project Phase II	5 Credit

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.

Dr. Babasaheb Ambedkar Technological University
(Established as a University of Technology in the State of Maharashtra)
(Under Maharashtra Act No. XXIX of 2014)
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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, 4^{th} Edition, 2008.
2. E. Balagurusamy, ***"Object Oriented Programming with C++"***, Tata McGraw Hill Publication, 6^{th} 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, 9^{th} 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"***, 20^{th} 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, 2^{nd} 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.

Dr. Babasaheb Ambedkar Technological University, Lonere

(Established as a University of Technology in the State of Maharashtra)

(Under Maharashtra Act No. XXIX of 2014)

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Course Structure and Detailed Syllabus
for

Final Year
B. Tech. Programme in Information Technology
(Academic Year 2020-21)

Rules and Regulations

1. The normal duration of the course leading to B.Tech degree will be EIGHT semesters.
2. The normal duration of the course leading to M.Tech. degree will be FOUR semesters.
3. Each academic year shall be divided into 2 semesters, each of 20 weeks duration, including evaluation and grade finalization, etc. The Academic Session in each semester shall provide for at least 90 Teaching Days, with at least 40 hours of teaching contact periods in a five to six days session per week. The semester that is typically from Mid-July to November is called the ODD SEMESTER, and the one that is from January to Mid-May is called the EVEN SEMESTER. Academic Session may be scheduled for the Summer Session/Semester as well. For 1st year B. Tech and M. Tech the schedule will be decided as per the admission schedule declared by Government of Maharashtra.
4. The schedule of academic activities for a Semester, including the dates of registration, mid-semester examination, end-semester examination, inter-semester vacation, etc. shall be referred to as the Academic Calendar of the Semester, which shall be prepared by the Dean (Academic), and announced at least TWO weeks before the Closing Date of the previous Semester.
5. The Academic Calendar must be strictly adhered to, and all other activities including co-curricular and/or extra -curricular activities must be scheduled so as not to interfere with the Curricular Activities as stipulated in the Academic Calendar.

REGISTRATION:

1. Lower and Upper Limits for Course Credits Registered in a Semester, by a Full-Time Student of a UG/PG Programme:
   A full time student of a particular UG/PG programme shall register for the appropriate number of course credits in each semester/session that is within the minimum and maximum limits specific to that UG/PG programme as stipulated in the specific Regulations pertaining to that UG/PG programme.
2. Mandatory Pre-Registration for higher semesters:
   In order to facilitate proper planning of the academic activities of a semester, it is essential for the every institute to inform to Dean (Academics) and COE regarding details of total no. of electives offered (Course-wise) along with the number of students opted for the same. This information should be submitted within two weeks from the date of commencement of the semester as per academic calendar.
3. PhD students can register for any of PG/PhD courses and the corresponding rules of evaluation will apply.
4. Under Graduate students may be permitted to register for a few selected Post Graduate courses, in exceptionally rare circumstances, only if the DUGC/DPGC is convinced of the level of the academic achievement and the potential in a student.

Course Pre-Requisites:

1. In order to register for some courses, it may be required either to have exposure in, or to have completed satisfactorily, or to have prior earned credits in, some specified courses.
2. Students who do not register on the day announced for the purpose may be permitted

LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

3. REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the Dean (Academic) / Principal.
4. A student will be permitted to register in the next semester only if he fulfills the following conditions:

(a) Satisfied all the Academic Requirements to continue with the programme of Studies without termination
(b) Cleared all Institute, Hostel and Library dues and fines (if any) of the previous semesters;
(c) Paid all required advance payments of the Institute and hostel for the current semester;
(d) Not been debarred from registering on any specific ground by the Institute.

EVALUATION SYSTEM:

1. Absolute grading system based on absolute marks as indicated below will be implementeds from academic year 2019-20,starting from I year B.Tech.

Perentage of marks	Letter grade	Grade point
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
<40	EF	0.0

2. Class is awdared based on CGPA of all eigth semster of B.Tech Program.

CGPA for pass is minimum 5.0	
CGPA upto < 5.50	Pass class
CGPA $\geq$ 5.50 & < 6.00	SecondClass
CGPA $\geq$ 6.00 & < 7.50	First Class
CGPA $\geq$ 7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

3. A total of 100 Marks for each theory course are distributed as follows:

1	MidSemester Exam (MSE) Marks	20
2	ContinuousAssesment Marks	20
End SemesterExamination(ESE)Marks		60

4. A total of 100 Marks for each practical course are distributed as follows:

1	Continuous Assesment Marks	60
2	End Semester Examination (ESE)Marks	40

It is mandatory for every student of B.Tech to score a minimum of 40 marks out of 100, <u>with a minimum of 20 marks out of 60 marks in End Semester Examination for theory course.</u>

This will be implemented from the first year of B.Tech starting from Academic Year 2019-20

5. Description of Grades:

EX Grade: An 'EX' grade stands for outstanding achievement.
EE Grade: The 'EE' grade stands for minimum passing grade.
The students may appear for the remedial examination for the subjects he/she failed for the current semester of admission only and his/her performance will be awarded with EE grade only.
If any of the student remain Absent for the regular examination due to genuine reason and the same will be verified and tested by the Dean (Academics) or committee constituted by the University Authority.
FF Grade: The 'FF' grade denotes very poor performance, i.e. failure in a course due to poor performance .The students who have been awarded 'FF' grade in a course in any semester must repeat the subject in next semester.

6. Evaluation of Performance:

1. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

(A) Semester Grade Point Average (SGPA) The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{\left[\sum_{i=1}^{n} c_i g_i\right]}{\left[\sum_{i=1}^{n} c_i\right]}$$

Where
'n' is the number of subjects for the semester,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his performance As per the above table.
-SGPA will be rounded off to the second place of decimal and recorded as such.

(B) Cumulative Grade Point Average (CGPA): An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places).Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{[\sum_{i=1}^{m} c_i g_i]}{[\sum_{i=1}^{m} c_i]}$$

Where
'm' is the total number of subjects from the first semester onwards up to and including the semester S,
'ci' is the number of credits allotted to a particular subject, and
'gi' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

-CGPA will be rounded off to the second place of decimal and recorded as such.

Award of Degree of Honours
Major Degree
The concept of Major and Minors at B.Tech level is introduced , to enhance learning skills of students, acquisition of additional knowledge in domains other than the discipline being pursued by the student, to make the students better employable with additional knowledge and encourage students to pursue cross-discipline research.

A. Eligibility Criteria for Majors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for majors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional advanced courses from the same discipline specified in the curriculum. These five courses should be of 4 credits each amounting to 20 credits. The students should complete these credits before the end of last semester.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded B.Tech (Honours) Degree.
B. Eligibility Criteria for Minors

1. The Student should have Minimum CGPA of 7.5 up to 4th Semester
2. Student willing to opt for minors has to register at the beginning of 5th Semester
3. The Student has to complete 5 additional courses from other discipline of their interest, which are specified in the respective discipline. These five courses should be of 4 credits each amounting to 20 credits.
4. Student may opt for the courses from NPTEL/ SWAYAM platform. (if the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

Student complying with these criteria will be awarded with B.Tech Degree in ------- Engineering with Minor in ------ --Engineering.

(For e.g.: B. Tech in Civil Engineering with Minor in Computer Engineering)

For applying for Honours and Minor Degree the student has to register themselves through the proper system.

ATTENDANCE REQUIREMENTS:

1. All students must attend every lecture, tutorial and practical classes.
2. To account for approved leave of absence (eg. Representing the Institute in sports, games or athletics; placement activities; NCC/NSS activities; etc.) and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes actually conducted.
   If the student failed to maintain 75% attendance, he/she will be detained for appearing the successive examination.
   The Dean (Academics)/ Principal is permitted to give 10% concession for the genuine reasons as such the case may be.
   In any case the student will not be permitted for appearing the examination if the attendance is less than 65%.
3. The course instructor handling a course must finalize the attendance 3 calendar days before the last day of classes in the current semester and communicate clearly to the students by displaying prominently in the department and also in report writing to the head of the department concerned.
4. The attendance records are to be maintained by the course instructor and he shall show it to the student, if and when required.

TRANSFER OF CREDITS

The courses credited elsewhere, in Indian or foreign University/Institutions/ Colleges/Swayam Courses by students during their study period at DBATU may count towards the credit requirements for the award of degree. The guidelines for such transfer of credits are as follows:

a) 20 % of the total credit will be considered for respective calculations.

b) Credits transferred will be considered for overall credits requirements of the programme.

c) Credits transfer can be considered only for the course at same level i.e UG, PG etc.

d) A student must provide all details (original or attested authentic copies)such as course contents, number of contact hours, course instructor /project guide and evaluation system for the course for which he is requesting a credits transfer. He shall also provide the approval or acceptance letter from the other side. These details will be evaluated by the concerned Board of Studies before giving approval. The Board of Studies will then decide the number of equivalent credits the student will get for such course(s) in DBATU. The complete details will then be forwarded to Dean for approval.

e) A student has to get minimum passing grades/ marks for such courses for which the credits transfers are to be made.

f) Credits transfers availed by a student shall be properly recorded on academic record(s) of the student.

g) In exceptional cases, the students may opt for higher credits than the prescribed.

Teaching and Evaluation Scheme for Final Year B. Tech. Programme in Information Technology
(For Academic year 2020-21)

Sr. No.	Course Code	Course Title	Teaching Scheme L	T	P	Evaluation Scheme MSE	CA: CA-I	CA: CA- II	ESE: Internal	ESE: External	Total Marks	Credits	Total Hours
Semester VII													
1	BTITC701	Cloud Computing and Storage Management	2	-	-	20	20		60		100	2	2
2	BTITC702	Artificial Intelligence#	3	-	-	20	20		60		100	3	3
3		**Elective VII**	3	-	-	20	20		60		100	3	3
	BTITE703A	A) Pattern Recognition											
	BTITE703B	B) Soft Computing											
	BTITE703C	C) Electronic Payment System@											
4		**Elective VIII** (Open)	3	-	-	20	20		60		100	3	3
	BTITOE704A	A) Natural Language Processing											
	BTITOE704B	B) Machine Learning											
5		**Elective IX**	3	-	-	20	20		60		100	3	3
	BTITPE705A	A) Real Time Systems											
	BTITPE705B	B) Information Security											
	BTITPE705C	C) Management Information Systems											
	BTITPE705D	D) Distributed Computing											
	BTITPE705E	E) Data Warehousing and Data Mining											
6	BTITL706	Cloud Computing and Storage Management Lab	-	-	2	-	15	15	10	10	50	1	2
7		**Elective VII Lab**	-	-	2	-	15	15	10	10	50	1	2
	BTITEL707A	A) Pattern Recognition Lab											
	BTITEL707B	B) Soft Computing Lab											
	BTITEL707C	C) Electronic Payment System Lab											
8		**Elective IX Lab**	-	-	2	-	15	15	10	10	50	1	2
	BTITPEL708A	A) Real Time Systems Lab											
	BTITPEL708B	B) Information Security Lab											
	BTITPEL708C	C) Management Information Systems Lab											
	BTITPEL708D	D) Distributed Computing Lab											
	BTITPEL708E	E) Data Warehousing and Data Mining Lab											
9	BTITP709	Project Phase I*	-	-	4	-	30		10	10	50	2	4
10	BTITF710	Field Training / Internship/ Industrial Training-III Evaluation	-	-	-	-	-		50		50	1	-
Summary of Semester Assessment Marks, Credit & Hours			**14**	**-**	**10**	**100**	**220**		**430**		**750**	**20**	**24**

Semester VIII												
1	BTITC801	Internet of Things#	3	-	-	20	20	60		100	3	3
2	BTITC802	Mobile Computing#	3	-	-	20	20	60		100	3	3
3	BTITP803	Project Phase II/ Project with Internship**	-	-	24	-	50	50	50	150	12	24
Summary of Semester Assessment Marks, Credit & Hours			**6**	**-**	**24**	**40**	**90**	**220**		**350**	**18**	**30**

These courses are to be studied on self –study mode using SWAYAM/NPTEL/Any other source.

@ Course designed and run by ELECTRONIC PAYMENT AND SERVICES (P) LTD, Mumbai.

* *In case of students opting for Internship in the eighth semester, the Project must be industry-based.*

** *Six months of Internship in the industry.*

Course Code	Course Title	SWAYAM course URL
BTITC702	Artificial Intelligence	https://nptel.ac.in/courses/106/102/106102220/
BTITC801	Internet of Things	https://nptel.ac.in/courses/106/105/106105166/
BTITC802	Mobile Computing	https://nptel.ac.in/courses/106/106/106106147/

Course Title:	**Cloud Computing and Storage Management**	**Semester**	**VII**
Course Code	**BTITC701**	**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:	**Artificial Intelligence**	**Semester**	**VII**
Course Code	**BTITC702**	**Course Type**	**Compulsory**
Pre-requisite	**-**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**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:	**Pattern Recognition**	**Semester**	**VII**
Course Code	**BTITE703A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**-**	**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	**BTITE703B**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**-**	**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 those 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:	**Electronic Payment System**	**Semester**	**VII**
Course Code	**BTITE703C**	**Course Type**	**Elective**
Prerequisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**-**	**Credits**	**3**

Course Objectives:

1. To understand common payment methods, working of different payment systems.
2. To learn basic payments processes and systems.
3. To understand emerging payments trend.
4. To gain knowledge on the underlying technologies governing payment systems.

Course Outcomes:

After learning the course, the students should be able:

1. To learn and speak Financial Services language.
2. To familiarize with banking regulations in the payment industry.
3. Gain domain knowledge for career in financial industry: Banks, Insurance & NBFC.

Course Content:

UNIT I

Evolution of payment systems in the digital world: Role of RBI in payment/clearing/settlement Indian payment systems: IMPS, NEFT/RTGS, eWallet, eKYC, AADHAR / AADHAR VAULT, RUPAY Debit/Credit cards, *99#, NACH,ABPS, BHIM, BHARAT PAY, CREDIT CARD, VISA/MASTER ROLE in CREDIT CARD PAYMENTS, CTS, UPI, BBPS, ATM.
Transformation in Social media channels & Payments: ChatBot, WhatsApp, FB.

UNIT II

Risks in Payment Systems : Credit Risk, Liquidity Risk, Systemic Risk, Operational Risk.

Risk mitigation techniques: Carefully chosen members, Novation, Central counterparty system, Loss sharing arrangements, Collateral, Other mitigation techniques like RECO.
Relationship structures: Correspondent banking, Bilateral clearing, arrangements, Network managed banking.

UNIT III

Payment types:
Book payments, Local payments, Domestic payments, Cross border payments.
Regional payments systems:
USA payment systems : Fedwire, CHIPS, NSS, ACH, SEPA payment systems : TARGET2, STEP 2 (SCT/SDD) PE- AC, China payment system : CDFCPS/CIPS, Hong Kong payment system : CHATS
Canadian payment system : LVTS, Indian payment systems : RTGS, NEFT, IMPS, UPI.

UNIT IV

Overview of SWIFT messaging: MT and MX messages, Role of SWIFT in payment systems, SWIFTnet Fin, File act, Interact, Browse SWIFT payment message processing – MT 1XX, MT 2XX, MT 9XX, MX PAIN/PACS, SWIFT Payment Messages examples, SWIFT for corporate.

UNIT V

Use of code in payment systems:
Codes – IBAN, BBAN, BIC, BEI, UID, UPIC, ABA routing codes etc., IFSC.
Foreign exchange transactions: Cash, TOM, Spot, Forwards, Interbank transactions, Merchant transactions, Exchange rate determination and rate computation.

UNIT VI

Cash management products:
Concept of float, Cash concentration, notional pooling and sweep, Virtual account management (VAM), ACH filter/ACH block, Lockboxes.
Impact of regulation:
Basel, FATF/OFAC compliance, FATCA compliance, AML compliance, FRM compliance.

Practical: Working of ATMs, Insides of an ATM, Vulnerability Points, Care to be taken while using ATM.

Text Book:

1. S. K. Nippani, B. K. Murthy, ***"Digital India Governance Transformation"***, 2018.

Online Reference for books & documentations:

https://rbidocs.rbi.org.in/rdocs/

Course Title:	**Natural Language Processing**	**Semester**	**VII**
Course Code	**BTITOE704A**	**Course Type**	**Elective**
Pre-requisite	**Nil**	**L – T – P**	**3 – 0 – 0**
Stream	**-**	**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:	**Machine Learning**	**Semester**	**VII**
Course Code	**BTITOE704B**	**Course Type**	**Elective**
Pre-requisite	**Engineering Mathematics-II**	**L – T – P**	**3 – 0 – 0**
Stream	**-**	**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:	**Real Time Systems**	**Semester**	**VII**
Course Code	**BTITPE705A**	**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	**BTITPE705B**	**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	**BTITPE705C**	**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	**BTITPE705D**	**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	**BTITPE705E**	**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.

Course Title:	**Cloud Computing and Storage Management Lab**	**Semester**	**VII**
Course Code	**BTITL706**	**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	**BTITEL707A**	**Course Type**	**Elective**
Pre-requisite	**NIL**	**L – T – P**	**0 – 0 – 2**
Stream	**-**	**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	**BTITEL707B**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**-**	**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:	**Electronic Payment System Lab**	**Semester**	**VII**
Course Code	**BTITEL707C**	**Course Type**	**Elective**
Pre-requisite	**Programming in Java/C/C++**	**L – T – P**	**0 – 0 – 2**
Stream	**-**	**Credit**	**1**

Lab Experiments Objectives:

To design and write programs to demonstrate various real life payment system concepts.

Lab Experiments List:

Assignments and project based on syllabus.

Course Title:	**Real Time Systems Lab**	**Semester**	**VII**
Course Code	**BTITPEL708A**	**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	**BTITPEL708B**	**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	**BTITPEL708C**	**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	**BTITPEL708D**	**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	**BTITPEL708E**	**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	**BTITP709**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 4**
Stream	**Core**	**Credits**	**2**

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:	**Internet of Things**	**Semester**	**VIII**
Course Code	**BTITC801**	**Course Type**	**Compulsory**
Pre-requisite	**Microprocessor & Micro-controllers**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**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:	**Mobile Computing**	**Semester**	**VIII**
Course Code	**BTITC802**	**Course Type**	**Compulsory**
Pre-requisite	**Internetworking Protocols , Operating Systems**	**L – T – P**	**3 – 0 – 0**
Stream	**Core**	**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:	**Project Phase II/ Project with internship**	**Semester**	**VIII**
Course Code	**BTITP803**	**Course Type**	**Compulsory**
Pre-requisite	**Nil**	**L – T – P**	**0 – 0 – 24**
Stream	**Core**	**Credits**	**12**

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.

JAIDEV EDUCATION SOCIETY'S

J D COLLEGE OF ENGINEERING AND MANAGEMENT

An Autonomous Institute, with NAAC "A" Grade

At: Khandala, Post- Valni, Kalmeshwar Road, Nagpur

Department of Information Technology

"A Place to Learn, A Chance to Grow"

Session: 2020-21

Course Structure and Syllabus (Autonomous)

For

B. Tech. Information Technology Programme

JADEV EDUCATION SOCIETY'S

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INDEX

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VISION AND MISSION OF INSTITUTE

VISION

To be a centre of excellence imparting professional education satisfying societal and global needs.

MISSION

Transforming students into lifelong learners through quality teaching, training and exposure to concurrent technologies. Fostering conducive atmosphere for research and development throughwell-equipped laboratories andqualified personnel in collaboration with global organizations.

VISION AND MISSION OF DEPARTMENT

VISION

To Produce Competent Professionals equipped with technical knowledge and commitment for satisfying the needs of society.

MISSION

1. To impart advanced knowledge with an inclination towards Research with well equipped Lab.

2. To develop an ability to work ethically and Responsive towards the need of society

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEOs	ATTRIBUTES
PEO 1	Students will have In-depth knowledge of trending technologies, effective communication skills, lifelong learning with leadership qualities in order to work in any multidisciplinary areas in a team or individually.
PEO 2	Students will be able to interpret and analyze the requirements of the software design and development to provide efficient engineering solutions with novel product designs within the jurisdiction of humanity and social constraints
PEO 3	Students will have the attitude to pursue higher studies or research work or initiate entrepreneurial activity

PROGRAM OUTCOMES (PO's)

POs	ATTRIBUTES
1	An Understanding of IT architecture, software and hardware concepts, functionalities and applications
2	An Ability to design, develop and test computer programs involving various algorithms, methodology and programming languages.
3	Competency of business domains and functional processes that employ IT systems and applications
4	Practical use of communication protocols and their applications in the field of internet and world wide web.
5	Sound understanding of fundamentals of computer as the central enabling platform for information management in 21st century .
6	An Ability to develop, integrate, maintain and innovate software applications deployed in various multi-disciplinary domains.
7	Thought leadership to design and implement practical solutions for global industry needs.
8	An Acumen to embrace and adopt futuristic IT technological developments.
9	Sound knowledge of entrepreneurship traits to succeed.
10	Adoption of practices that are ethical ensuring transparency and accountability.
11	Capability to provide solutions that are socially empowering and environment friendly.
12	Effective communication and collaboration techniques with stakeholders to achieve best results.

PROGRAM SPECIFIC OUTCOMES (PSOS):

At the end of Electronics and Telecommunication program the student will have following Program specific outcomes.

PSO1: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity

PSO2: The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.

PSO3: The ability o employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning & a zest for higher studies and also acts as good citizen by inculcating in them moral values & ethics.

Recommendations for conducting one theory course of curriculum through online Teaching / Learning

1. Only Swayam / NPTEL platform is allowed.

2. One defined subject per semester in online mode and BOS should declare that one subject for online mode based on availability of NPTEL offering before commencement of the semester.

3. Student will be allowed to appear for NPTEL / Institute level / University Examination as applicable.

4. In order to ensure learning, NPTEL lectures to be telecast in the class by including it in regular time table if required.

5. 75% assignment submission is mandatory for these online classes also like regular lecture attendance.

6. One faculty to be allotted for this subject, who will discuss and solve student's doubts. Allot 3 hrs/week load to teacher who is allotted to work as facilitator of online course.

7. For Autonomy Students: For online mode the student should submit all assignment given by nptel then his/her score has weightage of 40% for CA & MSE. And if student clear the nptel final exam and producing certificate then 60% weightage should be given as ESE, otherwise he/she has to appear for Makeup exam of Institute.

If student cannot enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II and End sem exams of the Institute.

8. For DBATU students: For online mode he has to appear for CA-I, CA-II, Midsem exam of the institute and End sem exam of University.

If student can't enroll for NPTEL then he/she has to study online videos / material and these students should appear for Mid Semester, CA-I , CA-II of the institute and End sem exams of the University.

10. If the credits of NPTEL/ SWAYAM courses do not match with the existing subject proper scaling will be done)

This system will ensure real learning; avoid any problem arising due to cancellation of NPTEL exam as it happened in this semester. At least for first year and in the unpredictable situation of covid pandemic these provisions will avoid any last moment chaos.

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- I [First Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/ Ext. Pra.	Total	
1	HSMC	HU1T002	Introduction to Computer programming	2	0	0	20	20	60	100	2
2	BSC	MA1T001	Engineering Mathematics-I	3	1	0	20	20	60	100	4
3	BSC	CS1T005	Engineering Physics	3	1	0	20	20	60	100	4
4	ESC	CS1T006	Energy and Environment	3	0	0	20	20	60	100	3
5	HSMC	HU1L002	Introduction to Computer programming Lab	0	0	4	60	0	40	100	2
6	ESC	WS1L001	Workshop Practices	0	0	4	60	0	40	100	2
7	BSC	CS1L005	Engineering Physics Lab	0	0	2	60	0	40	100	1
8			Induction Programme	3 Weeks							
9	ESC	CS1T007	Basic Electrical and Electronics Engineering	2	0	0	10	15	25	50	Audit
				13	**2**	**10**					**18**

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- II[First Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				Credit
				L	T	P	CA	MSE	ESE/ Ext.	Total	
1	HSMC	HU2T001	Communication Skills	2	0	0	60	0	40	100	2
2	BSC	MA2T001	Engineering Mathematics-II	3	1	0	20	20	60	100	4
3	BSC	CS2T002	Engineering Chemistry	3	1	0	20	20	60	100	4
4	ESC	CS2T003	Engineering Graphics	1	0	0	20	20	60	100	1
5	HSMC	HU2L001	Communication Skills Lab.	0	0	4	60	0	40	100	2
6	BSC	CS2L002	Engineering Chemistry Lab	0	0	2	60	0	40	100	1
7	ESC	CS2L003	Engineering Graphics Lab	0	0	4	60	0	40	100	2
8			Societal Internship/ Field	Report submission						50	1
9	ESC	CS2T004	Basic Civil and Mechanical Engineering	2	0	0	10	15	25	50	Audit
				11	**2**	**10**					**17**
				23							

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester-III [Second Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	HSMC	IT3T001	Organization Behavior	2	0	0	20	20	60	100	2
2	BSC	IT3T002	Mathematics-III	3	1	0	20	20	60	100	4
3	ESC	IT3T003	Digital Electronics & Fundamentals of Microprocessor	3	0	0	20	20	60	100	3
4	PCC	IT3T004	Computer Arhcitecture & Organsization	3	0	0	20	20	60	100	3
5	PCC	IT3T005	Data structure using OOPs	3	1	0	20	20	60	100	4
6	PCC	IT3T006	Computer Graphics	3	0	0	20	20	60	100	3
7	PCC	IT3L007	Data structure using OOPs(Lab)	0	0	2	60	0	40	100	1
8	ESC	IT3T008	Digital Electronics & Fundamentals of Microprocessor (Lab)	0	0	2	60	0	40	100	1
9	PCC	IT3L009	Computer Graphics (Lab)	0	0	2	60	0	40	100	1
10	PROJECT	IT3P010	Internship	0	0	0	0	0	0	0	1
11	UHV	IT3T011	Universal Human Values	2	0	0	15	10	25	50	Audit
				19	2	6	320	120	510	950	23

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- IV [Second Year]

Sr. No.	Category of	Course Code	Course Name	Tea chin			Evalu ation				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	IT4T001	Theory of Computation	3	1	0	20	20	60	100	4
2	PCC	IT4T002	Java Programming	3	0	0	20	20	60	100	3
3	PCC	IT4T003	Operating System	3	0	0	20	20	60	100	3
4	PCC	IT4T004	Computer Networks	2	1	0	20	20	60	100	3
5	PCC	IT4T005	DBMS	3	0	0	20	20	60	100	3
6	PCC	IT4T006	Discrete Mathematics & Graph Theory	3	0	0	20	20	60	100	3
7	PCC	IT4L007	DBMS(Lab)	0	0	2	60	0	40	100	1
8	PCC	IT4L008	Computer Networks(Lab)	0	0	2	60	0	40	100	1
9	PCC	IT4L009	Java Programming(Lab)	0	0	2	60	0	40	100	1
10	MC	IT4L010	Consumer Affairs	2	0	0	15	10	25	50	Audit
				19	2	6	300	120	530	950	22

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- V [Third Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	ESC	IT5T001	Embedded System & IoT	3	0	0	20	20	60	100	3
2	PCC	IT5T002	Cyber Security & Cryptography	3	1	0	20	20	60	100	4
3	PCC	IT5T003	Design and Analysis of Algorithm	3	1	0	20	20	60	100	4
4	PCC	ITOEC1	Open Elective-1	3	1	0	20	20	60	100	3
5	PEC	IT5TE01	Elective -I	3	0	0	20	20	60	100	3
8	ESC	IT5L004	Embedded System & IoT (Lab)	0	0	2	60	20	40	100	1
9	PCC	IT5L005	Cyber Security & Cryptography (Lab)	0	0	2	60	0	40	100	1
10	PCC	IT5L006	Design and Analysis of Algorithm (Lab)	0	0	2	60	0	40	100	1
6	PROJECT	IT5P007	Internship	0	0	0	0	0	0	0	1
7	MC	IT5T008	Innovation and Enterpreneurship Development	2	0	0	15	10	25	50	Audit
				17	3	6	300	120	450	850	21

IT5T001	Embedded System and IOT	3 Credit

COURSE OBJECTIVES:

1. To understand fundamentals of IoT and embedded system including essence, basic design strategy and process modelling.
2. To introduce students a set of advanced topics in embedded IoT and lead them to understand research in network
3. To develop comprehensive approach towards building small low cost embeddedIoT system
4. To understand fundamentals of security in IoT
5. To learn to implement secure infrastructure for IoT
6. To learn real world application scenarios of IoT along with its societal and economic impact using case studies

COURSE OUTCOMES:

CO1 : On completion of the course, student will be able to

CO2: Implement an architectural design for IoT for specified requirement

CO3: Solve the given societal challenge using IoT

CO4: Choose between available technologies and devices for stated IoT challenge

Unit 1 : Introduction to Embedded System and Internet of Things: [6Hrs]

Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real-time scheduling, Processor basics and System-On-Chip, Introduction to ARM processor and its architecture. **IoT:** Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoTProtocols,Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications

Unit 2 :EmbeddedIoT Platform Design Methodology [6 Hrs]

Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification,Device and component integration, o Application development

Unit 3 :Pillars of Embedded IoT and Physical Devices [6 Hrs]

Horizontal, verticals and four pillars of IoT, M2M: The internet of devices, RFID: The internet of objects, WSN: The internet of transducer, SCADA: The internet of controllers, DCM: Device, Connect and Manage, Device: Things that talk, Connect: Pervasive Network, IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Beagle board and Other IoT Devices.

Unit 4 :IoT Protocols and Security [6Hrs]

Protocol Standardization for IoT, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer. IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for Io

Unit 5 :Web of Things and Cloud of Things [6Hrs]

Web of Things and Cloud of Things ▪ Web of Things versus Internet of Things, Two Pillars of the Web, ▪ Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, ▪ The Cloud of Things Architecture.

Unit 6 :Cloud Offerings and IoT Case Studies [6Hrs]

IoT Physical Servers, Introduction to Cloud Storage Models, Communication API, WAMP: Autobahn for IoT, Xively Cloud for IoT, Python Web Application Framework: Django, Amazon Web Services for IoT, SkynetIoT Messaging Platform. Case Studies: Home Intrusion Detection, WeatherMonitoring System, Air Pollution Monitoring, Smart Irrigation.

Text Books:

1. Embedded System: Architecture, Programming and Design by Rajkamal,2nd edition,2010,Tata McGraw Hill
2. MSP430 Microcontroller Basics by John H. Davies Elsevier; First edition (2010)
3. Computer as Components: Principles of Embedded Computing System Design, Wayne Wolf,2nd edition,2008, Morgan Kaufmann Publication

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.

IT5T002	Cyber Security & Cryptography	4 Credit

COURSE OBJECTIVES:

1. To understand basics of Cryptography and Network Security.

2. To be able to secure a message over insecure channel by various means.

3. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.

4. To understand various protocols for network security to protect against the threats in the networks..

COURSE OUTCOMES:

CO1. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure.

CO2. Develop policies and procedures to manage enterprise security risks.

CO3. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training.

CO4. Interpret and forensically investigate security incidents.

Unit 1: Introduction to Cyber Security& Cryptography [6Hrs]

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority,International convention on Cyberspace, Cyber Security Regulations, Roles of International Law.

Overview of Cryptography:Public versus private key cryptography, Stream Ciphers, Digital Signatures, Applications of Cryptography.

Unit 2:Cryptography and Network Security [6Hrs]

Cryptography, Stream Ciphers–One-time Pad(OTP),Perfect secrecy,Pesudo-Random Generators,Attacks on stream ciphers and OTP,Public key cryptosystems: RSA, ElGamal, Rabin,Ellipticcurve cryptosystemsPKC, key exchange, IBE, Lattice based cryptosystem.Authentication and signature protocols,Kerberos.Overview of Firewalls-Types of Firewalls, Security Protocols: Security at the Application Layer- PGP and S/MIME, Security at Transport Layer- SSL and TLS,PEM and S/MIME, PGP, Security at Network Layer-IPSec,

Unit 3: Cyber Security Vulnerabilities and Cyber Security Safeguards [6Hrs]

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Ethical Hacking, Threats in network, Security policy, Threat Management

Unit 4: Securing Web Application, Services and Servers [6Hrs]

Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.

Unit 5: Intrusion Detection and Prevention **[6Hrs]**

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.Honeypots, password management.

Unit 6: Cyber Forensics **[6Hrs]**

Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

RESOURCES:

Video Lectures

1. http://nptel.ac.in/courses/106105031/lecture by Dr.DebdeepMukhopadhyayIITKharagpur
2.https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system engineering-spring-2009/video-lectures/ lecture by Prof. Robert Morris and Prof. Samuel Madden MIT.

Text Books

1. William Stallings, “Crpyptography and Network security Principles and Practices”, Pearson/PHI.
2. Wade Trappe, Lawrence C Washington, “ Introduction to Cryptography with coding theory”, Pearson.
3.J. Katz and Y. Lindell, Introduction to Modern Cryptography, CRC press, 2008.

Reference Books

1. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing – Prentice Hall of India.
2.Golreich O, Foundations of Cryptography, Vol.1.2, Cambridge University Press, 2004
3.Menezes, et.al, Handbook of Applied Cryptography, CRC Press, 2004.

IT5T003	Design and Analysis of Algorithm	4 Credit

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:

CO1. Develop efficient algorithms for simple computational tasks.

CO2 Gain understanding of concepts of time and space complexity, worst case, average case and best case complexities and the big-O notation.

CO3.Design standard algorithms such as sorting, searching, and problems involving graphs

CO4.Compute complexity measures of algorithms, including recursive algorithms using recurrence relations

Course Contents:

Unit 1 : [6 Hrs]

Introduction to Algorithm, Iterative Algorithm Design and Issue, Use of Loops, Efficiency of Algorithm, Estimating & Specifying Execution Time and Space, Order Notation (O, Θ, Ω Notations), Algorithm Strategies, Mathematical Analysis for Recursive and Non-Recursive algorithm.

Unit 2]6 Hrs]

Introduction to Divide and Conquer, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Finding median, Closest Pair, Convex Hulls Problem.

Unit 3 [6 Hrs]

Greedy Methods, Fractional Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Pattern, Huffman Coding, Minimum Spanning Tree – Kruskal's and Prim's Algorithm, Dijkstra's Shortest Path Algorithm.

Unit 4 [6 Hrs]

Introduction to Dynamic Programming, Elements of Dynamic Programming, Multistage Graphs, Traveling Salesman Problem, Matrix-chain multiplication, Optimal Polygon Triangulation, Longest common subsequence, Floyd-Warshall algorithm

Unit 5 **[6 Hrs]**

Introduction to Backtracking, N-Queen Problem, Combinational Search, Backtracking Strategies, Search & Traversal Techniques – BFS, DFS, Sum of Subsets, Graph coloring, Hamiltonian Circuit Problem, Tower of Hanoi Problem, State Space Tree, Branch & Bound, Least cost (LC) Search, Control Abstractions for LC search, FIFO Branch & Bound..

Unit 6 **[6 Hrs]**

Efficiency of Algorithms: Polynomial Time & Non-Polynomial Time Algorithms, NP-Complete, NP-Hard, Limitation of Algorithm, Worst and Average Case Behavior, Efficiency of Recursion, Complexity Calculation for Various Sorting Algorithms, Approximation of Algorithms, Time-Space Trade off in algorithms research.

Text Books:

1. Thomas H. Cormen, Charles E Leiserson, Introduction to Algorithms, PHI Publication, 3rd Edition.
2. Parag Dave, Himanshu Dave, Design and Analysis of Algorithm, Pearson Education India, 2nd Edition.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, India.

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.

OEC/32	Open Elective-1 Web Development & Design	4 Credit

COURSE OBJECTIVES:

1. Students will able to understand and illustrate HTML.
2. Students will be able to understand about CSS Properties.
3. Student will able to understand basic of Java Script
4. Student will able to design website

COURSE OUTCOMES: Student will able to

CO1. Remember the basic tags of HTML, CSS, and JavaScript

CO2. Understand thebasic tags of HTML, CSS, and JavaScript

CO3: Execute the different Syntax and Tags present in HTML, CSS, and JavaScript

CO4. Analyze difference between various web design Languages

CO5. Evaluate the design of Different Forms

CO6. Design the web site form

Course Contents:

Unit 1 - Introduction **[8Hrs]**

Introduction to Internet, World Wide Web Communication& Markup Language, HTTP Request / Response, The HTTP Request Circle.

Unit 2 -HTML Basic Tags **[8Hrs]**

HTML Basic Examples, HTML Editors, HTML Elements, HTML Attributes, HTML Documents, HTML Document Structure, HTML Headings, HTML Paragraphs, HTML Styles, HTML Text Formatting, HTML Quotation and Citation Elements, HTML Comments

Unit 3 -HTML Table **[8 hrs]**

HTML Colors, HTML Links, HTML Images, HTML Tables, HTML List, HTML frames, HTML Layout Elements and Techniques

Unit 4 - HTML form & Media **[8Hrs]**

HTML Form, Attribute, Element, Input Type, Input Attribute, Input Form Attribute

Unit 5 - CSS Introduction **[8Hrs]**

Concept of CSS: Introduction, Syntax, CSS Border, Background, CSS Text, Font, Link, Table, list ,Align, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts)

Unit 6 -Java Script Introduction **[8Hrs]**

JAVAScript Implementation, SyntaxBasics and Variable Types: History of a java script, java script Implementation, The language syntax, The character set, Data Types,

Reference Books:

1. Reference Book: Web Developer's Reference Guide. By: Joshua Johanan, Talha Khan, RicardoZea.

Reference Website:

2. Reference Website: W3 School web Developemt: https://www.w3schools.com/whatis/whatis_icons.asp

IT5TE01A	Semantic Web	3 Credit

COURSE OBJECTIVES :

1. To Understand the concepts of Web Science, semantics of knowledge and resource, ontology.
2. To Describe logic semantics and inference with OWL.
3. To Use ontology engineering approaches in semantic applications
4. To enable students build a applications based on semantic web

COURSE OUTCOMES:

CO1: Understand the fundamentals of Semantic web

CO2: Creating structured web documents in XML

CO3:Apply ontology engineering to various problems.

CO4:Understand Semantic Web query languages (SPARQL)

CO5:Program semantic applications with Java and Jena API.

Unit I: Semantic Web Vision: [6 Hrs]

Todays' web, Examples of semantic web from today's web, Semantic web technologies, layered approach

Structured web documents in XML: The XML language, Structuring, Namespaces, Querying and Addressing XML documents, Processing

Unit II: Describing Web Resources: [6Hrs]

Introduction, RDF: Basic Ideas,RDF: XML-Based Syntax,RDF serialization, RDF Schema: Basic Ideas,RDF Schema: The Language ,RDF and RDF Schema,Querying RQL.Logic and Inference Rules:

Introduction, Monotonic Rules syntax, semantics & examples, Nonmonotonic rules – syntax & examples, Encoding in XML

Unit III: Ontology Engineering: [6 Hrs]

Introduction, Manual construction of Ontology, Reusing existing ontology, using Semi-automatic methods, Knowledge semantic web architecture

Unit IV: SPARQL: [6 Hrs]

SPARQL simple Graph Patterns, Complex Graph Patterns, Group Patterns, Queries with Data Values, Filters OWL Formal Semantics,Emerging Semantic Web Ontology Languages using Protege tool.

Unit V: SchemaWeb Ontology Language: [6 Hrs]

SchemaWeb Ontology Language: Introduction, OWL language, Examples, OWL in OWL, Future extensions.

Unit VI: Trust and Applications: **[6 Hrs]**

Digital Signatures and Web of Trust, Applications in E-Commerce and Bio-Informatics, e-Learning, Web Services, Other Scenarios,Linked Open Data Cloud,Research in Semantic Web Mining.

Text Books

1. A Semantic Web Primer: Grigoris Antoniou and Frank Van Hermelen , MIT Press

2. Foundations of Semantic Web Technologies, Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, CRC Press

3. John Davies, Dieter Fensel and Frank Van Harmelen, "Towards the Semantic Web: Ontology-Driven Knowledge Management", John Wiley and Sons, 2003.

4. Linked Data:Evolving the Web into a Global Data space by Tom Heath, Christian Bizer , Morgan & Claypool publication

Reference Books

1. Michael C. Daconta, Leo J. Obrst, and Kevin T. Smith, "The Semantic Web: A Guide to the Futureof XML, Web Services, and Knowledge Management", Fourth Edition, Wiley Publishing, 2003.
2. John Davies, Rudi Studer, and Paul Warren John, "Semantic Web Technologies: Trends and Research in Ontology-based Systems", Wiley and Son's, 2006.

IT5TE02B	Quantum Computing	3 Credits

COURSE OBJECTIVES:

1. The objective of this course is to provide the students an introduction to quantum computation.
2. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.
3. Analyze the behaviour of basic quantum algorithms.
4. Implement simple quantum algorithms and information channels in the quantum circuit model.
5. Simulate a simple quantum error-correcting code.
6. Prove basic facts about quantum information channels.

COURSE OUTCOMES:

CO1. The basic principles of quantum computing.

CO2. The fundamental differences between conventional computing and quantum computing.

CO3. Several basic quantum computing algorithms.

Co4. The classes of problems that can be expected to be solved well by quantum computers.

CO5.Quantum mechanics as applied in Quantum computing.

CO6. Understand how quantum parallelism is used in the simplest quantum algorithms such as Deutsch, period finding and quantum Fourier transform

Course Contents:

Unit 1 **[6Hrs]**

Introduction to Quantum Computation: Quantum bits, B loch sphere representation of a qubit, multiple qubits.

Unit 2 **[6Hrs]**

Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

Unit 3 **[6 Hrs]**

Quantum mechanics, Measurements in bases other than computational basis. 083 Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits.

Unit 4 **[6 Hrs]**

Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states, Quantum teleportation. Quantum Cryptography, no cloning theorem.

Unit 5 **[6Hrs]**

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search.

Unit 6 **[6Hrs]**

Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation.

Text Books:

1. Nielsen M. A ., Quantum Computation and Quantum Information, Cambridge University Press.2002
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol.I : Basic Concepts, Vol I I: Basic Tools an d Special Topics, World Scientific.2004
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms.2000

Reference Books:

1. Quantum computing explained, David McMahon, Wiley-interscience, John Wiley & Sons, Inc. Publication 2008
2. Quantum computation and quantum information, Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press 2010
3. Introduction to Quantum Mechanics, 2nd Edition, David J. Griffiths, Prentice Hall New Jersey 1995

IT5TE03C	Biomedical Informatics	3 Credit

COURSE OBJECTIVES:

1.Driven by efforts to improvehuman health and healthcare systems, this course will cover relevant topics at the intersection of people, health information, and technology.

2. Specifically, we will survey the field of biomedical informatics that studies the effective uses of biomedical data, information, and knowledge fromindividuals(patients), populations, biomolecules, and cellular processes,forscientific inquiry,problemsolving, and decision making.

3. We will explore foundations and methods from both biomedical and computing perspectives, including hands-on experiences with systems, tools, andtechnologies in the healthcareecosystem.

COURSE OUTCOMES:

CO1. Understand the different sub-disciplines of biomedical informatics (BMI)and identity an area of interestfor further study, research, and/or practice

CO2.Comprehend how to acquire, store and maintain, retrieve, analyse, and meaningfully use biomedical data

CO3.Apply biomedical and computational tools and technologies to solve problems in biomedicine and healthcare

CO4.Understand how technology, including health information systemsand medical devices, can improve or limit the ability to provide clinical care.

CO5.Critically think and develop own perspectives on ethical and legal considerations in use of contemporary technology and informatics in health care.

Course Contents:

Unit 1 **[6 Hrs]**

The Science and Pragmatics of Biomedical Informatics,Acquisition, Storage, and Use of biomedical data (including “big data”),Introduction Categories of Biological Databases, Microarray Technology: A Boon to Biological Sciences Introduction to Microarray Microarray Technique

Unit 2 **[6Hrs]**

Standards in Biomedical Informatics,Biomedical Decision Making,Natural Language Processing in Health care and Biomedicine.

Unit 3 **[6Hrs]**

Sequence alignment,Multiple Sequence Alignment methods (MSA), Scoring of a MSA, Progressive (CLUSTALW and PILEUP), Iterative (Genetic) and Hidden Markov Model (HMM) methods of MSA, Local MSA (Profile and BLOCK analysis, and Pattern searching, and

Expectation Maximization (EM) Algorithm (MEME),Ethics in Biomedical and Health Informatics: Users, Standards, and Outcomes

Unit 4 **[6 Hrs]**

Markov Chains and HMM Frequent words in DNA, Consensus word analysis, Transaction and emission matrix, Development of training set, CpG island prediction using HMM, Application of HMM in gene finding, and Multiple sequence alignment by HMM method. Introduction to Methodologies in Biomedical Informatics

Unit 5 **[6 Hrs]**

Introduction to Biopython, sequence objects, sequence record objects. Sequence input and output:- parsing sequences, parsing sequences from the net, sequence files as dictionaries, writing sequence files. Multiple Sequence Alignment objects,BLAST using Biopython

Unit 6 **[6 Hrs]**

Phylogenetic analysis: Definition and description of phylogenetic trees, a primer on computational phylogenetic analysis. Computational gene prediction methods, analysis of codon usage bias, computational prediction and analysis of regulatory sites,Human Genome Project Genome Sequenced in the Public (HGP) and Private.

Text Books:

1. Biomedical Informatics: Computer Applications in Health Care and Biomedicine (Health Informatics),
2. Shortliffe EH, Cimino JJ. Fourth edition, 2014.
3. M.J. Bishop and C.J. Rawlings (editors), DNA and Protein Sequence Analysis---A Practical Approach IRL Press at Oxford University Press, ISBN 0 19 963464 7 (Pbk)
4. J. Pevsner (2002) Bioinformatics and Functional Genomics; Cold Spring Harbor Laboratory
   Press, Cold Spring Harbor, New York.
5. Jeff Chang, Brad Chapman, Iddo Friedberg, Thomas Hamelryck, BiopythonTutorial and Cookbook", http://biopython.org/DIST/docs/tutorial/Tutorial.html,2013

Reference Books:

1. Shortliffe, E. H., &Cimino, J. J. (2013). Biomedical Informatics: Computer Applications in Health Care and Biomedicine. Springer Science & Business Media, (4thEdition).
2. Selected readings from peer-reviewed literature in biomedical informatics, translational medicine, and healthcare systems engineering.
3. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press

IT5L004	Embedded System and IOT-Lab	1 Credit

COURSE OBJECTIVES :

To create an environment for research, design, development and testing of IoT solutions, in the field of energy management, communication systems, distributed sensor devices and advanced user interfaces

COURSE OUTCOMES:

Investigate a variety of emerging devices and technologies such as smart sensing, pervasive connectivity, virtual interfaces & ubiquitous computing and their potential applications in consumer, retail, healthcare and industrial contexts

List of Experiments:

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History& Elevation)

2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board

3. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.

4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs

5) Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.

6. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

7. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.

8. Study of different CPU frequency governors. Write an application to change CPU frequency of Raspberry-Pi /Beagle board

9. Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor.

10. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardwaresimulated traffic signal.

11. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardwaresimulated lift elevator

12. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.

IT5L006	Design and Analysis of Algorithm Lab	1 Credit

COURSE OBJECTIVES :

1. To analyze the running time of asymptotic algorithm.
2. To develop algorithms for sorting, searching, insertion and matching.
3. To identify and apply the concept of computational intractability.
4. To acquire knowledge in NP Hard and complete problem

COURSE OUTCOMES:

CO1. To design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands.

CO2.To find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate) .

CO3.To apply classical sorting, searching, optimization and graph algorithms Apply classical sorting, searching, optimization and graph algorithms

CO4. To understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy.

CO6.To explain NP-Completeness and deal with NP-complete problems.

CO7 To synthesize efficient algorithms in common engineering design situations.

List of Experiments:

1. Introduction of Algorithm (Order Notation , Time & Space Complexity)
2. Write a program to implement Binary Search Algorithm
3. Write a program to implement Merge sort Algorithm
4. Write a program to implement Knapsack problem using greedy method
5. Write a program to implement Prim’s Algorithm
6. Write a program to implement Kruskals Algorithm
7. Write a program to implement Dijkstras’s algorithm
8. Write a program to implement Travelling Salesman Problem
9. Write a program to implement Tower of Hanoi problem for n number of disks.
10. Write a program to implement Warshall’s algorithm.
11. Write a program to implement Quick Sort Algorithm
12. Write a program to implement Depth first Search Algorithm
13. Write a program to implement Spanning tree.

14. Write a program to implement Breath First Search Algorithm
15. Write a program to implement Selection Sort Algorithm
16. Write a program to implement Longest Common Subsequence Algorithm
17. Write a program to implement Bubble Sort algorithm.
18. Write a program to implement Insertion Sort Algorithm
19. Write a Program to Search a number from the given list of numbers using Linear Search
20. Write a program to implement Hamilton Algorithm

Course Structure and Syllabus

For

B. Tech. Information Technology Programme

Curriculum for Semester- VI [Third Year]

Sr. No.	Category of Subject	Course Code	Course Name	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	ESC	IT6T001	Adhoc Wireless Networks	3	0	0	20	20	60	100	3
2	PCC	IT6T002	Machine Learning	3	1	0	20	20	60	100	4
3	PEC	IT6TE02	Elective -II	3	0	0	20	20	60	100	3
4	PEC	IT6TE03	Elective-III	3	0	0	20	20	60	100	3
5	OEC	ITOEC2	OPEN Elective 2	3	1	0	20	20	60	100	4
6	ESC	IT6L003	Adhoc Wireless Networks (Lab)	0	0	2	60	0	40	100	1
7	PCC	IT6L004	Machine Learning (Lab)	0	0	2	60	0	40	100	1
8	PCC	IT6L005	Multimedia (Lab)	0	0	2	60	0	40	100	1
9	PROJECT	IT6P006	Mini Project	0	0	4	25	0	25	50	3
10	MC	IT6T007	Intellectual Property Rights	2	0	0	15	10	25	50	Audit
				17	2	10	325	100	475	900	23

IT6T001	Adhoc Wireless Network	3 Credit

COURSE OBJECTIVES:

1. Explain fundamental principles of Ad-hoc Networks
2. Discuss a comprehensive understanding of Ad-hoc network protocols
3. Outline current and emerging trends in Ad-hoc Wireless Networks.
4. Analyze energy management in ad-hoc wireless networks.

COURSE OUTCOMES:

CO1. Design their own wireless network

CO2. Evaluate the existing network and improve its quality of service

CO3. Choose appropriate protocol for various applications

CO4. Examine security measures present at different level

CO5. Analyze energy consumption and management

Course Contents:

Unit 1 [10 Hrs]

Teaching Hours Ad-hoc Wireless Networks Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas.

Unit 2 [8 Hrs]

Routing Protocols for Ad-hoc Wireless Networks Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols.

Unit 3 [9 Hrs]

Multicast Routing in Ad-hoc Wireless Networks Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for

Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols.

Unit 4 **[9Hrs]**

Transport Layer and Security Protocols for Ad-hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks; Security in Ad-hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad-hoc Wireless Networks.

Unit 5 **[9 Hrs]**

Quality of Service and Energy Management in Ad-hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad-hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad-hoc Wireless Networks: Introduction, Need for Energy Management in Ad-hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes.

Text Books:

1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

Reference Books:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.

2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.

IT6T002	**Machine Learning**	**4 Credit**

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 assumptionsthat underlies them.

5. To possess insights, concerning the relative strengths and weaknesses of various commonmachine learning methods.

COURSE OUTCOMES:

After learning the course the student will be able:

CO1. To demonstrate knowledge of the machine learning literature.

CO2. To describe how and why machine learning methods work.

CO3. To demonstrate results of parameter selection.

CO5. To select and apply appropriate machine learning methods to a selected problem.

CO6. Toimplement machine learning algorithms on real datasets.

Course Contents:

Unit 1 **[6 Hrs]**

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 2 **[6 Hrs]**

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 3 **[6 Hrs]**

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 4 **[6 Hrs]**

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, Ensemble Learning: Bagging, boosting, and DECORATE. Active learning with ensembles.

Unit 5 **[6 Hrs]**

Unsupervised Learning: Clustering:Learning from unclassified data, Hierarchical Aglomerative Clustering, k-means partitional clustering, Batchler and Wilkin's algorithm.

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.

IT6TE02A	Elective II- Cloud Computing and Storage Management Semester	Credit:3

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 centres.
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 centres 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. RajkumarBuyya, James Broberg, AndrzejGoscinski, “Cloud Computing Principles and Paradigms”, Wiley Publishers, 2011.

2. Barrie Sosinsky, “Cloud Computing Bible”, Wiley Publishers 2010.
3. Tim Mather, SubraKumaraswamy, ShahedLatif, “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. RajkumarBuyya, Christian Vacchiola, S ThamaraiSelvi, “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.

IT6TE02B	Expert Systems	3 Credit

COURSE OBJECTIVES:

1. Students will be introduced to what is an Expert System.
2. Students will be able to understand First and Second Generation Expert Systems.
3. Students will study Artificial Intelligence.
4. Students will study Artificial Intelligence.
5. Students will study Different approaches to gain knowledge with different perspectives.
6. Students will study about Machine Learning and its importance.

COURSE OUTCOMES:

CO1. Students will be able to understand Knowledge Representation.

CO2. Students will be able to understand what is Machine Learning.

CO3. Students will be able to analyse a Hybrid Expert System for Insurance Policy.

CO4. Students will illustrate the Frame Problem.

CO5. Students will be Understand what is Neural Network

CO6. Students will be introduced with Machine learning concepts.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction to Expert System: Artificial Intelligence, Basic expert System concepts, Knowledge Engineering, First and second Generation Expert Systems, Advantages and disadvantages of Expert Systems, Expert System applications.

Unit 2 **[6 Hrs]**

Theoretical Foundations : Introduction, Propositional Logic, First order predicate calculus and Predicate Logic, Inference, Proof by Refutation Resolution, Green's Answer Terms, Knowledge Acquisition Bottleneck, Search Strategies, Non Monotonic Reasoning, Forward Backward Chaining.

Knowledge Representation: Presentation of Knowledge, Rules, Semantic Networks, Frames, Object Oriented Systems, Hybrid Representation, The Frame problem, Semantic Primitives..

Unit 3 **[6 Hrs]**

Knowledge Acquisition, Verification and Validation: The Expert System Development Process, Knowledge Elicitation, The Knowledge Level, Explanation in Second Generation Expert System, The Problem Solving Methods and Generic Tasks Approach, Verification and Validation.

Unit 4 **[6 Hrs]**

Uncertainty: Uncertainty in Expert Systems, The Bayesian Approach, Certainty Factors, Dempster Shafer Theory of Evidence, Fuzzy Sets and Fuzzy Logic, Bayesian Belief Networks.

Machine Learning: Introduction, Decision Trees and The ID3 Algorithm, Learning From Noisy Data, Version Space Search and Conceptual Clustering, Case Based Reasoning, Evolutionary Machine Learning.

Unit 5 **[6 Hrs]**

Neural Networks: Introduction, Artificial Neural Network, Perceptron, Hidden Layers, Multi layerPerceptrons, Hopfield Networks, Multilayered Nets AndBackpropagation.

Unit 6 **[6 Hrs]**

Hybrid Expert System: Introduction, Macie: A Connectionist Expert System, Generating Rules from Neural Nets, A Hybrid expert system for Investment Advising, A Hybrid Expert System for Insurance Policy.

Reference Book:

1. Nikolopoulos "Expert Systems" 1997
2. J. Giarratano and G. Riley, "Expert Systems -- Principles and Programming". 4th Edition, PWS Publishing Company, 2004
3. Peter J. Lucas "Principles of Expert Systems" January 1991
4. Joseph C. Giarratano "Expert systems"

IT5TE01A	Blockchain	3 Credit

COURSE OBJECTIVES:

1. To Understand the concepts of blockchain
2. To Understand various cryptocurrency and their working
3. To Use various algorithms for distributed consensus
4. To enable students build a applications based on blockchain technology

COURSE OUTCOMES:

CO1: Understand emerging abstract models for Blockchain Technology.

CO2: Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.

CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4: Apply hyperledger Fabric and Etherum platform to implement the Block chain Application

Unit I: Introduction : [6 Hrs]

Blockchain-History,Myths,Benefits,Limitations and Challenges of Blockchain, Structure of Blocks, Miners,Working of Blockchain,Types of Blockchain,Blockchain as Public Ledgers-Bitcoin, Blockchain 2.0, Smart Contracts, Transactions-Distributed Consensus, The Chain and the Longest Chain -Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain,

Unit II: Blockchain Architecture and Cryptographic**:** **[6Hrs]**

Crypto Primitives, Permissioned Blockchain,Consensusmechanism **,**Cryptographic -Hash Function,Properties of a hash function-pointer and Merkle tree. Public key cryptosystems, private vs public blockchain. Introduction to cryptographic concepts required,Hashing, public key cryptosystems, private vs public blockchain and use cases,

Unit III: Bitcoin Consensus: [6 Hrs]

Introduction to BitcoinBlockchain,Transactions,Bitcoin limitations, Bitcoin Consensus, Proof of Work (PoW)- HashcashPoW , BitcoinPoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

Unit IV:Cryptocurrency and Smart Contracts [6 Hrs]

Introduction, Ethereumblockchain, Elements of the Ethereumblockchain, IOTA,Namecoin.Legal Aspects Cryptocurrency Exchange, Black Market and Global Economy.Smart Contracts: Definition, DAO,Ricardian contracts,Precompiled contracts.

Unit V: HyperledgerFabric: [6 Hrs]

Architecture of Hyperledger fabric v1.1-Introduction to hyperledger fabric v1.1, chain code-Ethereum:Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, TruffleDesign and issue Crypto currency, Mining, DApps, DAO

Unit VI: BlockchainApplications : [6 Hrs]

Uses of Blockchain in E-Governance, Land Registration, Medical Information Systems, Finance, and others

Text Books

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016

2. Draft version of “S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, ‘Blockchain Technology: Cryptocurrency and Applications’, Oxford University Press, 2019.

3. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

Reference Books

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popularBlockchain frameworks by Bashir, Imran,2017.
2. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoinandcryptocurrency, IEEE Symposium on security and Privacy, 2015.

IT6TE02D	**Big Data Analytic Technique**	**3 Credit**

COURSE OBJECTIVES:

1. Design applications using R, HADOOP.
2. Design applications using RHADOOP
3. Develop analytic applications for data Streams.
4. Develop Pig scripts for Big data applications.
5. Design Big data applications schema

COURSE OUTCOMES:

CO1. Understand basic concepts and techniques of Hadoop ecosystem and Big data.

CO2.Design different component of Hadoop ecosystem.

CO3. Understand the domain of data science and analysis of big data.

Course Contents:

Unit 1 : **[6 Hrs]**

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies.

Unit 2 : **[7 Hrs]**

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, master-slave replication, peer-peer replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning andcombining, composing map-reduce calculations.

Unit 3 : **[7 Hrs]**

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

Unit 4 : **[7 Hrs]**

Map Reduce workflows, unit tests with MR Unit, test data and local tests, anatomy of Map Reduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, Map Reduce types, input formats, output formats.

Unit 5 : **[7 Hrs]**

H base, data model and implementations, H base clients, H base examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Hive, data types and file formats, HiveQL data definition, Hive QL data manipulation, HiveQL queries.

Unit 6 : **[6Hrs]**

Big Data Issues: Privacy, Visualization, Compliance and Security,Structuredvs Unstructured Data.

Text Books:

1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, PreetiSaxena, McGraw Hill, 2018.
2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and AmbigaDhiraj, John Wiley & Sons, 2013

Reference Books:

1. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013
2. Hadoop: The Definitive Guide, Tom White ,Third Edition, O'Reilley, 2012.
3. Hadoop Operations, Eric Sammer, O'Reilley, 2012.
4. Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley, 2012.
5. H Base: The Definitive Guide, Lars George, O'Reilley, 2011.
6. Cassandra: The Definitive Guide, Eben Hewitt, O'Reilley, 2010.

IT6TE03A	Graph Analytic for Big data	3 Credit

COURSE OBJECTIVES:

1.To understand the concept of Big Data

2.To learn Big Data file systems and their storage methods

3.To understand the algorithms and

4.To learn to process Big Data information for analytics

5.To discuss and understand Big Data implementations within large corporations like Google and Facebook

COURSE OUTCOMES:

CO1.To model and implement efficient big data solutions for various application areas using appropriately selected algorithms and data structures.

CO2.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.

CO3.To explain trade-offs in big data processing technique design and analysis in written and oral form.

CO4.To explain the Big Data Fundamentals, including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.

CO5.To apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.

Course Contents:

Unit 1 **[6 Hrs]**

What is big data?, the four V's of big data, Distributed File System, functional programming vsobject oriented programming, advantages of scala, spark streaming

Unit 2 **[7 Hrs]**

Introduction, Parallel processing using Pig, Pig Architecture, Grunt, Pig Data Model-scalar and complex types. Pig Latin-Input and output, Relational operators, User defined functions. Working with scripts

Unit 3 **[7 Hrs]**

Big Data Storage Models: Distributed Hash-table, Key-Value Storage Model (Amazon's Dynamo), Document Storage Model(Facebook's Cassandra), Graph storage models

Unit 4 **[7 Hrs]**

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 No SQL, Algorithms for detecting similaritems, Recommendation systems, Data stream analysis algorithms, Clustering algorithms, Detecting frequent items.

Unit 5 **[7 Hrs]**

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 Net fix Prize, Link Analysis with case studies of the PageRank algorithm and the Spam farm analysis, Crowd Sourcing

Unit 6 **[6 Hrs]**

Big graph Analytic Approaches: In memory big graph analytics, SSD-based big graph analytics, Disk based big graph analytics, centrality analysis: Degree, eignvectorkatz, page rank.

Text Books:

1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Raj kamal, PreetiSaxena, McGraw Hill, 2018.
2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and AmbigaDhiraj, John Wiley & Sons, 2013.

Reference Books:

1. An Introduction to Information Retrieval, Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze
2. Data-Intensive Text Processing with Map Reduce, Jimmy Lin and Chris Dyer.

IT6TE03B	**Smart Sensors for Robotics**	**3 Credit**

COURSE OBJECTIVES:

1. To understand the different sesnsors used in robotics
2. To learn kinematics of robotics
3. To understand sensors used in industries

COURSE OUTCOMES:

CO1.Student shall be able to differentiate sensors uses..
CO2.Student shall be able to apply the knowledge of different sensors in different area of robotics.
CO3.Students shall able to understand the robotics assembly

Course Contents:

UNIT I: Introduction **[6 Hrs]**

An Introduction to sensors and Transducers, History and definitions, Smart Sensing, AI sensing, Need of sensors in Robotics.

UNIT II: Sensors In Robotics **[7 Hrs]**

Position sensors -optical, non-optical, Velocitysensors, Accelerometers, Proximity Sensors - Contact, non-contact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors

UNIT III: Miscellaneous Sensors In Robotics **[8Hrs]**

Different sensing variables -smell, Heat or Temperature, Humidity, Light, Speech or Voice recognition Systems, Telepresence and related technologies. Range detectors, assembly aid devices,force and torque sensors, machine vision, ranging, laser, acoustic, magnetic, fiberopticand tactile sensors.

UNIT IV: Vision Sensors InRobtics **[6Hrs]**

Robot Control through Vision sensors, Robot vision locating position, Robot guidance with vision system, End effector camera Sensor

UNIT V: Multisensor Controlled Robot Assembly **[7Hrs]**

Control Computer, Vision Sensor modules, Software Structure, Vision Sensor software, Robot programming, Handling, Gripper and Gripping methods, accuracy .

UNIT VI: Case Study **[6Hrs]**

Case Studies: Multiple robots, machine interface, robots in manufacturing and non- manufacturing applications, robot cell design, selection of robot.

Text Books:

1.Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", McGraw-Hill, Singapore, 1996.
2.Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998.
3.Paul W Chapman, "Smart Sensors", an Independent Learning Module Series, 1996

4.Richard D. Klafer, Thomas a. Chmielewski; Michael Negin, "Robotic Engineering -An integrated approach", Prentice Hall of India Private Limited, 1989

Reference Books:

1.K.S. Fu, R.C. Gonzalez, C.S.G. Lee, "Robotics -Control Sensing, Vision and Intelligence", McGraw Hill InternationalEditions, 1987
2.Mikell P. Groover, Mitchell Weiss, Roger N Nagel, Nicholas G. Odrey, "Industrial Robotics - Technology, Programming and Applications", McGraw Hill, International Editions, 1986
3.SabricSoloman, "Sensors and Control Systems in Manufacturing", McGraw Hill, International Editions, 1994
4.Julian W Gardner, Micro Sensor MEMS and Smart Devices, John Wiley & Sons, 2001
5.Bijay K. Ghosh, Ning Xi, T.J. Tarn, Control in Robtics and Automation Sensor -Based integration, Academic Press, 1999
6.K.S. Fu, R.C. Gonzalez, C.S.G. Lee, Robotics Control, Sensing Vision and Intelligence, McGraw Hill Book Company, 1987

IT6TE03C	Human Computing Interface	3 Credit

COURSE OBJECTIVES

The student should be made to:

1. Learn the foundations of Human Computer Interaction
2. Be familiar with the design technologies for individuals and persons with disabilities
3. Gain an understanding and articulate the fundamental design concepts and practices associated with the design of human-computer interactions.
4. Analyze human factors such as cognition, affect and behaviour as they relate to the human-computer interaction and apply them in the development of human-computer interactions.
5. Evaluate the impact of new and emerging technology trends on human computer interactions and the user experience.
6. Synthesize sound (solid) design principles and aesthetics as they apply to the design of innovative interfaces.

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

CO1. Design effective dialog for HCI.
CO2.Design effective HCI for individuals and persons with disabilities.
CO3.Assess the importance of user feedback.
CO4 Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO5 Develop meaningful user interface.

Unit 1: FOUNDATIONS OF HCI **[6 Hrs]**

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks.

Unit 2 :INTERACTIVE SYSTEM DESIGN **[6 Hrs]**

Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering .

Unit 3 : MODELS AND THEORIES **[6 Hrs]**

Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.

Unit 4: MODEL BASED DESIGN AND EVALUATION **[6 Hrs]**

Basic idea, introduction to different types of models, GOMS family of models (KLM and CMN-GOMS), Fitts' law and HickHyman's law.

Unit 5: GUIDELINES IN HCI [6 Hrs]

Shneiderman's eight golden rules, Norman's seven principles, Norman's model of interaction, Nielsen's ten heuristics with example of its use, Heuristic evaluation, Cognitive walkthrough.

Unit 6: TASK MODELING AND ANALYSIS [6 Hrs]

Hierarchical task analysis (HTA), Engineering task models and Concur Task Tree (CTT), Introduction to formalism in dialog design, design using FSM (finite state machines), State charts and (classical) Petri Nets in dialog design.

TEXTBOOK:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT –IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009.(UNIT-V)

REFERENCE BOOK:

1. Preece J., Rogers Y.,Sharp H.,Baniyon D., Holland S. and Carey T. Human Computer Interaction,Addison-Wesley, 1994.
2. B.Shneiderman; Designing the User Interface,Addison Wesley 2000 (Indian Reprint).

IT6TE03D	Machine Learning with Big Data	3 Credits

COURSE OBJECTIVES:

1. Understand the Big Data Platform and its Use cases.
2. Apply analytics on Structured, Unstructured Data.
3. Acquire a sharp understanding of how big data can be applied to concrete environments/sectors.
4. Approach dissemination actions targeting different stakeholders.
5. The student will learn to use tools to develop systems using machine-learning algorithms in big data.
6. The student will learn about problems and industrial challenges through domain-based case studies.

COURSE OUTCOMES:

CO1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.
CO2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
CO3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.
CO4. Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
CO5. Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
CO6. Ability to integrate machine learning libraries and mathematical and statistical tools with modern technologies like hadoop and mapreduce.

Course Contents:

Unit 1 **[6 Hrs]**

Introduction: Types of Machine Learning , Machine Learning process, preliminaries, testing Machine Learning algorithms, turning data into probabilities, and Statistics for Machine Learning, Probability theory ,Probability Distributions ,Decision Theory.

Unit 2 **[6 Hrs]**

Supervised Learning: Linear Models for Regression , Classification, Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models , Decision Tree Learning , Bayesian Learning, Naïve Bayes , Ensemble Methods, Bagging, Boosting, Neural Networks , Multilayer Perception, Feed-forward Network, Error Back propagation ,Support Vector Machines.

Unit 3 **[6 Hrs]**

Unsupervised Learning: Clustering-K-means , EM Algorithm, Mixtures of Gaussians , Dimensionality Reduction, Linear Discriminant Analysis, Factor Analysis, Principal Components Analysis, Independent Components Analysis.

Unit 4 **[6 Hrs]**

Discriminative Models: Least Square Regression, Gradient Descent Algorithm, Univariate and Multivariate Linear Regression, Prediction Model, probabilistic interpretation, Regularization, Logistic regression, multi class classification, Support Vector Machines- Large margin classifiers, Nonlinear SVM, kernel functions, SMO algorithm.

Unit 5 **[6 Hrs]**

Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Data Analytics Lifecycle, data analytics problems. Understanding features of R language, Understanding different Hadoop modes, Understanding Hadoop features, The HDFS and MapReduce architecture.

Unit 6 **[6 Hrs]**

Understanding the basics of MapReduce, The HadoopMapReduce, The HadoopMapReduce fundamentals, writing a HadoopMapReduce example, learning the different ways to write MapReduce in R. Integrating R and Hadoop – the RHIPE architecture and RHadoop.

Text Books:

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2016.
2. EthemAlpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.
3. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
4. Big Data Analytics with R and Hadoop, VigneshPrajapati, PACKT Publishing, 2013.
5. Fundamentals of Business Analytics, R N Prasad and S Acharya, Wiley India, 2011

Reference Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2007.
2. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", Chapman andHall, CRC Press, Second Edition, 2014.
3. Randal S, "Python Machine Learning, PACKT Publishing, 2016

ITOEC2	Advance Java Programming	4 Credit

COURSE OBJECTIVES:

1	To learn the Advanced concepts in J2SE
2	To understand Web Application Development, Database Connectivity and its Implementation using Servlets, JSP and JDBC
3	To introduce advanced Java frameworks for improving the web application design.

COURSE OUTCOMES:

CO1. Student shall be able to Understand and implement advanced Java concepts.

CO2. Student shall be able to Develop Java based Web applications using Servlets and JSP

CO3.Student shall be able to Incorporate cutting-edge frameworks in web application development.

Course Contents:

Unit 1:Introduction to Java Programming : [7 Hrs.]

Overview of Java, Fundamental Programming Structures, Strings – Objects Classes and Methods - Inheritance - Packages and Interfaces - Exception handling, Collections - Multithreading – Java I/O Streams, File Handling.

Exploring Core Java : Applets , Java GUI Programming and Event Handling, RMI, Java Auto boxing and Annotations.

Unit 2: Java Networking [6 Hrs.]

Network Basics and Socket overview, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, Server Socket, Inet Address, URL, URL Connection.

Introducing Java EE, Enterprise Java, Basic Application Structure, Using Web Containers, Creating Servlets, Configuring Servlets, Understanding HTTP methods, Using Parameters and Accepting Form Submissions, Using Init parameters, File Uploading.

Unit 3: JDBC Programming : [6 Hrs.]

The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQL Exception Class, The SQL Warning Class, The Statement Interface, Prepared Statement, Callable Statement The Result Set Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, Result Set Meta Data, Executing SQL Updates, Transaction Management.

Unit 4 :Servlet API and Overview : **[7 Hrs.]**

Servlet Model, Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor Servlet Context and Servlet Config interface, Attributes in Servelt, Request Dispacher interface The Filter API: Filter, Filter Chain, Filter Config Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting.

Unit 5 :Java Server Faces2.0 **[8 Hrs.]**

Introduction to JSF, JSF request processing Life cycle, JSF Expression Language, JSF Standard Component, JSFFacelets Tag, JSF Convertor Tag, JSF Validation Tag, JSF Event Handling and Database Access, JSF Libraries: Prime Faces.

EJB: Enterprise bean architecture, Benefits of enterprise bean, types of beans, Accessing beans, packaging beans.

Unit 6 :Hibernate 4.0 **[7 Hrs.]**

Overview of Hibernate, Hibernate Architecture, Hibernate Mapping Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language.

Java Web Frameworks: Spring MVC, Overview of Spring, Spring Architecture, bean life cycle, XML Configuration on Spring, Aspect – oriented Spring, Managing Database, Managing Transaction.

Textbook:

1. Herbert Schildt, The Complete Reference-Java, Tata Mcgraw-Hill Edition, Eighth Edition, 2014.
2. Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.
3. Complete Reference J2EE by James Keogh mcgraw publication.

Reference Books:

1. Black Book “ Java server programming” J2EE, 1st ed., Dream Tech Publishers, 2008. 3. Kathy walrath .
2. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell Pearson Publication.
3. Spring in Action 3rd edition , Craig walls, Manning Publication.
4. Hibernate 2nd edition, Jeff Linwood and Dave Minter, Beginning Après publication.

ITOEC2	LINUX	4 Credit

COURSE OUTCOMES:-

CO1. Understand Linux Architecture, different Linux installation and Linux commands.

CO2. Effectively use Linux Environment using shell, file system, scripts, filters and program development tools

CO3. Perform file I/O management through commands and perform package management, storage management and failure recovery.

CO5. Automate tasks and write simple programs using scripts

CO6. Configure important services like FTP, DNS, MAIL and WEB.

Course Contents:

Unit I **[6 Hrs]**

History of Linux OS, Architecture of Linux OS, Linux Distributions, Installation of Linux OS

Unit II **[7 Hrs]**

Introduction to terminal, Basic commands, File system, File handling commands, process and process management commands, VI editor.

Unit III **[6 Hrs]**

Users and Group management- Creation, Updating, Deletion of user and group, Commands – passwd, Shadow, useradd, usermod, userdel, groupadd, groupmod, groupdel.

Unit IV **[6 Hrs]**

Package Management - Introduction to package manager, function of package manager, Package management commands – rpm, yum.

Unit V **[6 Hrs]**

Storage management- Types of storages, creating partitions using fdisk command, Logical volume management (LVM), Creating file system, mounting file system.

Unit VI **[6 Hrs]**

Shell and Shell script.

Text Book

1. Unix and Shell Programming – B. M. Harwani, OXFORD University Press.

Reference Books

1. Linux Administration : A Beginner's Guide – Wale Soyinka , McGraw Hill Publication

2. Unix Concepts and Applications – Sumitabha Das, McGraw Hill Publication

ITOEC2	Web Development And Design	4 Credit

COURSE OBJECTIVES:

1. Students will understand and illustrate HTML.
2. Students will be able to understand about Different CSS Properties.
3. Student will study Bootstrap
4. Student will study Typography

COURSE OUTCOMES:

CO1. Students will get to know about JAVAScript Implementation.

CO2. Students will be able to understand About Cascading Style Sheets (CSS).

CO3. Students will understand CSS Properties.

CO4. Students will be able to understand what AngularJS is.

CO5. Students will be able to understand what id Server side javascript

CO6. Students will be able to Understand what animation is.

Course Contents:

Unit 1 **[5 Hrs]**

HTML Elements, HTML Attributes, CSS concepts and Applications

Unit 2 **]6 Hrs]**

CSS properties - Part 1: Animation, Background, Box Model, Border radius, Unit, Flexible box, CSS Properties - part 2: Fonts, TRansform, Positioning, Text, Tables, Words and paragraphs, Paging.

Unit 3 **[6 Hrs]**

CSS Properties Part 3: Page box, List, Counter, Drop shadows, Display and visibility, Masking and cliping, image rendering and Ordering, User Interface, 3-Dimensional. CSS Functions

Unit 4 **[7 Hrs]**

JAVAScript Implementation, SyntaxBasics and Variable Types: History of a java script, java script Implementation, The language syntax, The character set, Data Types, Variable Scope and memory, classes and Modules, Objects, classes, Statements, Arrays. Server-side javaScript - NodeJS, Introduction to Bootstrap, Introduction to json, jQuery

Unit 5 **[5 Hrs]**

Introduction to AngularJS: Modules, Directives, Expressions, Controllers, Scope.

Unit 6 **[7Hrs]**

Cascading Style Sheets (CSS): Properties Table:Using the style Attribute, Creating Classes and IDs, Generating External Style Sheets, Typography, Consistency, Types of styles, Specifying class within HTML document, Style placement: Inline style, Span & div tags, header styles, Text and font attributes: Font Vs CSS, changing fonts, text attributes, Advance CSS properties: Backgrounds, Box properties and Positioning.

Reference Books:

1. Joshua Johanan, Talha Khan, Ricardo Zea. “Web Developer's Reference Guide”.
2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin "Mastering HTML, CSS &Javascript Web Publishing" 2016
3. Jain Satish "Web Designing and Development Training Guide" 2015
4. Randy Connolly and Ricardo Hoar "Fundamentals Of Web Development" 2016

Reference Website:

5. Reference Website: W3 School web Developemt: https://www.w3schools.com/whatis/whatis_icons.asp

ITOEC2	Machine Learning	4 Credit

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:

CO1. To demonstrate knowledge of the machine learning literature.

CO2. To describe how and why machine learning methods work.

CO3. To demonstrate results of parameter selection.

CO4. To explain relative strengths and weaknesses of different machine learning methods.

CO5. To select and apply appropriate machine learning methods to a selected problem.

CO6. To implement machine learning algorithms on real datasets.

Course Contents:

Unit 1 **[6 Hrs]**

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 2 **[6 Hrs]**

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 3 **[6 Hrs]**

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 4 **[6 Hrs]**

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, Ensemble Learning: Bagging, boosting, and DECORATE. Active learning with ensembles.

Unit 5 **[6 Hrs]**

Unsupervised Learning: Clustering:Learning from unclassified data, Hierarchical Aglomerative Clustering, k-means partitional clustering, Batchler and Wilkin's algorithm.

Unit 6 **[6 Hrs]**

Reinforcement Learning: The learning task, Q learning, Non-deterministic rewards and action, Temporal difference learning, Generalizing from examples.VisualizationTechniques:Represeantation of data in graph and chart,Predictive analysis, UnivarietPlots,Multivariate Plots.

Text Books:

3. Mitchell, Tom. M., "Machine Learning", McGraw-Hill Education, 1st Edition, May 2013.
4. 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.

ITOEC2	Android App Development	4 Credit

Course Objectives:

Learn and obtain hands-on experience in developing basic and advanced Android apps. The course begins with an overview of required Java programming knowledge. Then we will move on to the world of Android development and create various apps that utilize different capabilities of a modern Android phone, including the usage of vibration, sounds playback and recording, the camera, animations, location, basic 3D graphics, file system, Network operations (UDP/TCP) and more. During the course we will work with the most advanced IDEs including Eclipse and IntelliJIDEA (Android Studio).

Course Outcomes:

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

CO1. Identify various concepts of mobile programming that make it unique from programming for other platforms,
CO2. Critique mobile applications on their design pros and cons,
CO3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
CO4. Program mobile applications for the Android operating system that use basic and advanced phone features, and
CO5. Deploy applications to the Android marketplace for distribution.

Unit 1 **[6 Hrs]**

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, AndroidManifest file.

Unit 2 **[6 Hrs]**

Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using IntentFilter, Permissions.

Unit 3 **[6 Hrs]**

Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.

Unit 4 **[6Hrs]**

Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

Unit 5 **[7 Hrs]**

Using Common Android APIs: Using Android Data and Storage APIs, Managing data using Sqlite,Sharing Data between Applications with Content Providers, Using Android Networking

APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Unit 6 **[6 Hrs]**

Using more Android capabilitie, intelliJIDEA / Android Studio, Permission Working with files, Working with the network, Debugging Android apps

Text Books:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)

Reference Books:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India PvtLtd
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Lt
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

ITOEC2	Ethical Hacking	4 Credit

COURSE OBJECTIVES:

1. To understand and analysis Information security threats & counter measures
2. To perform security auditing & testing
3. To understand issues relating to ethical hacking
4. To study & employ network defense measures To understand penetration and security testing issues

COURSE OUTCOMES:

CO1. To understand vulnerabilities, mechanisms to identify vulnerabilities/ threats / attacks

CO2. To perform penetration & security testing.

CO3 To become a professional ethical hacker

Course Contents:

Unit 1 ETHICAL HACKING OVERVIEW & VULNERABILITIES [6Hrs]

Understanding the importance of security, Concept of ethical hacking and essential TerminologiesThreat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.

Unit 2 FOOTPRINTING & PORT SCANNING [6Hrs]

Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS

Unit 3 SYSTEM HACKING [6Hrs]

Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

Unit 4 HACKING WEB SERVICES & SESSION HIJACKING [6Hrs]

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools

Unit 5 HACKING WIRELESS NETWORKS [6 Hrs]

Introduction to 802.11,Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.

Unit 6

Text Books:

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010

2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010

3. RajatKhare, "Network Seuciryt and Ethical Hacking", Luniver Press, 2006

4. Ramachandran V, BackTrack 5 Wireless Penetration Testing Beginner’s Guide (3rd ed.). Packt Publishing, 2011

5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003

ITOEC2	Data Science	4 Credit

COURSE OBJECTIVES:

1. To learn data collection and preprocessing of techniques for data science
2. To understand and practice analytical methods for solving real life problems.
3. To learn statistical methods and machine learning algorithm required for data science.
4. To study different data visualization techniques and tools.
5. To learn algorithms for analysing and mining the structure of network graphs.

COURSE OUTCOMES:

Students will able to :

CO1. Apply data preprocessing methods on open access data and generate quality data for analysis.

CO2.Apply and analyze classification and regression data analytical methods for real life problems.

CO3.Apply different visualization techniques to understand the data.

CO4.Apply standard clustering methods to analyze social network graph

Course Contents :

UNIT I :- Introduction to Data Science [6 Hours]

Defining data science and big data, Importance of data science, current scenario, industry perspective types of data: structured vs unstructured data, quantitative vs categorical data, data science process : Overview, different steps, Machine learning definition and relation with data science. Role of data scientist.

UNIT II :- Statistics and probability basics for data analysis [8 Hours]

Statistics: Population and sample, data preparation, exploratory data analysis- summarizing data, data distribution, continuous distribution, Kernel density, Estimation: Sample and estimated Mean, Variance and standard Scores, Covariance, Pearson's and Spearman's Rank Correlation. Dependence and independence, Bayes's Theorem , Random variable, Normal distribution, Probability, Permutations and Combinations, conditional probability, Random Variables, Probability Distributions, Binomial, Poisson, and Hyper geometric Distributions, Distributions of Several Random Variables.

UNIT III :- Machine learning algorithm [6 Hours]

Machine learning algorithm: Linear regression , K- nearest Neighbours (k-NN), Clustering : K-mean – determining number of cluster, Association rules: Apriori algorithm. Spam filters, Naïve Bayes and Wrangling, Scraping the Web: API's and other tools.

UNIT IV :- Advanced data analysis [7 Hours]

Decision Trees: What Is a Decision Tree? Entropy, The Entropy of a Partition, Creating a Decision Tree, Random ForestsNeuralNetworks :Perceptrons, Feed-Forward Neural Networks, Back-propagation, Example: Defeating a CAPTCHAMapReduce : Why MapReduce? Examples like word count and matrix multiplication

UNIT V :- Basics of data visualization [7 Hours]

Introduction to data visualization, challenges of data visualization, Definition of Dashboard, Their type, Evolution of dashboard, dashboard design and principles, display media for dashboard.

Types of Data visualization: Basic charts scatter plots, Histogram, advanced visualization Techniques like streamline and statistical measures, Plots, Graphs, Networks, Hierarchies, Reports.

UNIT VI :- Data visualization of multidimensional data [6 Hours]

Need of data modeling, Multidimensional data models, Mapping of high dimensional data into suitable visualization method- Principal component analysis, clustering study of High dimensional data.

TEXT BOOKS :

1. Jiawei Han, MichelineKamber, Jian Pei, "Data Mining: Concepts and Techniques" , 3rd Edition.
2. Joel Grus, " Data Science from Scratch", O'Reilly Media Inc.,
3. Colin ware, " Information visualization perception for design" , MK publication.
4. Cathy O'Neil and Rachel Schutt. Doing Data Science, Straight Talk From The Frontline. O'Reilly.
5. Jure Leskovek, AnandRajaraman and Jeffrey Ullman. Mining of Massive Datasets. v2.1,Cambridge University Press.

REFERENCE BOOK:

1. Big data black book, Dream tech publication

2. David RoiHardoon, GalitShmuel, “Getting Started with Business Analytics: Insightful Decision-Making”, CRC Press

3. James R Evans, “ Business Analytics” , Pearson

4. Jake VanderPlas, “ Python Data science Handbook”,Orielly publication

5. Vovost Foster, Fawcett Tom, “Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking

5. Laura Igual and SantiSegui, Introduction to Data Science: A Python Approach to Concepts, Techniques and Applications,Springer; 1st ed. 2017 edition

ITOEC2	Application of Artificial Intelligence in Finance	Credit 3

COURSE OBJECTIVES:

1. To understand basics of artificial Intelligence in finance
2. To understand different methods used for prediction of credir spreads
3. To understand use of AI in Credit Decisions, Risk Management and Fraud Prevention
4. To understand various benefits of applying AI in Finance

COURSE OUTCOMES:

CO1: Understand Fundamentals of Supervised Learning in Finance.

CO2: Identify major research challenges and technical gaps existing between theory and practice in

Finance domain.

CO3: It provides conceptual understanding of the function of Normative Finance uncertinity and risk

CO4: Apply the Market prediction techniques

Unit I: Fundamentals of Supervised Learning in Finance: [6 Hrs]

Introduction to Fundamentals of Machine Learning in Finance, Support Vector Machines ,Example: SVM for Prediction of Credit Spreads ,Tree Methods: CART Trees, Random Forest, Boosting

Unit II: Artificial Intelligence Examples in Finance: [6 Hrs]

AI Today: Where it Works and What For?,AI and Credit Decisions, AI and Risk Management,AI and Fraud Prevention,AI and Personalized Banking

Unit III: Finance and Machine Learning : [6 Hrs]

Normative Finance: Uncertainty and Risk ,Definitions, Expected Utility Theory, Mean-Variance Portfolio Theory,Capital Asset Pricing Model,Arbitrage Pricing Theory

Unit IV: Data Driven Finance : [6 Hrs]

Financial Econometrics and Regression,DataAvailability,ProgrammaticAPIs,Structured Historical Data

Structured Streaming Data,Unstructured Historical Data ,Unstructured Streaming Data, Alternative Data

Unit V: AI and Market Prediction **[6 Hrs]**

Efficient Markets,Market Prediction Based on Returns Data,Market Prediction with More Features,Market Prediction Intraday

Unit VI: Applications of AI in Financial Services: **[6 Hrs]**

AI in Personal Finance,ConsumerFinance,CorporateFinance,Benefits of implementing AI in finance,Future of AI in Financial Services

Text Books

1. Artificial Intelligence in Financeby Yves Hilpisch, October 2020 , O'Reilly Media, Inc.
2. Machine Learning for FinancePrinciples and Practice for Financial InsidersByJannesKlaas · 2019
3. A. Smola and B. Scholkopf, "A Tutorial on Support Vector Regression", Statistics and Computing, vol. 14, pp. 199-229, 2004
4. K. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2009,

Reference Books

1. Artificial Intelligence in Finance and Investing: Theory and Application in Portfolio Managementby Robert R. Trippi , Jae K. Lee ,Irwin Professional Publishing.

IT6L003	AD-HOC WIRELESS NETWORKS LAB	Credit 1

1. To be able to understand importance of ad-hoc network, NS3 and assembly programming languages.

2. To be able to understand about importance of various Interfaces.

List of Experiments:

1. Program in NS 3 to connect WIFI TO BUS(CSMA)

2. Program in NS 3 to create WIFI SIMPLE INFRASTUCTURE MODE 3. Program in NS

3 To create WIFI SIMPLE ADHOC MODE

4. Program in NS 3 to connect WIFI TO WIRED BRIDGING

5. Program in NS 3 to create WIFI TO LTE(4G) CONNECTION

6. Create a simple dumbbell topology, two client Node1 and Node2 on the left side of the dumbbell and server nodes Node3 and Node4 on the right side of the dumbbell. Let Node5 and Node6 form the bridge of the dumbbell. Use point to point links.

7. Program in NS3 for CREATING A SIMPLE WIFI ADHOC GRID

8. Create a wireless mobile ad-hoc network with three nodes Node1, Node2 and Node3. Install the OLSR routing protocol on these nodes

9. Setup a 5x5 wireless adhoc network with a grid. You may use examples/wireless/wifi-simple-adhoc-grid.cc as a base

10. Setup a 2-nodes wireless adhoc network. Place the nodes at a fixed distance in a 3d scenario

IT6L004	Machine Learning Lab	Credit 1

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.

List of Experiments:

1. Implement and demonstratethe FIND-Salgorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples. 3. Write a program to demonstrate the working of the decision tree based ID

3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample.

4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

IT6L005	Multimedia (Lab)	Credit 1

COURSE OBJECTIVES:

1. Students will Gain an understanding of how to use Multimedia Software's.
2. Students will Understandhow to create an Animation.
3. Students will study Animation Techniques.
4. Students will Study Animation Software.

COURSE OUTCOMES:

1. Students will be able to understand how to create their own Animations by using different Multimedia software.
2. Students will understand Flash8 software.
3. Students will understand background given techniques while creating Animation.
4. Students will understand how to simulate movement.

List of Practicals:

1. Create an Animation to Represent the Growing Moon.

2. Create an Animation to Indicate a Ball Bouncing on Steps.

3. Create an Animation to Simulate Movement of a Cloud.

4. Create Procedure to Draw the Fan Blades and to Give Proper Animation.

5. Create an Animation to Display the Background Given(Filename: Tulip.jpg) Through Your Name.

6. Create an Animation to Simulate a Ball Hitting Another Ball.

7. Create an Animation to Create an Animated Cursor UsingStartdrag("Ss", True); Mouse.hide();

8. Design a Visiting Card Containing At Least One Graphic and Text Information.

9. Take a Photographic Image. Give a Title for the Image. Put the Border. Write Your Names. Write the Name of Institution and Place.

10. Prepare Cover Page for The book in Your Subject Area. Plan Your Own Design.

11.Software: Flash8, adobe Photoshop 7.0

IT6P006	Mini Project	Credit 1

Evaluation Criteria: The total term work shall be of 50 marks. The 30 marks shall be distributed over internal assessments / reviews (at least 02 reviews) during the semester by a review committee. The remaining 5 marks shall be distributed for attendance. The Head of the Department shall constitute the review committee. The student shall make presentation on the progress made before the committee. The 20marks of the practical will be awarded based on
the performance in the practical exam conducted by the University at the end of the semester.
General Suggestions and Expectations / Guidelines

• The project shall be developed in C++/JAVA/PYTHON

• The students may choose the theory concepts they studied in different subjects as project topic.

• Interdisciplinary project proposals and innovative projects are encouraged and more appreciable.

• The project topic can be suggested by the staff member or it can be proposed by the students.

• The project topic shall be approved by the project in-charge.

• The Guides are advised to give projects and suggest project titles focusing more on the current field ofresearch and ensure the level of innovation.

• A project team shall contain a maximum of 2 members.

• The project work should be properly distributed among the team members.

• Students should submit the project documentation at the beginning of the semester consisting of: Title, AbstractModules Split-upDeliverables for each reviewData Model (If Any)Details of Team Members

• Reviews for the project work will be conducted at regular intervals by the panel of examiners formed by theHead of the Department.

• The student failing to attend the project review will be subject to strict action as decided by the Head of theDepartment.

• Throughout the semester at any point of time if students are found to be involved in any of the following:

Using project codes available on the Internet

Using project codes developed by someone elseUsing project work which is already submitted in other institute or university Such students shall bedeclared failed or penalized as decided by the Examiners.

• The students must arrange regular meetings with the guide and present progress of project work.

• A Spiral bound Project report to be prepared as per the guidelines and format given by the Department

- The guides are advised to check for the formatting of the presentation and project report.
- Students must submit a report well before the end of the semester.

IT6T007	Intellectual Property Right (IPR)	1 Credit

Course Objectives :

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and abroad and registration aspects
3. To disseminate knowledge on copyrights and its related rights and registration aspects
4. To aware about current trends in IPR and Govt. steps in fostering IPR

Course Outcome :

CO 1: To provide an understanding of the law relating to Intellectual Property and Competition in India.

CO2: To understand the concept of Intellectual Property and Intellectual Property Rights with special reference to India.

CO3:To appreciate the significance of Intellectual Property in modern times, in the light of its international legal regime.

CO4:To study the important Agreements, Treaties and Conventions relating to Intellectual Property Rights.

CO5:To understand the intricacies of grant of Patent, Patentability, Licensing and Revocation at National and International levels.

Course Contents :

UNIT1: Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad Function of IPR. Public good, Incentive theory, different forms of IPR , Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT 2: Practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad .Introduction to competition Law, Anti-competitive agreements, Abuse of dominance, Regulation of combinations,

UNIT3: International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT 4:The relationship and Interaction between IPR and competition law The economics of US Anti trustlaw,IP and competition issues,Technology transfer agreements. The EU experience with IP and Competition Law

UNIT5:Market allocation, Horizontal agreements, Vertical agreements, licensing issues.Indian Competition Act and IPR protection. Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

Text Books :

1. Fundamentals ofIP for Engineers: K.Bansl&P.Bansal

2. Intellectual property right, Deborah, E. BoDcboux, Cengageleam'ng.

3. Inrelletul property right - Unleasbing the knowledgeconomy, PmbuddhaGanguli, Tata MccrawHiU Publishing Company Ltd.

Refrence Books:

1. Eleclronic resource guide ERc published online by the American Society of Intellectual Propery Rights md Develolment Policy: Repod of rhe

2. Commission on InrellectualPrcpertyRidls, London Sepiedber 2002