

**Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur**

**Faculty of Engineering & Technology**

**CIVIL ENGINEERING**

**Scheme of Examination & Evaluation - CBS**

**Semester: Seventh**

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

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

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

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		Theory hrs/week	Tutorial hrs/week	Practical hrs/week	Total hrs/week	Credits	Assessment of Marks for Theory				Assessment of Marks for Practical				
							College Assessment (CA)	University Exam	Total Marks	Min. Marks	Internal	External	Total Marks	Min. Marks	
BECVE801T	Irrigation Engineering	3	2		5	5	20	80	100	40					3
BECVE802T	Elective - II	3	1		4	4	20	80	100	40					3
BECVE803T	Elective - III	4			4	4	20	80	100	40					3
BECVE803P	Elective - III			2	2	1					25	25	50	25	
BECVE804T	Construction Economics and Finance	3	1		4	4	20	80	100	40					3
BECVE805P	Project			6	6	6					75	75	150	75	
<b>Total</b>		<b>13</b>	<b>4</b>	<b>8</b>	<b>25</b>	<b>24</b>	<b>80</b>	<b>320</b>	<b>400</b>		<b>100</b>	<b>100</b>	<b>200</b>		

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

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

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

**VII Semester**

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

**VIII Semester**

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

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

**SEVENTH SEMESTER B.E. CIVIL**

## ADVANCED CONCRETE STRUCTURES

**BECVE701T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 4 hrs**

**COURSE OUTCOME:** The Students will be able to

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

### **Unit – I**

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

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

### **Unit – II**

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

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

### **Unit – III**

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

### **Unit – IV (with LSM)**

Design of RCC Cantilever and Counter-fort Retaining wall.

### **Unit - V**

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

**Unit – VI :** Design of combined footing.

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

## ADVANCED CONCRETE STRUCTURE

**BECVE701P**  
**Hrs/Week); Total Credits-1**

**Evaluation Scheme: (25-Internal/25-External) (P-2)**

### PRACTICAL

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

## ESTIMATING AND COSTING

**BECVE702T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 4 hrs**

### **COURSE OUTCOMES: The Students will be able to**

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

### **Unit I**

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

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

## **Unit II**

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

## **Unit III**

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

## **Unit IV**

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

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

## **Unit V**

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

## **Unit VI**

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

## **REFERENCE BOOKS**

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

## **ESTIMATING AND COSTING**

**BECVE702P**

**Evaluation Scheme: (50-Internal/50-External)**

**(P-2 Hrs/Week); Total Credits-1**

PRACTICAL – Minimum 8 practical assignment based on

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

## **EARTHQUAKE RESISTANT DESIGN OF STRUCTURE (ELECTIVE-I)**

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The Students will be able to**

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

### **Unit I :**

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

### **Unit II :**

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

### **Unit III :**

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

### **Unit IV :**

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

### **Unit V :**

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

### **Unit VI :**

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

**REFERENCE BOOKS:**

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

**ADVANCED TRAFFIC ENGINEERING (ELECTIVE-I)**

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES: The Students will be able to**

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

**Unit – I**

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

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

## **Unit – II**

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

## **Unit – III**

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

## **Unit – IV**

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

## **Unit – V**

### **Traffic Safety, Enforcement and Education :**

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

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

## **Unit – VI**

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

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

**Students should complete the assignment based on**

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

**Reference Book:**

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

**AIR POLLUTION AND SOLID WASTE MANAGEMENT (ELECTIVE-I)**

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-**The students will be able to

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

**Unit - I**

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

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

**Unit - II**

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

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

### **Unit – III pollution control**

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

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

Noise Pollution : Sources, ill effects, control measures.

### **Unit - IV**

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

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

### **Unit – V : Collection and Transportation methods:**

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

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

### **Unit – VI : Disposal methods:**

Composting of waste, methods of composting, factors affecting composting

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

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

Diagrams

### **REFERENCE BOOKS**

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

## ADVANCED HYDRAULICS (ELECTIVE-I)

**BECVE703T**

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

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

**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The students shall be able to**

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

### **Unit-I : GENERAL:**

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

Theory of gradually varied flow, dynamics equations for GVF in various forms, Analysis of gradually varied flow profiles.

### **Unit-II : GVF (GRADUALLY VARIED FLOW):**

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

### **Unit- III : HYDRAULIC JUMP:**

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

### **Unit- IV : UNSTEADY FLOW IN PIPE :**

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

### **Unit-V : WATER HAMMER :**

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

### **REFERENCE BOOKS**

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

**SUSTAINABLE RESOURCE MANAGEMENT IN CIVIL ENGINEERING  
(ELECTIVE-I)**

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES : The students shall be able to**

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

**Unit – I**

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

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

**Unit – II**

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

**Unit – III**

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

**Unit – IV**

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

**Unit – V**

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

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

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

### **Reference :**

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

## **BUILDING SERVICES (ELECTIVE I)**

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES:-**

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

### **Unit-I:**

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

### **Unit-II:**

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

### **Unit-III**

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

#### **Unit-IV:**

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

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

#### **Unit-V**

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

#### **Unit-VI:**

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

#### **Assignment:**

Case Study of any Building & its services

#### **Reference Books:**

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

## ADVANCED CONSTRUCTION MATERIALS (ELECTIVE I)

**BECVE703T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES:- The students shall be able to**

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

### **UNIT I: CEMENT, MORTAR AND CONCRETE CERAMIC MATERIALS**

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

### **UNIT II: METALS**

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

### **UNIT III: COMPOSITES**

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

### **UNIT IV: CONSTRUCTION CHEMICALS AND WASTE**

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

### **UNIT V: SHORING & FORMWORK MATERIALS**

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

## **UNIT VI: ELEMENTARY CONCEPT OF SMART MATERIAL**

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

## CONSTRUCTION MANAGEMENT & LAW

**BECVE704T**  
**(L-4, T-0, P-0) Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **OUTCOMES :**

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

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

### **UNIT - I :**

#### **BASIC STUDIES IN CONSTRUCTION PROJECT**

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

### **UNIT- II :**

#### **CONSTRUCTION SCHEDULING**

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

### **UNIT III - :**

#### **MANPOWER, MATERIAL AND MACHINERY (3M) MANAGEMENT**

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

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

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

### **UNIT- IV:**

#### **QUALITY AND SAFETY MANAGEMENT**

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

**UNIT –V :**

**LEGAL ASPECTS IN CONSTRUCTION PROJECTS**

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

**UNIT –VI :**

**INTRODUCTION TO DIFFERENT LAWS**

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

Reference Books :

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

## TRANSPORTATION ENGINEERING-II

**BECVE705T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-**The students are able to

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

### **Unit – I : RAILWAYS**

Classification of Rail way lines and their track standards.

Traction and Tractive Resistance, Hauling capacity and Tractive effort of locomotives, Different Types of tractions

Permanent Way: (Ideal permanent way), gauges, track section. Coning of wheels, Stresses in railway track, High speed track.

### **Unit – II**

Rail types and functions, selection for rails, wear & defects, creeps of rails, long welded rails., sleepers -function, types, merits and demerits, sleeper density. Ballast cushion. Ballast section, Spikes, fishplates, hook bolts, Dog bolt, pondrot clip .

Geometric design of railway track, Gauge, Gradients speed, super elevation, cant deficiency, Negative super elevation, objectives of transition curves, grade compensations.

### **Unit - III**

Points & crossings: Left and right hand turnouts, design calculations for turnouts ,Station and Yards: Types, functions,

Railway signaling and interlocking: Objects of signaling, principles of signaling. Classification and types of signals. Necessity of interlocking methods and mechanical devices Railway track construction, inspection & modern techniques of maintenance. Modern technology related to track, signaling & controlling.

## **Unit – IV : AIRPORTS**

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

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

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

## **Unit – V**

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

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

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

## **Unit – VI (Tunnel Engineering and Docks and Harbors)**

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

### **Text Books and Reference Book:**

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

## **INDUSTRIAL CASE STUDY & PROJECT SEMINAR**

**BECVE706P**  
**/Week); Total Credits-3**

**Evaluation Scheme: (50-Internal/50-External) (P-3 Hrs**

### **Industrial Case Study**

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

### **Project & Seminar**

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

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

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

**EIGHTH SEM. B.E CIVIL**

## IRRIGATION ENGINEERING

**BECVE801T**

**(L-3 Hrs/Week, T-2 Hrs/Week); Total Credits - 5**

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

**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-**The students shall be able to

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

### **Unit – I**

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

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

### **Unit – II**

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

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

### **Unit – III**

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

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

### **Unit – IV**

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

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

### **Unit – V**

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

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

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

### **Unit – VI**

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

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

***Water Logging And Land Drainage*** : Causes, effects, preventive measures of water logging, types of drains, layout of tile drains system, flow of ground water to drains.

(Components of lift irrigation scheme)

### **RECOMMENDED BOOKS**

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

## ADVANCED STRUCTURAL ANALYSIS (ELECTIVE-II)

**BECVE802T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-** The students shall be able to

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

### **Unit – I**

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

### **Unit – II**

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

### **Unit – III**

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

### **Unit – IV**

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

## Unit – V

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

## Unit – VI

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

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

### RECOMMENDED BOOKS:

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

## PRE-STRESS CONCRETE (ELECTIVE-II)

**BECVE802T**

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

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

**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-** The students shall be able to

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

### Unit – I

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

### Unit - II

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

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

### **Unit - III**

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

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

### **Unit - IV**

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

### **Unit - V**

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

### **Unit - VI**

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

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

### **RECOMMENDED BOOKS:**

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

## PAVEMENT ANALYSIS AND DESIGN (ELECTIVE-II)

**BECVE802T**

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

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

**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-**The students shall be able to

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

### **UNIT - I**

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

### **UNIT - II**

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

### **UNIT - III**

- 5) Highway pavement design:

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

- 6) Airfield pavement design

#### **UNIT - IV**

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

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

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

#### **UNIT –V**

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

#### **UNIT VI**

9) Strengthening of pavements: design of flexible, composite and rigid overlays for flexible and rigid pavements, repairs, maintenance and rehabilitation of pavements.

10) Specification and cost estimate: Review of IRC/MOST/ICAO/IAAI specifications and standards for highway and airfield construction. Cost evaluation and comparative study.

11) case studies of highway and airfield pavement projects.

#### **Reference Book:**

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

## WATERSHED MANAGEMENT (ELECTIVE II)

**BECVE802T**  
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The students will/shall be able to**

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

### **Unit – I**

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

### **Unit – II**

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

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

### **Unit – III**

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

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

## **Unit IV**

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

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

## **Unit V**

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

## **Unit VI**

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

### **RECOMMENDED BOOKS**

1. J. V. S Murthy, Watershed Management, New Age International Publishers, 1998.
2. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers, 2003.
3. V.V. N. Murthy, Land and Water Management, Kalyani Publishers, 1994.
4. Ghanshyam Das, Hydrology & soil Conservation Engineering ,PHI Publication.

## ENVIRONMENTAL MANAGEMENT SYSTEM (ELECTIVE II)

**BECVE802T**  
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The students will be able to**

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

### **Unit – I : Environmental Management**

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

### **Unit – II : Environmental legislation**

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

### **Unit – III : Environmental impact Assessment :**

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

### **Unit – IV**

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

### **Unit – V : Risk Analysis**

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

## **Unit – VI**

### Energy Impact Analysis

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

### **Recommended Books:**

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

## **WATER TRANSMISSION AND DISTRIBUTION SYSTEM (ELECTIVE II)**

**BECVE802T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

**COURSE OUTCOMES:-** The students shall be able to

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

### **Unit-I**

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

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

### **Unit- II**

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

### **Unit-III**

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

### **Unit-IV**

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

## **Unit-V**

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

## **Unit-VI**

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

### **Reference Books:**

- 1 Jeppaon R.W.(1977), "Analysis of Flow in Pipe Networks" Ann Arbor Science. Ann Arbor Michigan, USA
- 2 Walski. T.M.(1984)," Analysis of flow in water distribution networks"
- 3 Technomic Publishing CO.Lancaster, Pennsylvania,USA
- 4 Analysis of water distribution networks by P.R. Bhave, R.Gupta.

## **GEOTECHNICAL INVESTIGATION & GROUND IMPROVEMENT TECHNIQUE (ELECTIVE II)**

**BECVE802T**  
**((L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The Students will be able to**

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

### **Unit I - Importance and objects of Geotechnical exploration:**

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

### **Unit II - Field investigation:**

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

### **Unit III - Introduction to ground improvement techniques:**

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

### **Unit IV - Reinforced soil and Geo-synthetics:**

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

## **Unit 5 : Ground Anchor and Soil Nailing**

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

## **Unit 6 : Diaphragm wall**

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

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

### **Reference Book:**

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

## ADVANCE ENGINEERING GEOLOGY (ELECTIVE- II)

**BECVE802T**  
(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The Students will be able to**

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

### **Rock Mechanics**

#### **Unit-I**

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

#### **Unit-II**

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

#### **Unit-III**

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

#### **Unit-IV**

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

#### **Unit-V**

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

#### **Unit-VI**

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

### **RECOMMENDED BOOKS**

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

## **WATER POWER ENGINEERING (ELECTIVE- II)**

**BECVE802T**  
**(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOME:-**

At the end of syllabus, students shall be able to

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

### **Unit 1:**

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

### **Unit 2:**

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

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

### **Unit 3:**

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

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

### **Unit 4:**

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

**Unit 5:**

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

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

**Unit 6:**

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

**Assignment:**

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

**Recommended books:**

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

**FORENSIC CIVIL ENGINEERING (ELECTIVE II)****BECVE802T****(L-3 Hrs/Week, T-1 Hrs/Week); Total Credits - 4****Evaluation Scheme: (80/20)****Exam Duration: 3 hrs****COURSE OUTCOMES: The students will be able to**

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

**Unit – 1**

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

## **Unit - 2**

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

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

## **Unit - 3**

Testing of failures: Various methods of testing of failed structures & instrumentation- Laser scanning, microscope, Radio graphic evaluation, Load Testing of shoring systems and repair technology.

Back analysis: Selection of theoretical model - methods of analysis, Instrumentation and Monitoring. Development of the most probable failure hypothesis - cross-check with original design.

## **Unit - 4**

Designing Against Failure: Quality control – Material selection, workmanship, design and detailing.

Performing reliability checks, Legal issues involving jurisprudence system, insurance, reducing potential liability, responsibility of engineers and contractors. Professional practice and ethics.

Reporting – Oral & Written

### **Assignment:**

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

### **Recommended Books:**

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

## **DISASTER RESPONSE AND MANAGEMENT TECHNIQUES (ELECTIVE II)**

**BECVE802T**

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

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

**Exam Duration: 3 hrs**

### **COURSE OUTCOMES:**

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

### **Unit - 1**

#### **Disasters:**

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

#### **Disaster Response Plan:**

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

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

### **Unit - 2**

#### **Risk & Cost Assessment:**

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

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

### **Unit - 3**

#### **Disaster Management:**

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

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

## **Unit - 4**

### **Post Disaster Management:**

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

### **Assignment:**

One Case Study on any one Disaster in India.

### **Recommended Books:**

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

## ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)

**BECVE803T**  
**(L-4 Hrs/Week) Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

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

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

### **Unit-I :**

#### **EXPANSIVE SOILS:**

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

### **Unit-II:**

#### **GRAIN MORPHOLOGY**

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

### **Unit-III:**

#### **DRAINAGE &DEWATERING :**

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

### **UNIT-IV**

#### **CONSOLIDATION:**

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

## **Unit –V : DYNAMIC SOIL PROPERTIES**

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

## **Unit-VI : LIQUEFACTION**

Introduction, phenomenon, evaluation, effects of Liquefaction.

### **Reference Book:**

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

## **ADVANCED GEOTECHNICAL ENGINEERING (ELECTIVE-III)**

**BECVE803P**

**Evaluation Scheme: (25-Internal/25-External) (P-2**

**Hrs/Week); Total Credits-2**

### **PRACTICALS:**

#### **A. Any three of the following laboratory practicals :**

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

#### **B. Any two design assignments:**

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

## ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)

**BECVE803T**  
**(L-4 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### UNIT I: INTRODUCTION TO CONCRETE

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

### UNIT II: SPECIAL CONCRETE AND CONCRETING TECHNIQUES

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

### UNIT III: DESIGN OF CONCRETE

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

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

### UNIT IV: BEHAVIOR AND STRENGTH OF CONCRETE

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

### UNIT V: DURABILITY OF CONCRETE

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

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

#### **UNIT VI: TESTING OF CONCRETE**

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

### **ADVANCED CONCRETE TECHNOLOGY (ELECTIVE – III)**

**BECVE 803P**

**(P - 2 Hrs/Week); Total Credits-2**

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

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

## ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

**BECVE803T**  
**(L-4 Hrs/Week); Total Credits-4**

**Evaluation Scheme: (80/20)**  
**Exam Duration: 3 hrs**

### **COURSE OUTCOMES: The students will be able to**

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

### **Unit – I**

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

### **Unit – II**

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

### **Unit – III**

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

### **Unit – IV**

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

### **RECOMMENDED BOOKS:**

- 1 Advanced Reinforced Concrete Design - Varghese P.C, Publisher Prentice Hall of India Edition 2001.
- 2 Advanced reinforced Concrete - N. Krishna Raju, Publisher CBS Publishers & Distributers Edition 2002.
- 3 Reliability Analysis & Design of Structures- Ranganathan R Publisher Tata McGrawHill Edition 1990.
- 4 Reinforced Design- Pillai ,S.U.,D. Menon, Publisher T M H Publication Edition (Second Edition)2003

## ADVANCED REINFORCED CEMENT CONCRETE DESIGN (ELECTIVE-III)

**BECVE803P**

**Evaluation Scheme: (25-Internal/25-External) (P-2)**

**Hrs/Week) Total Credits-2**

### **PRACTICALS : (Minimum 3 designs)**

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

## ADVANCED STEEL DESIGN (ELECTIVE-III)

**BECVE803T**

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

**(L-4 Hrs/Week); Total Credits-4**

**Exam Duration: 3 hrs**

### **COURSE OUTCOMES:-**

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

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

### **Unit – I**

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

### **Unit - II**

3. Bridges : Types of bridges foot bridge, road bridge, railway bridge.  
Rolled beam bridges, plate girder bridges, trussed bridge, through type, deck type bridges.  
Loading on foot ways, IRC loading, loading on railway bridges.  
Design of a foot bridge, design of components of railway and road bridges
4. Bearings : Types of bearings, bearing pads, design of rocker and roller bearings

### **Unit - III**

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

### **Unit - IV**

7. Composite construction. General concepts.  
Properties, Steel – concrete composite design of encased beams, columns, shear connectors.

### **ADVANCED STEEL DESIGN (ELECTIVE-III)**

**BECVE803P**

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

**(P-2 Hrs/Week) Total Credits-2**

#### **PRACTICLAS:**

Minimum 3 designs based on above syllabus

### **WATER AND WASTE WATER TREATMENT (ELECTIVE III)**

**BECVE803T**

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

**(L-4 Hrs/Week); Total Credits-4**

**Exam Duration: 3 hrs**

**COURSE OUTCOMES:** The students will be able to

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

#### **Unit – I - Introduction to WTP & Aeration:**

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

#### **Unit – II - Coagulation, Flocculation & Sedimentation**

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

### **Unit – III - Filtration, Disinfection & Minor methods**

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

### **Unit – IV - Characteristics & Disposal of Waste water**

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

### **Unit – V - Preliminary & Primary Treatment**

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

### **Unit – VI- Secondary Treatments**

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

### **REFERENCE BOOKS:**

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

## **WATER AND WASTE WATER TREATMENT (ELECTIVE III)**

**BECVE803P**

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

**(P-2 Hrs/Week); Total Credits-2**

### **PRACTICALS:**

A) Minimum 6 experiments

1. Determination of Sulphates
2. Determination of Chlorides.
3. Residual, Available Chlorine and Chlorine demand.
4. Determination of BOD
5. Determination of COD.
6. Jar test.
7. Determination of filter sand from available stack sand.
8. Balferiology test on water.

B) Design of individual unit of water and waste water treatment.

## **APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)**

**BECVE803T**

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

**(L-4 Hrs/Week); Total Credits-4**

**Exam Duration: 3 hrs**

**COURSE OUTCOMES :** - The students shall be able to

- Develop skills and knowledge regarding basic principles of GIS
- Apply knowledge of remote sensing and GIS in various fields of civil engineering
- Understand fundamental knowledge of principles of ariel photography and remote sensing.
- Remote Sensing and GIS for mapping and monitoring land cover and land use changes
- Remote Sensing and GIS approach in the monitoring and evaluation of rapid urban growth for sustainable development.
- 

### **UNIT-I: Basics of Remote Sensing:**

Introduction. history & development, Definition and Scope of Remote Sensing, Advantages and disadvantages of remote sensing techniques, Type of Remote Sensing, Basic principle of remote sensing, Electromagnetic energy and its wavelength, Wavelength regions and their applications in remote sensing, Interaction of EMR with atmosphere, Atmospheric windows Ideal Remote sensing system. Radiometers. Spectral signature and Spectral response curves.

### **UNIT-II: Remote Sensing Platforms and Sensors:**

Introduction, Terrestrial, Airborne and Space borne platforms-classification of satellites, Sun-synchronous and geostationary satellites, Type of Orbit. Satellite launch vehicles GSLV and PSLV, Sensors and Scanners, sensor material, sensor systems, Resolution of sensors, Swath, Image referencing system- Path and Row, Multispectral, Thermal and Radar Scanners,, Remote sensing data products, and their types: Analogue and Digital data formats, Thermal and Radar imageries, FCC, Indian remote sensing program. Various Earth resources satellites and their characteristics,

### **UNIT-III: Aerial Photography:**

Introduction, Terminology. Geometry of vertical aerial photograph. Elements of photo and image interpretation, Interpretation key, Interpretation Instruments, Orientation of aerial photographs, Aerial mosaics, Flight planning, Types of aerial photographs. Scale of Aerial photographs, Number of photographs to cover a given area, Relief displacement of vertical objects, Image Parallax and vertical exaggeration.

### **UNIT-IV: Digital Image Processing:**

Introduction, Image reduction, Image magnification, Image rectification and restoration, Image Enhancement contrast manipulation, spatial feature manipulation multi image manipulation. Image classification: supervised and unsupervised classifications, accuracy assessments and data merging

### **UNIT-V: Geographical Information System**

Introduction, Components of GIS- Hardware and Software components. data input and editing, spatial and non spatial data, raster and vector data, database management, data manipulation and analysis, data output.

**Global Positioning System:** Introduction to Global Positioning System (GPS) Fundamental concepts. GPS system elements and signals, Classification of GPS receivers.

### **UNIT-VI : Applications: Integrated Approach of RS and GIS Application:**

Application in Geological Investigations, Water Resources Management. Environmental studies, Land cover and Land use, Transportation planning, Application in Civil Engineering Projects — Dams and Bridges site investigations, Land slide studies. Flood studies.

### **RECOMMENDED BOOKS**

1. Remote Sensing and Geographical Information Systems - M. Anji Reddy.
2. Concepts and techniques of Geographic Information Systems- C.P LO Albert KW Yeung, Pritince Hall of India Edition 2002 .
3. Remote Sensing of the Environment ..an Earth Resource Perspective - John R Jensen, Pearson Education Edition 2006 .

## **APPLIED REMOTE SENSING AND GIS (ELECTIVE-III)**

**BECVE803P**

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

**(P-2 Hrs/Week); Total Credits-2**

### **PRACTICALS:**

RS Data Formats and their study : Analogue and Digital Data Products

1. Digital Image Processing : Registration, Enhancements and digital Classifications
2. Case Studies in water Resources (Surface, Ground water) Environmental geology, engineering projects
3. Calculations on RS Data : Elevation, spatial attributes
4. GIS : Vector data generation, data attachments and data analysis.

# Construction Economics and Finance

**BECVE804T**

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

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

**Exam Duration: 3 hrs**

**COURSE OUTCOMES :** - The students shall be able to

- Acquaint with various economic and financial aspects of construction industry
- Understand the tools and techniques of economic analysis for improving their decision making skills
- Understand the knowledge of economics and finance with special reference to construction industry
- Understand the concept of IRR, turnkey construction projects
- Apply knowledge of inflation, recession, financial ratios

## **Unit I:**

Importance of construction and infrastructure in economic development and growth. Construction – a key industry of India, Concepts of Time value of money, discounted cash flow, internal rate of return, numerical problem based on calculation of IRR.

## **Unit II:**

Factors of production with special reference to construction industry, definition and nature of turnkey construction projects, numerical problem based on calculation of Rate of Return and Net Present Value

## **Unit III:**

Types of market structure in construction industry of India-monopoly, oligopoly and monopolistic competition, definition of recession, inflation, stagflation and its impact on construction industry.

## **Unit IV :**

The sources of finance for construction industry, types of foreign direct investment in infrastructure development of India, project cash flow and numerical problem based on calculation of project cash flow.

## **Unit V:**

Elements of Balance sheet and income statement in construction industry, affordable housing scheme by government of India. numerical problem based on calculation of financial ratios – liquidity ratio, debt/equity ratio, operating profit ratio, return on investment ratio.

## **Unit VI :**

Relevance of capital structure, cost of capital, working capital management in construction projects, factors influencing working capital, the concept and practice of CIBIL in finance, numerical problem based on calculation of working capital for construction project.

*Note : Numerical problem shall be of 4 to 6 marks .*

References :

1. Tarquin, A.J and Blank L.T, (1976) Engineering economy and behavioral approach. Mc Graw Hill Company.
2. Taylor, G.A. (1968). Managerial and Engineering Economy. East-West Edition.
3. Thuesen, H.G. (1959). Engineering Economy, Prentice-Hall, Inc.
4. Van Horne, J.C. (1990). Fundamentals of Financial Management, Prentice-Hall of India Ltd.
5. Brigham, E.F. (1978). Fundamentals of Financial Management, The Dryden Press, Hinsdale, Illinois.
6. Kolb, R.W. and Rodriguez, R.J. (1992). Financial Management. D.C. Heath & Co.
7. Walker, E.W. (1974). Essentials of Financial Management, Prentice Hall of India Private Limited, New Delhi.
8. Wilfred, N. (1971). Accounting for the Building Trade, Hutchinson Educational, London.
9. Pilcher R. (1966). Principles of Construction Management. McGraw Hill Publishing Co Ltd.
10. Lifson, N.W. and Shalfer, E.F. (1982). Decision and Risk Analysis for Construction Management, John Wiley & Sons.
11. Degoff, R.A. and Friedman, H.A. (1985). Construction Management, John Wiley & Sons.
12. Van Horne, J.C. (1990). Management and Policy, Prentice-Hall of India Ltd.
13. Harris, F. and McCaffer, R. (1989). Modern Construction Management. BSP Professional Books.

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