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# SHIVAJI UNIVERSITY, KOLHAPUR.

Revised Syllabus of

**( B.E. Civil Engineering Sem –VII & VIII )**

To be introduced from the academic year 2010-11

(i.e. from June 2010 ) Onwards

(Subject to the modifications will be made from time to time)

## Final Year Civil Engineering

### SYLLABUS STRUCTURE

#### B.E. Civil Engineering Semester-VII

Sr. No.	Subject	Teaching Scheme per week					Examination Scheme (marks)				
		L	P	T	D	Total	Theory Paper	TW	POE	OE	Total
1	Design of Concrete Structures-I	4	-	-	-	4	100	-	-	-	100
2	Quantity Survey and Valuation	4	4	-	-	8	100	50	-	25	175
3	Earthquake Engineering	3	2	-	-	5	100	25	-	-	125
4	Transportation Engineering	4	2	-	-	6	100	25	-	25	150
5	Elective-I	3	2	-	-	5	100	25	-	25	150
6	Project Work	-	2	-	-	2	-	75	-	-	75
7	Report on Field Training #	-	-	-	-	-	-	25	-	-	25
<b>TOTAL</b>		<b>18</b>	<b>12</b>	<b>-</b>	<b>-</b>	<b>30</b>	<b>500</b>	<b>225</b>	<b>-</b>	<b>75</b>	<b>800</b>

# Assessment of Report on Field Training to be done Project Guide along with Project Term Work  
Assessment Committee

#### B.E. Civil Engineering Semester-VIII

Sr. No.	Subject	Teaching Scheme per week					Examination Scheme (marks)				
		L	P	T	D	Total	Theory Paper	TW	POE	OE	Total
1	Town Planning & Transportation Engineering	4	-	-	-	4	100	-	-	-	100
2	Construction Practices	4	-	-	-	4	100	-	-	-	100
3	Design of Concrete Structures-II	4	2	-	-	6	100	25	-	-	125
4	Elective-II	3	2	-	-	5	100	25	-	25	150
5	Elective-III	3	-	-	-	3	100	-	-	-	100
6	Structural Design and Drawing - II	-	-	-	4	4	-	50	-	25	75
7	Project Work	-	6	-	-	6	-	75	-	75	150
<b>TOTAL</b>		<b>18</b>	<b>10</b>	<b>-</b>	<b>4</b>	<b>32</b>	<b>500</b>	<b>175</b>	<b>-</b>	<b>125</b>	<b>800</b>

[Note :- Examination scheme and term work marks strictly as per above structure]



**B.E. CIVIL ENGINEERING  
PART-I  
SEMESTER-VII**

**B.E. CIVIL ENGINEERING-PART-I SEM-VII**

**DESIGN OF CONCRETE STRUCTURES-I**

**Teaching Scheme**

Lectures: 4 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I****Unit : 1** (06)

Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Design philosophies, Various limits states, Characteristics strength and Characteristic load, Load factor, Partial safety factors.

**Unit : 2** (08)

Limit state of collapse (flexure): Analysis and Design of Singly and Doubly Reinforced rectangular sections, Singly reinforced T and L beams.

**Unit : 3** (06)

Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length.

**Unit : 4** (04)

Limit state of serviceability: Significance of deflection, IS recommendations, Cracking-classification and Types of Cracks, Causes mechanism, and IS recommendations.

**SECTION- II****Unit : 5** (05)

Design of slabs: One way, Two way with different support conditions as per IS:456, Cantilever slab

**Unit : 6** (05)

Design of staircases; Types of staircases, Design of Simply Supported and Dog legged staircases

**Unit : 7** (07)

Analysis and Design of axially and eccentrically (uni-axial) loaded circular and rectangular columns, Interaction diagram, Circular column with helical reinforcement

**Unit : 8** (07)

Design of isolated rectangular column footing with constant depth subjected to axial load and moment, Design of combined rectangular footing

**Reference books :**

- 1 IS 456-2000
- 2 Limit state theory and Design –Karve and Shah , Structures publications , Pune
- 3 Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee
- 4 Fundamentals of Reinforced Concrete –Sinha and Roy, S. Chand and company Ltd. Ram Nagar, New Delhi
- 5 Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi
- 6 Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi
- 7 Reinforced Concrete Design-M. L. Gambhir-Mc millan India Ltd. New Delhi
- 8 Special publications -16-Bureau of Indian standards

**B.E. CIVIL ENGINEERING-PART-I SEM-VII****MyUniversityBuzz**  
**QUANTITY SURVEY AND VALUATION****Teaching Scheme**

Lectures: 4 Hrs/Week

Practical: 4 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

Term Work: 50 Marks

Oral Exam: 25 Marks

Paper duration: 4 hr.

**SECTION- I****Unit : 1****(06)**

- a) General introduction to Quantity surveying – purpose of estimates. Types of estimates, various items to be included in estimates. Principles in selecting units of measurement for items, various units and modes of measurement for different trades, administrative approval and technical sanction to estimates. I.S. 1200, Introduction to D.S.R.
- b) Specification- purpose and basic principle of general and detailed specification (writing the detailed specification for various constructions should be covered in term work)

**Unit : 2****(08)**

- a) Prime cost, provisional sums and provisional quantities, taking out

quantity – Long wall - short wall, centre line method, Measurement and abstract sheets and recording.

- b) Analysis of rates, factors affecting the cost of materials, labour. Task work, schedule as basis of labour costs. Plants and equipment -hour costs based on total costs and outputs. Transports, Overhead charges, rates for various items of construction of civil engineering works. Standard schedule of rate, price escalation

**Unit : 3**

**(12)**

- a) Detailed estimate of buildings, R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works. Preparation of schedule for steel as reinforcement.
- b) Approximate estimates, purpose, various methods used for buildings and other civil engineering works such as bridge, water supply, drainage, road project, school buildings, industrial sheds.
- c) Different method of executing work. Essentials of legally valid contract, Contract between Engineer & Employers, Contract between Employer & Contractor, Appointment & authority of Engineer for execution of civil construction works, Category of contractor.

**SECTION- II**

**Unit : 4**

**(08)**

- a) Competitive bidding, Local Competitive bidding, international contracting, item rate contract, percentage rate contract & Lump – sum contract. Tender document- invitation of tenders. Tender notice, tender documents, Submission. Scrutiny and acceptance two envelop method. Award of jobs. Various conditions to contracts. Rights and responsibilities of parties of contracts.
- b) Negotiated contracts, cost plus percentage, cost plus fixed fee, Cost plus sliding scale of fees. Target as based on sharing risk and profits. Turnkey contracts. More than two party contracts.
- c) Introduction to non conventional contract such as B.O.T, B.O.O.T, B.O.L.T

**Unit : 5**

**(06)**

- a) Principles of valuation, definition of value, price and cost. Attributes of value, Different types of values- Book value, salvage value, scrap value, replacement value, reproduction value, Market value, Potential value, Distress value, Speculation value, Sentimental value. Accommodation value. Essential characteristics of market value.
- b) Valuer and his duties, purpose of valuation and its function. Factors affecting the valuation of properties-tangible and intangible properties, Landed properties- free hold and leasehold properties, different types of lease.

**Unit : 6****(05)**

- a) Rental method of valuation. Form of rent, different types of rent, standard rent.
- b) Value of land, belting method of valuation, Valuation based on land and building.
- c) Development method of valuation for building estate.
- d) Valuation on profit basis for lodges, cinema theatres, hotels, motels etc. Valuation for rating purpose. Methods for assessing ratable value of property. Rental method, Comparison method.

**Unit : 7****(07)**

- a) Valuation from yield and from life, gross yield and net yield, outgoing, capitalized value, Year's purchases-Single rate and dual rate, reversion value of land, annuity-perpetual, deferred. Sinking fund.
- b) Depreciation, different methods of calculating depreciation – straight line method, declining balance method, sinking fund method, quantity survey method. Depreciated cost, Obsolescence.
- c) Introduction to Indian Arbitration and conciliation Act 1996.

**Term Work:**

- 1 Detailed estimate for single story residential building
- 2 Preparing detailed estimate for any one of the following:
  - a) A stretch of a road about 1 Km. long including earthwork.
  - b) A reach of canal about 1 Km. long.
  - c) A factory shed of steel frame.
- 3 Valuation reports for building of residential purpose or commercial purpose
- 4 Detailed specification for minimum five civil engineering items. (One each from Roads, Irrigation works, Water Supply & Sanitation & three from buildings)
- 5 Rate Analysis of seven civil engineering items.
- 6 Schedule of reinforcement for anyone from the following
  - a) Beams & slab,
  - b) Staircase
  - c) Column & Column footing
- 7 Preparation of contract document for a small building.

**Use of software for preparation of estimate is desirable.**

**Reference books :**

- 1 Quantity Surveying – P. L. Bhasin. S. Chand&Co-Ramnagar, Delhi-110055

- 2 Elements of Estimating and Costing – S. C. Rangwala. Charotar Publishing house- Opp Amul Dairy Court road Anand.388001 (west rly )India.
- 3 Civil Engineering Contracts and Estimates – B. S. Patil. Universities Press Private Ltd. 3-5-819 Hyderguda, Hyderabad. 500029(A.P),India.
- 4 Professional Practice (Estimating and Valuation) – Roshan Nanavati (1984 Edition)U.B.S. Publishers, Distributers PVT.Ltd.5 Ansari road New Delhi.
- 5 Estimating and Costing – Dutta. Dhanpat Rai & Sons. 1682, Nai Sarak, Delhi-110006
- 6 Estimating and Costing – Birdi Dhanpat Rai & Sons 1682, Nai Sarak, Delhi-110006
- 7 Estimating, Costing and Specification in civil engineering – Chakroborty M.21 b,Bhabananda Road,Kolkata-700026
- 8 Valuation of real Properties – S. C. Rangwala Charotar Publishing House- opposite Amul dairy, court Road Anand. 388001.India
- 9 Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharastra
- 10 C.P.W.D. specifications
- 11 C.P.W.D. schedule of rates.

## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **EARTHQUAKE ENGINEERING**



**Teaching Scheme**

Lectures: 3 Hrs/Week  
Practical: 2 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks  
Term Work: 25 Marks

**SECTION- I****Unit : 1** (05)

Elements of seismology – terminology, structure of earth, causes of an earthquake, plate tectonic theory, continental drift theory, elastic rebound theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelogram, prominent earthquakes of India

**Unit : 2** (08)

Fundamentals of theory of vibration, free and forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution, General dynamic loading Duhamel Integral, earthquake response of SDOF system

**Unit : 3** (07)

Response spectrum theory: Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation soil and structural damping on design spectrum, evaluation of lateral loads due to earthquake on multistory buildings as per IS 1893 – 2002 Part I

**SECTION- II****Unit : 4** (04)

Conceptual Design: Planning aspects, Load path, Stiffness and strength distribution, different structural system, liquefaction and settlement.

**Unit : 5** (08)

Earthquake Resistance Design Principles: Design philosophy, Behavior of RC building, ductility and ductile detailing, Design and detailing of beam and columns using IS 13920.

**Unit : 6** (08)

Masonry and Timber Structures: Behavior of unreinforced masonry and reinforced masonry, RC bands, vertical reinforcement, openings, Behavior of timber structures, connections, shear panel construction, stud wall construction, Provisions of I.S. 4326 , Repairs and strengthening of masonry and RC members.

**Term Work:**

- 1 At least one Assignment on each unit

**Reference books :**

- 1 Dynamics of Structures-Theory and Applications to Earthquake Engineering by A.K. Chopra – Prentice Hall Publications.
- 2 Earthquake Resistance Design of Structure – S. K. Duggal , Oxford Uni. Press
- 3 Earthquake Engineering by Manish Shrikhande
- 4 Structural Dynamics - Mario Paz CBS Publication
- 5 Earthquake Resistant Structures –D.J. Dowrick John Wiley Publication
- 6 Dynamics of Structures – R. M. Clough and Ponian ,McGraw Hill co.New Delhi
- 7 Mechanical Vibrations – G. R. Grover Roorkee University, Roorkee.
- 8 Analysis and Design of Foundations for Vibrations – P. J. Moove. Oxford and I. B. H. Publication, Delhi
- 9 Foundation Design Manual – N. V. Nayak, Dhanpatrai and sons, Delhi
- 10 Manual of Earthquake Resistant Non engineering Construction, University of Roorkee
- 11 Elements of Earthquake Engineering – Jai Krishna, South Asian Pub.New Delhi
- 12 Earthquake Resistant, Design of Masonry and Timber Structures – A.S. Arya
- 13 Elements Seismology – Rochter
- 14 Earthquake Resistant Design of R. C. C. Structures – S. K. Gosh
- 15 IS 1893-2002 –Part I,IS 13920 and 4326.
- 16 Government of Maharashtra Earthquake resistant Design of house guiding lines and assessment of damages

**B.E. CIVIL ENGINEERING-PART-I SEM-VII**

## **TRANSPORTATION ENGINEERING**

### **Teaching Scheme**

Lectures: 4 Hrs/Week  
Practical: 2 Hrs/Week

### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work: 25 Marks  
Oral Exam: 25 Marks

### **SECTION- I** **(Highway Engineering)**

#### **Unit : 1** **(07)**

- a) Introduction Scope of highway engg., Road development plans, Recent developments – NHAI, NHDP, PMGSY, MSRDC, Highway finance – BOT, BOT, Annuity, PPP, DBFO.
- b) Highway Geometric Design: Terrain classification, Highway Alignment-Definition, requirements, factors controlling alignment, alignment of hill roads. Cross-sectional elements, sight distances, horizontal alignment – super elevation, widening of pavement on horizontal curve, Vertical alignment – gradient, vertical curves, design problems.

#### **Unit : 2** **(06)**

- a) Traffic Engineering: traffic characteristics, traffic studies and analysis, traffic control devices – road marking, traffic sign, traffic signal, intersections.

#### **Unit : 3** **(06)**

- a) Pavement Design: Pavement types, components, functions, design factors, Design of flexible pavements, CBR Method, IRC: 37-2001.
- b) Design of rigid pavement: Westergaard's analysis of wheel load stress, temperature stresses. Types of joints and their functions, IRC: 58-2002 method of design.

#### **Unit : 4** **(06)**

- a) Highway Construction: Highway materials, WMM roads, bituminous roads-BC, SDBC, DBM; concrete roads-DLC, PQC; soil stabilized road, MOST specifications.
- b) Highway Drainage: Necessity, surface and subsurface drainage, maintenance and repairs.

### **SECTION- II**

#### **Unit : 5** **(06)**

#### **Airport Engineering**



- b. Softening point test
  - c. Flash and fire point test
  - d. Ductility test
  - e. Viscosity Test
  - f. Stripping Value
- 3 Tutorial on Design Problems.
  - 4 Recent developments in the planning, designing of Highway/Airways systems, major projects - A report are expected.
  - 5 At least One Assignment on each unit of Section –II.

**Reference books :**

- 1 Khanna S.K. and C.E.G. Justo (2000): Highway Engineering, Nem Chand & Bros., Roorkee.
- 2 Khanna S.K., Arora M.G. and Jain S.S. (1997): Airport Planning and Design, Nem Chand and Bros., Roorkee.
- 3 Partha Chakroborty and Animesh Das (2003): Principles of Transportation Engineering, Prentice-Hall India, New Delhi.
- 4 Dock and Harbor Engineering – Oza ,Chartor pub. house
- 5 Dock, Harbor and Tunnel Engineering – Shrinivasan Chartor pub. house
- 6 Dock and Harbor Engineering – Cormick H. F.
- 7 Bruton M.J. (1975): Introduction to Transportation Planning. II Edn. Hutchinson, London.
- 8 Drew D.R. (1968): Traffic Flow Theory and Control, McGraw-Hill, New York.
- 9 Hutchinson B.G. (1974): Principles of Urban Transport Systems Planning. McGraw-Hill Book Co., New York.
- 10 McShane W.R. and Roess R.P. (1990): Traffic Engineering, Prentice-Hall Inc., New Jersey.
- 11 DSIR: Soil Mechanics for Road Engineers, H.M.S.O., London.
- 12 DSIR: Bituminous Materials in Road Construction, H.M.S.O., London.
- 13 Horonjeff Robert: The Planning and Design of Airports, McGraw Hill Co., New York.
- 14 IRC: 76-1979 – Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield Pavement, IRC, New Delhi.
- 15 IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field Constructions, IRC, New Delhi.

- 16 IRC: 58-2002 (Second Revision) – Guidelines for the Design of Rigid Pavements for Highways, IRC, New Delhi.
- 17 IRC: 37-2001 – Guidelines for the Design of Flexible Pavements for Highways, IRC, New Delhi.
- 18 Yang H. Huang (1993): Pavement Analysis and Design, Prentice-Hall.
- 19 Yoder E.J. and Witczak M.W. (1975): Principles of Pavement Design, John Wiley & Sons, Inc., New York.

## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **PROJECT WORK- (PHASE -I)**

#### **Teaching Scheme**

Practical: 2 Hrs/Week  
(for batch of 9 Students)

#### **Examination Scheme**

Term Work: 75 Marks

The project work will be a design project – experimental project – field surveying or computer oriented on any of the topics of civil engineering interest. It will allot as a group project consisting of a minimum THREE and maximum FIVE number of students, depending upon the depth of project depth work. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem.

The term work assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The complete project report is not expected at the end this semester. However a Ten pages typed report based on the work done will have to be submitted by the students to the assessing committee. The project guides will award the marks to the individual students depending on the group average awarded by the committee.

One Project Guide will be allotting Maximum TWO group for guidance.

For work load calculation minimum load is 1 Hr./week, for one groups of FOUR to FIVE students. (As per AICTE Guide Lines)

## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

## **ASSESSMENT ON REPORT OF FIELD TRAINING**

### **Examination Scheme**

Term Work: 25 Marks

The students are required to undergo training in any area related to Civil Engineering as mentioned in the syllabus for 30 working days beyond the academic schedule between the completion of T.E. (Civil) Part-I and B.E.(Civil) Part-I term end.

Students shall submit the report of the field training taken and necessary certificate from the organization where such training is undertaken.

**Assessment will be done at the end of VII Semester by project guide along with Project Term Work Assessment Committee**

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<b>Elective I</b>
• Advanced Structural Analysis
• Experimental Stress Analysis
• Finite Element Method
• Advanced Foundation Engineering
• Transportation Infrastructure Planning and Demand Estimation
• Advanced Engineering geology
• Open channel Hydraulics
• Human Resource Development
• Project Appraisal
• Solid Waste Management

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **ADVANCED STRUCTURAL ANALYSIS**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1 (05)**

Influence Line Diagrams : Muller Breslau Principle, I.L.D. for Propped Cantilever, Fixed beam, Continuous beam

#### **Unit : 2 (06)**

Beams Curved in Plan : Determinate and Indeterminate beams curved in plan

#### **Unit : 3 (04)**

Fixed Arches : Analysis of fixed arches by Elastic Center Method

#### **Unit : 4 (05)**

Approximate Method for Analysis : Analysis of Portal Frames subjected to lateral loads-Portal Method , Cantilever Method

### **SECTION- II**

#### **Unit : 5 (04)**

Analysis of Secondary Stresses in Plane Frames

#### **Unit : 6 (05)**

Analysis of Space Trusses by Tension Coefficient Method

#### **Unit : 7 (06)**

Beams on Elastic Foundations : Analysis of infinite and semi-infinite beams

#### **Unit : 8 (05)**

Unsymmetrical Bending and Shear Center

**Term Work:**

- 1 Term Work shall consists of minimum eight assignments based on above syllabus with at least Two problems from each unit

**Reference books :**

- 1 Analysis of Structures Vol.II- Vazirani and Ratwani, Khanna Publishers,Delhi
- 2 Advanced Theory of Structures & Matrix Methods- Vazirani and Ratwani
- 3 Structural Analysis – Negi and Jangid, Tata McGraw Hill Pub. Co. Ltd.
- 4 Design of Steel Structures Vol.II– Ramchandra Standard Book House ,Delhi
- 5 Strength of Materials Vol.II – Timshenko, East-West Press ltd. Delhi
- 6 Mechanics of Structures Vol. II & III- S. B. Junnerkar & Shah, Chartor Pub.House, Anand
- 7 Design of Steel Structures- B.C.Punmia, A.K.jain, Laxmi Publication(p) Ltd.Delhi

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **EXPERIMENTAL STRESS ANALYSIS**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(02)**

Introduction to experimental stress analysis, advantages of ESA technique, Fundamental concept of strain measurement.

#### **Unit : 2** **(06)**

Development of ERSG, types, construction and material, Gauge sensitivity and gauge factor, transverse sensitivity, correction for transverse strain effect, Grid, Backing material, Adhesive, Mounting method, checking gauge installation, Performance characteristics of foil strain gauge, linearity, hysteresis, zero shift, environmental effect, moisture proofing.

#### **Unit : 3** **(07)**

Wheatstone bridge circuit, sensitivity, types, balancing of bridges, constant current circuit, Transducer application, diaphragm pressure transducer, displacement transducer, axial force transducer, bending force transducer, torque transducer.

#### **Unit : 4** **(04)**

Introduction, determination of principal strains, principal stresses, maximum shear stress and principal angles, three and four element rectangular rosette, delta rosette, tee rosette.

### **SECTION- II**

#### **Unit : 5** **(05)**

Introduction, general principles, advantages and disadvantages, state of stress and laws of failure, detection of cracks, types of brittle coating, test procedure, calibration technique.

#### **Unit : 6** **(07)**

Basic optics related to photo elasticity, ordinary light, monochromatic light, polarized light, natural and artificial,

Birefringence, Stress optic law in two dimensions at normal incidence, Material fringe value in terms of stress function

**Unit : 7**

**(07)**

Plane polariscope, isoclinics, isochromatics, Circular polariscope, different arrangements, isochromatics, Fractional fringe measurement, Tardy's method, Babinet Soleil method, Selection and properties of model materials, Calibration methods, circular disc, tensile specimen, Separation methods, oblique incidence method, shear difference method

**Term Work:**

Minimum ten of the following experiments to be performed

- 1 Study of electrical resistance strain gauge
- 2 Study of commercial strain indicator
- 3 Calibration of electrical resistance strain gauge. Determination of gauge factor  $S_g$
- 4 Determination of unknown weight. Transducer application of strain gauge
- 5 Calculation of gauge factor and strain for single and two arm bridges.
- 6 Calculation of gauge factor and strain for four arms lateral and linear sensitive bridges.
- 7 Measurement by using commercial strain indicator and transducers.
- 8 Study of isoclinics and isochromatics and use of white light
- 9 Calibration of photo elastic model material. Determination of material fringe value.
- 10 Determination of fringe order by Tardy's method.
- 11 Separation of stresses by oblique incidence method.
- 12 Study of brittle coating method.

**Text books :**

- 1 Experimental stress analysis by Dailly and Riley, McGraw Hill
- 2 Experimental stress analysis by Dr. Sadhu Singh, Khanna Publications

**Reference books :**

- 1 Experimental stress analysis by Holister Dove and Adams.
- 2 Photoelasticity Vol. I by Frecht
- 3 Applied stress analysis by Direlli
- 4 The strain gauge primer by Perry Listner

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **FINITE ELEMENT METHOD**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(08)**

Elementary Theory of Elasticity: Stress-Strain relations; Strain-Displacement relations; Plane stress and plane strain problems; Compatibility condition; Differential equations of equilibrium; Equations for two and three dimensional problems.

#### **Unit : 2** **(06)**

Analysis of Skeletal structures: Formulation of element stiffness matrices for plane truss, beam and plane portal frame by direct method; Co-ordinate System; Transformation matrix; Discretization of Continuum; Numbering of nodes; Minimization of band width; Force displacement relationship; Solution for displacement unknowns; Application of method to plane truss, continuous beam and plane portal frames.

#### **Unit : 3** **(06)**

Principle of minimum potential energy; Variational method; Continuum problems; Two dimensional elements; Use of displacement functions; Pascal's triangle; Triangular and rectangular elements; Formulation of element stiffness matrix.

### **SECTION- II**

#### **Unit : 4** **(06)**

Convergence requirement; Selection of order of polynomial; Conforming and non-conforming elements; Effect of element aspect ratio, Finite representation of infinite bodies

#### **Unit : 5** **(08)**

Shape function in Cartesian and natural coordinate system; Lagrange's interpolation formulae; Concept of isoparametric element; Relation between Cartesian and natural Coordinate systems;

Jacobian matrix; One and two dimensional isoparametric element.

**Unit : 6**

**(06)**

Introduction to three dimensional problem; Various three dimensional elements; Axisymmetric problems; Formulation of stiffness matrix of three dimensional and axis-symmetric elements.

**Term Work:**

- 1 Set of exercises based on above syllabus

**Reference books :**

- 1 Introduction to Finite Element Method – Chandrakant C. Desai and J.F.Abel
- 2 Concept and Application of Finite Element Method – R D Cook.
- 3 Finite Element Method – J.N.Reddy
- 4 Finite Element Method – O.C.Zeinkiewicz and Taylor
- 5 Introduction to Finite Element in Engineering – T R Chandrupatla and A D Belegundu

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - I**

#### **ADVANCE FOUNDATION ENGINEERING**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(06)**

Shallow foundations- Types, Depth of foundation, Analysis of Isolated footing, combined footing, proportioning of footing, eccentrically loaded footing

#### **Unit : 2** **(06)**

Raft foundations: Types of rafts, Bearing capacity and settlements of raft, Design consideration and I.S. Code method of analysis

#### **Unit : 3** **(08)**

Deep foundation: Types of piles based on function, materials and methods of construction, friction and end bearing piles, static formulae, Engineering News and Hiley's formula, group action in piles, block failures, negative skin friction, under reamed piles.

### **SECTION- II**

#### **Unit : 4** **(06)**

Design of machine foundations: Static and dynamic design criteria- permissible amplitude of vibrations for different types of machines. Foundations for reciprocating machines- design criteria- calculation of induced forces and moments- multi cylinder engines

#### **Unit : 5** **(07)**

Sheet Pile walls and Cofferdams: types and uses of sheet piles- design of cantilever sheet pile walls in granular and cohesive soils- anchored bulkhead-free earth support and fixed earth support method-coffer dams-uses- braced and cellular cofferdams.

#### **Unit : 6** **(07)**

Foundations in Special soils: Foundation in expansive soil, soft and compressible soils, problems associated with foundation installation- ground water lowering and drainage- shoring and



underpinning-different methods-damage and vibrations due to constructional operations

**Term Work:**

- 1 Set of exercises based on above syllabus

**Reference books :**

- 1 Bowles.J.E, Foundation Analysis and DesignMc Graw Hill Publishing Company
- 2 N.P.Kurian, Modern foundations Tata Mc Graw Hill Publishing company
- 3 Srinivasulu P, Vaidyanathan C.V Handbook of Machine foundations
- 4 Swami Saran, "Soil Dynamics and machine foundation", Galgotia Publications Pvt. Ltd., New Delhi
- 5 W. C. Teng, "Foundation Design", Prentice Hall of India Pvt. Ltd., New Delhi
- 6 Ronald F. Scott "Foundation Analysis", Prentice Hall Inc.,
- 7 B.C. Punmia, " Soil Mechanics and Foundation Engineering" Laxmi Publications Pvt. Ltd.,New Delhi

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

### **TRANSPORTATION INFRASTRUCTURE PLANNING & DEMAND ESTIMATION**

#### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

#### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(03)**

**Introduction:** Infrastructure & its role in developing society; Transport sector in India – policy framework; Development plans – Airports, Highways – National Highway Development Program (NHDP); JNNURM, Project Development Process.

#### **Unit : 2** **(05)**

**Infrastructure Planning:** Systems Engineering Approach to Transportation Planning; Inter dependence of Land Use and Transportation; Urban vs. Rural Transportation Needs; Transportation System Evaluation Process (Demand & Supply equilibrium); Deficiency Analysis; Stages of Project Planning & Stakeholders – Feasibility Studies, Detailed Studies (Detailed Project Reports).

#### **Unit : 3** **(06)**

**Traffic Characteristics:** Traffic characteristics – Road user characteristics, General human characteristics, physical characteristics. Vision eye – movement peripheral vision, Visual attention, visual sensitivity to light and colour, glare vision and recovery perception of space. Hearing, Stability sensation, Time factor in response, Theory of PIEV modifying factors, conditional responses; Vehicular Characteristics – types, dimensions, resistance, power requirement for different resistance, change in direction – minimum turning radius, off tracking, slip angle.

#### **Unit : 4** **(06)**

**Traffic & Transportation Surveys:** Project data needs assessment; Identification of Project Influence Area; Zoning Principles; Primary and Secondary data; Data Collection & Sampling Techniques; Traffic Surveys – Planning & Questionnaire Design; Inventory of Transport Facility; Sources of Secondary Data.

## SECTION- II

### Unit : 5 (05)

**Traffic Parameter Studies and Analysis:** Objectives and Method of Studies, Traffic Studies - Volume, Speed, Travel Time, Capacity and Intersection survey and analysis, Parking and Accident studies.

### Unit : 6 (05)

**Travel Demand Estimation & Forecasting:** Characteristics of Highway Travel Demand, Urban (Public & Private Transport) Travel Demand; Principles of Travel Demand Estimation & Forecasting; 4-stage Travel Demand Modelling; Category analysis; Applications.

### Unit : 7 (04)

**Traffic Management:** Elements of Traffic Management Plan; Urban Traffic Management, Arterial Road Traffic Management Measures; Traffic Signal Designs; Design of Intersections & Rotary; Traffic Management at Construction Site.

### Unit : 8 (06)

**Intelligent Transport System:** Technology oriented systems area – Advanced traffic management system, traveller information system and vehicle control system; Application oriented systems area – Advanced public transport system, commercial vehicle operation and rural transport system, benefits of ITS. Case Studies on Urban Transportation Plans for medium sized cities; Traffic Forecasting for Highways; Public Transit Demand Forecasting.

#### **Term Work:**

- 1 Field studies on traffic volume at midblock, intersection; O-D studies; speed studies, spot speed, speed and delay; parking demand studies, accident studies.

#### **Text books :**

- 1 Kadiyali L.R. and N.B. Lal (2004): Principles and Practice of Highway Engineering (Including Expressways and Airport Engineering), Khanna Publishers, New Delhi.
- 2 Kadiyali L.R. (1994): Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi.
- 3 Partha Chakroborty and Animesh Das (2003): Principles of Transportation Engineering, Prentice-Hall India, New Delhi.

### Reference books :

- 1 Black John (1981): Urban Transportation Planning. Croom Helm Ltd. London.
- 2 BPR (1970): Urban Transportation Planning: General Information and Introduction to System 360. Bureau of Public Roads, Washington D.C.
- 3 Bruton M.J. (1975): Introduction to Transportation Planning. II Edn. Hutchinson, London
- 4 Drew D.R. (1968): Traffic Flow Theory and Control, McGraw-Hill, New York.
- 5 Hutchinson B.G. (1974): Principles of Urban Transport Systems Planning. McGraw-Hill Book Co., New York.
- 6 McShane W.R. and Roess R.P. (1990): Traffic Engineering, Prentice-Hall Inc., New Jersey
- 7 Pignataro L.J. (1973): Traffic Engineering: Theory and Practice, Prentice-Hall Inc., New Jersey.
- 8 Putman S.H. (1983): Integrated Urban Models. Pion Ltd., London.
- 9 Wilson A.G. (1970): Entropy in Urban and Regional Modelling. Pion Ltd., London
- 10 Wells G.R. (1970): Traffic Engineering – An Introduction, Griffins, London.
- 11 Wohl M. and Martin B.V. (1974): Traffic System Analysis of Engineers and Planners, McGraw-Hill Book Co., New York.
- 12 [www.nhai.org](http://www.nhai.org)

## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **ADVANCED ENGINEERING GEOLOGY**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1                    STRATIGRAPHY AND INDIAN GEOLOGY                    (05)**

Scope, Geological Time scale, Physiographic divisions of India, General study of important geological formations of India viz; Vindhyan, Gondwana system and Deccan traps and its Civil engineering significance.

#### **Unit : 2                    SEISMIC ACTIVITY OF DECCAN TRAP                    (06)** **REGION**

Continental Drift and plate Tectonics, Seismic zones of world, Seismic activity of Deccan trap region, Theories on origin of the seismic activity, Reservoir induced seismicity. Nature and characteristics of seismic activity. Tectonic nature of seismic activity of deccan trap region, Prediction of earthquake. Earthquake proof constructions. Numerical problems based on seismic data

#### **Unit : 3                    SUBSURFACE EXPLORATION                    (04)**

Various steps in the geological studies of project site, Engineering consideration of structural features like dip, strike, joints, fractures, faults, folds, dyke etc. Exploratory drilling—observations, preservation and limitations, core logging, Graphical representation, Bore hole problems.

#### **Unit : 4                    SUBSURFACE WATER                    (05)**

Groundwater--origin, zones of subsurface water, aquifer—parameters and types, Darcy's law, regional problems in ground water, water bearing capacity of common rocks, springs, hot springs and geysers, Artesian wells, cone of depression and its significance in civil Engineering, Natural and artificial recharge of aquifers, Saline water intrusions - control and prevention.

### **SECTION- II**

**Unit : 5                      ENGINEERING GEOLOGY OF DECCAN TRAPS                      (06)**

Types of basalts and their engineering characteristics, Compact and amygdaloidal basalt as construction material, Tail channel erosion problem in Deccan Trap region, Suitability of basalts from tunneling point of view. Problems due to columnar basalt, dykes, red bole, tachylitic basalt, Volcanic breccia and fractures, Laterites-Origin, occurrence and engineering aspects. Ground water bearing capacity of the rocks of Deccan Trap region, Percolation tanks, Geological conditions suitable and unsuitable for construction of percolation tanks.

**Unit : 6                      GEOLOGY OF SOIL FORMATIONS                      (03)**

Soil genesis, Geological classification of soils, characteristics of soils derived from different types of rocks. Nature of alluvium and sand of the rivers of Deccan Trap region, Scarcity of sand in Deccan Trap area.

**Unit : 7                      GEOPHYSICS                      (05)**

Geophysical methods--- Basic principles of seismic, magnetic gravitational and electrical resistivity methods, Use of electrical resistivity method using Wenner configuration in Civil Engineering problems such as--i) Finding out the thickness of over burden and depth of hard rock, ii) Locating the spot for ground water. Numerical problems.

**Unit : 8                      RESOURCE ENGINEERING                      (03)**

Renewable and non renewable resources, Coal and Petroleum--genesis, occurrence and reservoir in India, Geothermal energy.

**Unit : 9                      ENVIRONMENTAL GEOLOGY                      (03)**

Scope, geological causes of environmental pollution, effects on human being, affected areas in Maharashtra and India, global warming, environmental implications of dam, road and canal construction.

**Term Work:**

The term work shall consist of the laboratory work based upon following syllabus.

- 1 Study of geological map of Maharashtra state and India..
- 2 Study of Civil Engineering aspects of important rock types.
- 3 Microscopic study of rocks and minerals.

- 4 Three point problems.
- 5 Core logging of exploring drill hole.
- 6 Study and constructions of sections based upon drill holes data.
- 7 Completion of outcrop on contoured geological map and drawing a section of it.
- 8 Use of electrical resistivity method for determining depth of bedrock or groundwater.
- 9 Problems on confined and unconfined aquifers.
- 10 Education tour to the projects to study engineering geological aspects

**Reference books :**

- 1 Geology of India and Burma – M. S. Krishnan, Higginbothams Pvt Ltd;
- 2 Groundwater Hydrology by Todd D. K.-John Wiley& Son. New York
- 3 Groundwater- C.F. Tolman. McGraw Hill Co.
- 4 A Text Book of Engineering Geology-By R. B. Gupte-Pune Vidyarthi Griha Prakashan, Pune)
- 5 India's Mineral Resources - S. Krishnaswamy. Oxford & I.B.H. Co.
- 6 Koyana Earthquake Journal (1968) Indian Geophysics Uni.
- 7 Engineering Geology for Civil Engineers- By Dr. D. V. Reddy.
- 8 Introduction to Rock Mechanics by Verma B. P., Khanna Publisher Delhi.
- 9 Engineering Geology –By B. S. Sathya, Narayanswami.
- 10 A Text book of Applied Engineering Geology- By M.T.Maruthesha Reddy, New Age International Publishers,New Delhi.
- 11 Environmental Geology,-Indian Context By K.S. Valdia, TMcGH Publishing company Ltd. New Delhi.

## B.E. CIVIL ENGINEERING-PART-I SEM-VII

### ELECTIVE - I

#### OPEN CHANNEL HYDRAULICS

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### SECTION- I

#### Unit : 1

(05)

**Basic Fluid Flow Concepts:** Classification of open channels and O.C.F., Basic equations (Continuity, Energy, Momentum) , Energy and Momentum coefficients, Specific energy and Critical depth ,Establishment of Uniform flow in open channels, Uniform flow formulae, Section factor and conveyance factor, First and Second hydraulic exponent , Uniform flow computations

#### Unit : 2

(05)

**Non-Uniform Flow in Open Channel:** Types of Non-Uniform flow, Governing equation for GVF, Characteristics and classification of surface curves, Computation of GVF in prismatic channels, Hydraulic jump in rectangular channels (Types and characteristics), Jump on sloping floor, Jump in non-rectangular channels ,Use of jump as Energy Dissipater, Spatially-Varid Flow, Side weir, Bottom racks

#### Unit : 3

(05)

**Flow in Non-linear alignment Channels:** Nature of Flow, Spiral Flow, Energy Loss, Superelevation, Cross Waves, Design Considerations for Subcritical flow, Design Considerations for Supercritical flow

#### Unit : 4

(05)

**Flow Through Non-prismatic Channel Sections:** Transitions and contractions in open channel flow, Subcritical flow through sudden transitions and constrictions, Contractions and Expansions in Supercritical flow, Standing wave flume, Flow between bridge piers, Flow through culvert, Flow through Trash Racks.



## SECTION- II

### Unit : 5 (05)

**Unsteady Flow in Open Channels:** Gradually Varied Unsteady Flow, Waves and their classification, Celerity of a wave, Rapidly Varied Flow, Surges, Positive and negative Surges, Surges in Power Canals, Dam-break problem

### Unit : 6 (05)

**Dispersion in Open Channels:** Diffusion and dispersion, Governing equations, Some classical solutions of the diffusion equation, Dispersion and diffusion coefficients, Discharge measurement using tracer techniques, discharge of hot water into rivers

### Unit : 7 (05)

**Hydraulics of Mobile Bed Channels:** Initiation of motion of sediment, Bed forms, Sediment Load, Method of permissible velocity and Critical Tractive Force Approach to design Erodible Channels, Regime Theory for Alluvial Channels

### Unit : 8 (05)

**Hydraulic Models:** Fixed bed river models (Distorted and Undistorted), Moveable bed Models, Model materials and construction, Physical model calibration and verification, Special-Purpose models

#### **Term Work:**

- 1 At least one assignment based on each unit.

#### **Reference books :**

- 1 Open Channel Hydraulics: By, Ven Te Chow, McGraw-Hill International Editions
- 2 Open Channel Hydraulics: By, Richard H. French, McGraw-Hill International Student Edition
- 3 Flow Through Open Channels: By, K. G. RangaRaju, Tata Mc Graw Hill Publsh. Co. Ltd.
- 4 Flow in Open Channels: By, K. G. RangaRaju, Tata Mc Graw Hill Publsh. Co. Ltd.
- 5 Open-Channel Flow: By, M. Hanif Chaudhary, Prentice-Hall International Publications

## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **HUMAN RESOURCE DEVELOPMENT**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(06)**

Introduction – History of HRD, Objectives, Functions, HRD in Construction industry, status of construction labor.

##### **Unit : 2** **(07)**

Human Resource Planning – Formulating human Resource plans, various methods, job analysis, job specifications and job design in construction projects, forecasting personal needs and supply in construction sector.

##### **Unit : 3** **(07)**

Recruitment & selection – selecting project manager & project team, external & internal recruitment. Data gathering methods, skill requirement of construction personnel.

#### **SECTION- II**

##### **Unit : 4** **(06)**

Training & Development: The training Process, Individual and organizational development, change management, performance appraisal, use of performance appraisal information establishing the evaluation system.

##### **Unit : 5** **(07)**

Employee Benefits: Employee health and safety , wage and salary administration, incentive system, wages of construction industry, retirement and pensions.

##### **Unit : 6** **(07)**

Employee Management Relations : Collective Bargaining ,basic unions connected with construction & construction industry , trade unions act, labor welfare act, ,payment of wages act ,workers compensation act ,contract labor act management of conflicts.

**Term Work:**

- 1 At least one assignment based on each unit.

**Reference books :**

- 1 Human resource management Subbarao
- 2 Personnel & Human resource Management – C.B. Mamoria
- 3 Human Resource Management— Ashwathapa
- 4 International Human Resource Management--- Gary Diesler

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **PROJECT APPRAISAL**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(06)**

Identification of needs, present availability, additional requirements, alternatives and their comparative study, project identification.

##### **Unit : 2** **(06)**

Technical analysis market and demand analysis, project location resource requirement and their fulfillment technology, know how requirements technical study of alternatives and their suitability.

##### **Unit : 3** **(06)**

Financial analysis interest, compounding and discounting, investment and capital outlay cash flow of the project and its significance profit, Probability and break even analysis, internal rate of return, of shadow pricing benefit cost ratio, influence of inflation on profitability influence of inflation and escalation on the projects.

#### **SECTION- II**

##### **Unit : 4** **(05)**

Social cost benefit analysis, objectives, direct – indirect costs and benefits – tangibles, intangibles and their conversion, levy subsidy concepts

##### **Unit : 5** **(08)**

Appraisal : criteria and selection from alternatives, discounting non-discounting criteria selection under capital restriction, social restriction and other restriction risk analysis, sensitivity analysis, application of decision tree analysis and game theory.

##### **Unit : 6** **(05)**

Project administration organization and control during execution period maintenance and care taker operational set up, project management after completion. Preparation of project report and

norms and its presentation. Definition of entrepreneurship and entrepreneur qualities.

**Term Work:**

- 1 Term work consists of Preparation and Submission of a detailed project report of anyone of the civil engineering projects like lift irrigation, irrigation, bridge, water supply, housing complex, road etc.

**Reference books :**

- 1 Water resources Project Economics – Kuiper
- 2 Project Preparation, Appraisal, Budgeting and implementation – Prasanna Chandra
- 3 Cost Benefit Analysis – E. J. Mishan
- 4 The Practice of Entrepreneurship – Geoffery G. Meredith R. E. Nelson and P. A.

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## **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

### **ELECTIVE - I**

#### **SOLID WASTE MANAGEMENT**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** (05)

Solid waste management: Definition, objectives, effects, Functional outlines of solid waste, sources, types, refuse analysis, composition and quantity of refuse

#### **Unit : 2** (08)

Generation rate, Factors affecting generation rate, different methods of collection, collection systems, Storage, transfer and transportation of refuse, economic aspects of refuse collection & transport.

#### **Unit : 3** (04)

Source Reduction, segregation and salvage, recovery of by – products, use of solid waste as raw materials in industry, recycling of solid waste.

#### **Unit : 4** (03)

Introduction to Biomedical waste management, Hazardous waste management and Agricultural & animal waste management.

### **SECTION- II**

#### **Unit : 5** (06)

Introduction, components of landfilling, types of landfilling, site selection, construction techniques, maintenance and precautions, leachate and its control, control of contamination of ground water, Operation monitoring ,Closure & end-use.

#### **Unit : 6** (06)

Theory of composting, types of composting, factors governing composting, processing before composting, mechanical composting plant, recovery of Bio – gas energy from organic solid waste.

**Unit : 7****(06)**

Theory and types of incinerators, location planning, aspect, Effect of feed, composition, rate, temperature and air supply, Design of incineration plant, pyrolysis and its by-products, Energy recovery, Air pollution and its control.

**Unit : 8****(02)**

Solid waste management rules, Status of solid waste management in India

**Term Work:****Part A**

- 1 Assignment on each unit

**Part B**

- 1 Analysis of solid waste- Physical and Chemical
- 2 Project on Design of Refuse collection & Disposal System for medium size town/ part of city.

**Reference books :**

- 1 Solid Waste Management – Dr. A. D. Bhide
- 2 Solid Waste Management –Gorge Tchobanoglous
- 3 Solid Waste Management Hand Book – Pavoni
- 4 Composting – Gottas
- 5 Handbook and Solid Waste Disposal – Techabonglaus
- 6 Manual on Municipal Solid Waste Management by Ministry of Urban Development of Govt. of India.



**B.E. CIVIL ENGINEERING  
PART-II  
SEMESTER-VIII**



## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **TOWN PLANNING and TRANSPORTATION ENGINEERING**

#### **Teaching Scheme**

Lectures: 4 Hrs/Week

#### **Examination Scheme**

Theory Paper: 100 Marks

### **SECTION- I**

#### **Unit : 1**

**(07)**

- a) Necessity and scope and principles of Town Planning, Brief history. (Greek and Roman towns, planning in ancient India - Indus Valley civilization, Pre- independence, Post independence period. Present status of town planning in India.
- b) Contribution of town planners in modern era such as Sir Patrick Geddes. Sir Ebenezer Howard. Clarence stein, Sir Patrick Abercrombie, Le Corbusier.

#### **Unit : 2**

**(07)**

- a) Growth pattern of towns-Natural and Planned ,Elements of town, Types of zoning and importance, Urban roads- traffic problem in cities, various road networks(Grid iron pattern, shoe string development ,etc),Surveys of data collection, physical, social, economic, civic etc. Analysis of data, Town aesthetics, landscape architecture (Suitability of trees. Treatment of traffic islands, open spaces, walks ways, public sit-outs, and continuous park system. Green ways)
- b) Layout of residential units, neighborhood unit planning. Rehabilitation of slum and urban renewal.

#### **Unit : 3**

**(06)**

- a) Development control rules with respective to town planning.
- b) Different town planning works with reference to M.R.T.P. Act. (Brief idea about various provisions)
- c) Land acquisition act – necessity and procedure of acquisition.
- d) Village planning- Necessity and principles.
- e) Multilevel planning, Decentralization concepts, Rural developments- Growth centre approach, Area Development approach, Integrated rural development approach

## **SECTION- II**

### **(A) Railway Engineering**

#### **Unit : 4** **(06)**

- a) Introduction, Permanent Way : Components, coning of wheels
- b) Geometric design: Alignment, gradient, horizontal curves, super elevation, design problems on above.
- c) Points & Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions.
- d) Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.

#### **Unit : 5** **(06)**

- a) Signaling and interlocking—Introduction, Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying, maintenance of Track, Modern trends in railways.

### **(B) Bridge Engineering**

#### **Unit : 6** **(08)**

- a) Classification of bridges, selection of site, Bridge Hydrology: determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth, design problems on above topics.
- b) Standard specification for bridges: - IRC loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design.

#### **Unit : 7** **(08)**

- a) Types of bridge foundations, Bridge piers, Abutments, Wing walls, bearings.
- b) Construction and maintenance of bridges—Introduction; Recent trends in bridges.

#### **NOTE (For Paper Setters):**

- One question from each unit of section I, along with 4<sup>th</sup> question consisting of Short Notes, having equal weightage to 1, 2 & 3.
- One question for each unit from section II

#### **Reference books :**

- 1 Town and country Planning-G.K. Hiraskar & K. G. Hiraskar, By Dhanpat Rai Publication (p) Ltd., 22 Ansari Road, Dariyaganj New Delhi

- 2 Town and country Planning- N.K. Gandhi
- 3 Town Planning- S.C.Rangawala, Charotar Publications, Pune
- 4 MRTP Act 1966
- 5 Land Acquisition Act - 1894
- 6 Urban Pattern by Gallion, Eisner
- 7 Rural development Planning – Design and method : Misra S.N., Satvahan Publications New Delhi
- 8 Economic development in Third world: Todaro Michael, Orient Longman Publication, New- delhi
- 9 Bridge Engineering – S.P. Bindra
- 10 Bridge Engineering – Ponnuswamy S, , Tata Mcgraw Hill Publications
- 11 Bridge Construction Practice – Raina
- 12 Bridge Engineering – John Victor
- 13 Railway Engineering – K. F. Antia
- 14 A Course in Railway Engineering - Saxena and Arora, Dhanpatrai & Sons, New Delhi.

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **CONSTRUCTION PRACTICES**

#### **Teaching Scheme**

Lectures: 4 Hrs/Week

#### **Examination Scheme**

Theory Paper: 100 Marks

### **SECTION- I**

#### **Unit : 1**

**(14)**

- a) Introduction –Conceptual planning of new project, site access and services, mechanical v/s manual construction
- b) Excavation in Earth: Earth moving equipments- Tractors, Bulldozers, Scrappers, Power shovel, Hoes, Simple numerical problems based on cycle time and production rates.
- c) Drag line, Clamshell, Trenchers, Compactors-types and performance, operating efficiencies, lifting capacities

**Unit : 2****(10)**

- a) Excavation in hard rock: Rippers, jack hammers, drills, compressors and pneumatic equipments.
- b) Blasting explosives, detonators, fuses, Drainage in excavation – necessity and methods of dewatering.

**SECTION- II****Unit : 3****(06)**

- a) RMC plant, layout and production capacity.
- b) Grouting, Shortcreting, under water concreting.
- c) Slip formwork

**Unit : 4****(09)**

- a) Prefabricated construction : Relative economy,
- b) Steel Construction : Planning and field operations, Erection equipments
- c) Floating and dredging equipments
- d) Asphalt mixing and batching plant (Hot mix plant), Sensor Paver for rigid roads, Crushing plants. Belt conveyers, cableways- Need and Construction methods.

**Unit : 5****(09)**

- a) Diaphragm Walls: Purpose and Construction methods
- b) Introduction to trenchless technology
- c) Safety measures in construction, prevention of accidents
- d) Introduction to Disaster management

**Reference books :**

- 1 Construction planning equipment and methods—R.L. Purifoy McGraw Hill Book
- 2 Erection of steel structures--- Thomas Baron
- 3 Reinforced concrete bridges--- Taylor
- 4 Construction Equipment – Mahesh Varma Metropotan Book Co.
- 5 Handbook of Heavy Construction – Stubb
- 6 Heavy Construction – Planning ,Equipment,methods—Jagman singh Oxford and IBH Publishers New Delhi

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **DESIGN OF CONCRETE STRUCTURES-II**

#### **Teaching Scheme**

Lectures: 4 Hrs/Week

Practical: 2 Hrs/Week

#### **Examination Scheme**

Theory Paper: 100 Marks

Term Work: 25 Marks

### **SECTION- I**

#### **Unit : 1** (05)

Limit State of Collapse –Torsion Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion.

#### **Unit : 2** (05)

Limit state Design of two span continuous beams and three span continuous beams using IS coefficient, concept of moment redistribution

#### **Unit : 3** (06)

Design of singly and doubly reinforced rectangular beams and slab by working stress method

#### **Unit : 4** (08)

Design of water tank-design criteria ,permissible stresses, design of circular water tank resting on ground with flexible and rigid base, design of rectangular water tank resting on ground by approximate method

### **SECTION- II**

#### **Unit : 5** (04)

Introduction to prestressed concrete, concepts, systems and methods of prestressing

#### **Unit : 6** (07)

Analysis of rectangular and I sections, thrust line, cable profiles

#### **Unit : 7** (05)

Losses in prestress, Pre & Post tensioned members

**Unit : 8****(08)**

Design of rectangular and Symmetrical I sections. concept of end block, stress distribution in end block

**Term Work:**

- 1 At least five design problem from each section covering at least one from every unit

**Reference books :**

- 1 IS: 456-2000
- 2 IS:1343
- 3 Limit State Theory & design -Karve& Shah Structures Pub. Pune
- 4 Reinforced Concrete Design (Limit State) - A.K. Jain
- 5 Fundamentals of Reinforced Concrete- - Sinha & Roy
- 6 Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi
- 7 Reinforced Cement Concrete -B.C. Punmia
- 8 Handbook of Reinforced Concrete SP-34
- 9 Prestressed Concrete - T.Y. Lin John Willey &sons Newyark
- 10 Prestressed Concrete - Sinha & Roy S.Chand & Co. NewDelhi
- 11 Prestressed Concrete – N Krishna Raju, Tata McGraw-Hill Publication Company ltd., New Delhi.

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **STRUCTURAL DESIGN AND DRAWING - II**

#### **Teaching Scheme**

Drawing: 4 Hrs/Week

#### **Examination Scheme**

Term Work: 50 Marks

Oral Exam: 25 Marks

Term work shall consist of detailed design & drawing of the following R.C. structures by Limit State method.

- 1 Residential two storied building. (Minimum 120 sqmt.) Drawings prepared shall indicate ductility details as per the provision in IS: 13920.
- 2 Any one from the following:
  - a) Retaining wall (cantilever or counter fort type)
  - b) Combined footing /raft foundation /pile foundation.

Note:

At least one site visit to be conducted to show the onsite detailing  
Exposure to prevailing software for analysis and design is desirable.

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **PROJECT WORK (PHASE –II)**

#### **Teaching Scheme**

Work: 6 Hrs/Week  
(for batch of 9  
Students)

#### **Examination Scheme**

Term Work: 75 Marks  
Oral Exam: 75 Marks

The project work started in the seventh semester will continue in this semester. The students will complete the project work in this semester and present it before the assessing committee.

The term work assessment committee as constituted in the seventh semester will assess the various projects for the relative grading and group average. The guides will award the marks for the individual students depending on the group average. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library.

For work load calculation minimum load is 2 Hr./week, for one groups of THREE to FOUR students. (As per AICTE Guide Lines)



## **Elective II**

- Advance Concrete design
- Design Of Industrial Structure
- Analysis and Design of Earthquake Resisting Structure
- Structural Design of Foundation and Retaining Structures
- Pavement Analysis, Design and Evaluation
- Remote sensing applications in civil engineering
- Hydrology and Watershed Management
- Site investigation methods and practices
- Entrepreneurships
- Air Pollution & Control

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **ADVANCED CONCRETE DESIGN**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

1. All designs should be based on IS codes

#### **SECTION- I**

##### **Unit : 1** **(06)**

Large span concrete roofs – Classification- Behaviour of Flat slabs-  
Direct design and equivalent frame method- Codal provisions

##### **Unit : 2** **(06)**

Analysis of deep beams- Design as per IS 456-2000

##### **Unit : 3** **(08)**

Analysis of stresses in concrete chimneys- uncracked and cracked  
sections- Codal provisions- Design of chimney

#### **SECTION- II**

##### **Unit : 4** **(08)**

Overhead water tanks- rectangular and circular with flat bottom-  
spherical and conical tank roofs- staging- Design based on IS 3370

##### **Unit : 5** **(06)**

Analysis and Design of cantilever and counter fort retaining walls  
with horizontal and inclined surcharge

##### **Unit : 6** **(06)**

Yield line analysis of slabs- virtual work and equilibrium method of  
analysis- simply supported rectangular slabs with corners held  
down- uniform and concentrated loads- design of simply supported  
rectangular and circular slabs

**Term Work:**

- 1 At Least TWO Assignments on each unit.

**Reference books :**

- 1 Reinforced Concrete Structural Elements- Purushothaman. P, Tata Mc Graw Hill
- 2 Design and Construction of Concrete Shell Roofs- G.S.Ramaswamy
- 3 Reinforced Concrete – Ashok K Jain, Nem Chand Bros. Roorkee
- 4 Plain and Reinforced Concrete – Jain & Jaikrishna, Vol. I & II, Nem Chand Bros. Roorkee
- 5 Reinforced Concrete Chimneys- Taylor C Pere,
- 6 Yield Line Analysis of Slabs- Jones L L, Thomas and Hudson
- 7 Design of deep girders, Concrete Association of India
- 8 Reinforced Concrete, Mallick & Gupta- Oxford & IBH
- 9 IS 456-2000
- 10 IS2210-1998- Criteria for design of reinforced concrete shell structures and folded plates
- 11 IS 4998-1998- Criteria for design of reinforced concrete chimneys
- 12 IS 3370- 1991- Part 1-4- Code of Practice for concrete structures for the storage of liquids

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **DESIGN OF INDUSTRIAL STRUCTURES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(06)**

Analysis and design of single storey shed, knee braced truss column structure, various arrangements for gantry columns.

##### **Unit : 2** **(06)**

Different types of moment resisting bases of columns.

##### **Unit : 3** **(06)**

Industrial shed using single storey portal frame with and without gravity. Design of haunches.

#### **SECTION- II**

##### **Unit : 5** **(07)**

Space deck structures. Domes in the form of space trusses, trussed purlins.

##### **Unit : 6** **(06)**

Machine foundations, industrial flooring, protection and maintenance of industrial structures.

##### **Unit : 7** **(05)**

Open web portal frames.

##### **Term Work:**

- 1 Design and drawing of any two different types of industrial structures on the basis of topics listed above with use of software for analysis.

##### **Reference books :**

- 1 Steel Designers Manual: ELBS Low Priced 4th Edition

- 2 Principles of Space Structures: N. Subramanian
- 3 Design of steel Structures: Ramchandra Vol. II
- 4 Advanced Design in Structural Steel: John E. Lothers
- 5 Relevant IS Special Publications &.I.S. Codes.

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

### **ANALYSIS AND DESIGN OF EARTHQUAKE RESISTANT STRUCTURES**

#### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

#### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(06)**

##### **Dynamics of MDOF systems subjected to Earthquake loading:-**

Concept of MDOF systems, equations of motion, free-vibrations, Eigen-value analysis, frequencies and mode-shapes, orthogonality of modes, proportional damping, rayleigh damping, modal analysis for earthquake loading, participation factors, modal mass participation

#### **Unit : 2** **(06)**

##### **Response spectrum analysis of MDOF systems.**

Concept of response spectrum analysis as applied to MDOF systems, modal combination rules, SRSS and CQC methods, response spectrum analysis using IS:1893, analysis of asymmetrical buildings, torsional response, accidental eccentricity.

#### **Unit : 3** **(06)**

##### **Analysis of framed buildings using approximate methods.**

Portal and cantilever methods of analysis for lateral loading, substitute frame methods for vertical loading, determination of design forces using load combinations of IS:1893.

### **SECTION- II**

#### **Unit : 4** **(05)**

##### **Geotechnical Earthquake Engineering.**

Dynamic soil properties, laboratory and field tests, liquefaction and its effects, dynamic modeling of soil, soil-structure interaction.

#### **Unit : 5** **(06)**

##### **Earthquake Resistant Design of Reinforced Concrete members.**

Earthquake resistant design philosophy, Design and detailing of RC members, flexural members, compression members, shear walls,

provisions of IS:13920.

**Unit : 6**

**(05)**

**Earthquake Resistant Design of Masonry structures.**

Behavior of unreinforced and reinforced masonry walls, box-action and bands, behavior of infill walls in a frame, provisions of IS:4326, seismic design of masonry buildings, restoration and strengthening of masonry walls.

**Unit : 7**

**(05)**

**Modern approaches for Earthquake Resistant Design.**

Concepts of active and passive vibration control, Passive control devices, base-isolation concept and systems, tuned-mass damper, viscous dampers, metallic dampers, visco-elastic dampers.

**Term Work:**

- 1 At Least TWO Assignments on each unit.

**Reference books :**

- 1 Dynamics of Structures-Theory and Applications to Earthquake Engineering by A.K. Chopra – Prentice Hall Publications.
- 2 Dynamics of Structures by Clough and Penziene – Mc-Graw Hill Publications.
- 3 Geotechnical Earthquake Engineering by Steven L. Kramer – Pearson Education.
- 4 Earthquake Resistant Design of Structures by S.K.Duggal – Oxford University Press.
- 5 Seismic Design of Reinforced and Precast Concrete Buildings by Robert E. Englekirk – John Wiley Publications.
- 6 The Seismic Design Handbook by Farzad Naeim – Kluwer Academic Publishers.
- 7 Earthquake Resistant Design by D.J.Dowrick – John Wiley Publications.
- 8 Passive Energy Dissipation Systems in Structural Engineering by T.T.Soong and G.F.Dargush.
- 9 Earthquake Resistant Design using Rubber by James M. Kelly – Springer Verlag.

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

## **STRUCTURAL DESIGN OF FOUNDATION AND RETAINING STRUCTURES**

### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** **(07)**

Shallow foundations: All types of footings and raft subjected to axial, eccentric and lateral loads

#### **Unit : 2** **(05)**

Pile foundations: Types, design and placement

#### **Unit : 3** **(08)**

Analysis and Design of raft foundation

### **SECTION- II**

#### **Unit : 4** **(08)**

Well foundations: Elements, forces acting on well, lateral stability analysis, problems in sinking of wells and remedial measures

#### **Unit : 5** **(07)**

Retaining Structures: Various types of retaining walls, design of cantilever and counterfort retaining walls

#### **Unit : 6** **(05)**

Break Waters: Design and methods of construction

### **Term Work:**

- 1 At least eight assignments
- 2 At least site visit on foundation site

### **Reference books :**

- 1 Winterkorn H.F. and Fang H.Y , "Foundation Engineering Hand Book" Van Nostand Reinhold Company, 1975



- 2 B.J. Kasmalkar, “ Foundation Engineering”, Pune Vidyarthi Griha Prakashan
- 3 N.V .Naik, “ Foundation Design Manual” Dhanpat Rai and sons
- 4 J.E. Bowles, “ Foundation Analysis and Design” Tata McGraw Hill Book Company
- 5 Poulos, H.G. and Davis, E.H. (1980). “Pile Foundation Analysis and Design”, John Wiley and Sons, New York.
- 6 Mohan, Dinesh (1990)., “Pile Foundations”, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
- 7 Swami Saran, “Soil Dynamics and machine foundation”, Galgotia Publications Pvt. Ltd., New Delhi
- 8 W. C. Teng, “Foundation Design”, Prentice Hall of India Pvt. Ltd., New Delhi
- 9 P. Shrinivasu “ Hand Book of Machine Design” Tata McGraw Hill Book Company”
- 10 Ronald F. Scott “Foundation Analysis”, Prentice Hall Inc.,
- 11 B.C. Punmia, “ Soil Mechanics and Foundation Engineering” Laxmi Publications Pvt. Ltd.,New Delhi

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **PAVEMENT ANALYSIS, DESIGN AND EVALUATION**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1 (05)**

**Stresses and Deflections in Flexible Pavements:** Types and component parts of pavements, Factors affecting design and performance of pavements. Comparison of highway and airfield pavements. Stresses and deflections in homogeneous masses. Burmister's two layer theory, three layer and multi layer theories; wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels. Repeated loads and EWL factors; sustained loads.

#### **Unit : 2 (05)**

**Flexible Pavement Design Methods for Highways:** Empirical, semi-empirical and theoretical approaches, development, principle, design steps, advantages and application of the different pavement design methods including IRC: 37-2001.

#### **Unit : 3 (05)**

**Stresses in Rigid Pavements:** Types of stresses and causes, factors influencing the stresses; general considerations in rigid pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

#### **Unit : 4 (05)**

**Design of Rigid Pavements:** Design of CC pavement for roadway, Types of joints in cement concrete pavements and their functions, joint spacing; design of joint details for longitudinal joints, contraction joints and expansion joints. IRC:58-2002 method of design, Design of continuously reinforced concrete pavements.

### **SECTION- II**

#### **Unit : 5 (04)**

**Pavement Maintenance Management:** Pavement failures: Failures in flexible pavement and rigid pavement; Methods of Maintenance of

different types of pavements; Special problems in high rainfall areas and wet/water logging condition, maintenance of drainage system, Components of Pavement Management System, Examples of HDM/RTIM packages.

**Unit : 6**

**(06)**

**Pavement Evaluation:** Visual rating, Pavement Serviceability Index, Roughness, Skid resistance and Deflection measurements, Use of modern equipment for pavement surface condition measurements- Analysis of data, interpretation and application, Functional evaluation, Structural evaluation of flexible pavements by rebound deflection method, analysis of data, interpretation and applications, FWD, and Benkelman Beam Deflection Technique (IRC:81-1997), Choice and Design of overlay type and pavement materials over existing flexible and rigid pavements with different degrees of distress. Rehabilitation and Recycling of bituminous pavement.

**Unit : 7**

**(04)**

**Structural Design of Airfield Pavements:** Design Factors, Basic Runway Length, Correction for Elevation, Temperature and Gradient, Runway Geometric design, Design Methods for Airfield Flexible Pavements: CBR Method, McLeod method, Burmister's method, Analytical and Computer aided design, Design Methods for Airfield Rigid Pavements, LCN System of Pavement design, Design of Joints in Cement Concrete Pavements.

**Unit : 8**

**(06)**

**Drainage:** Design and construction of surface and sub-surface drainage system for highways and airports. Drainage materials, design procedures and IRC Guidelines for Drainage of Urban Roads.

**Term Work:**

- 1 At least one assignment based on each unit.

**Text books :**

- 1 Kadiyali L.R. and N.B. Lal (2004): Principles and Practice of Highway Engineering (Including Expressways and Airport Engineering), Khanna Publishers, New Delhi.
- 2 Khanna S.K. and C.E.G. Justo (2000): Highway Engineering, Nem Chand & Bros., Roorkee.
- 3 Khanna S.K., Arora M.G. and Jain S.S. (1997): Airport Planning and Design, Nem Chand and Bros., Roorkee.
- 4 Partha Chakroborty and Animesh Das (2003): Principles of Transportation Engineering, Prentice-Hall India, New Delhi.

**Reference books :**

- 1 Horonjeff Robert: The Planning and Design of Airports, McGraw Hill Co., New York.
- 2 IRC: 76-1979 – Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield Pavement, IRC, New Delhi.
- 3 IRC: 85-1983 – Code of Practice for Accelerated Strength Testing and Evaluation of Concrete Road and Air field Constructions, IRC, New Delhi.
- 4 IRC: 58-2002 (Second Revision) – Guidelines for the Design of Rigid Pavements for Highways, IRC, New Delhi.
- 5 IRC: 37-2001 – Guidelines for the Design of Flexible Pavements for Highways, IRC, New Delhi.
- 6 Yang H. Huang (1993): Pavement Analysis and Design, Prentice-Hall.
- 7 Yoder E.J. and Witczak M.W. (1975): Principles of Pavement Design, John Wiley & Sons, Inc., New York.

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **REMOTE SENSING APPLICATIONS IN CIVIL ENGINEERING**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

Term Work : 25 marks

Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1** (03)

Introduction: Definition, History, Types of satellites based upon uses, Programs of different countries, India's position, etc. Scope- Various fields of applications, Users in India, Requirements of users.

#### **Unit : 2** (04)

Space System: Technique of aerial photography, Photographic flight mission, Factors influencing flight mission, Cameras, Types of films, Prints and diapositives, Numbering of aerial photographs, Procurement of aerial photographs. Technique of satellite photography - Important units of satellite and functioning of satellite, height, formant and coverage, Stages in remote sensing, Electromagnetic radiation, and electromagnetic spectrum, Interaction of electromagnetic radiation with earth surface, Sensors used in remote sensing.

#### **Unit : 3** (04)

Ground System: Photo-interpretation equipments-pocket and mirror stereoscope, parallax bar, multi-spectral additive colour viewer, image analyzer etc. General information on aerial photographs and satellite pictures-format, fiducial marks, principal point, front and side overlap, flight gap etc. Repetitive coverage of satellite pictures. Advantages, disadvantages of aerial photographs, satellite pictures and toposheets,

#### **Unit : 4** (02)

Computer Analysis : Introduction to the application of computer in detailed analysis of satellite pictures, Pixel, Computer compatible tapes.

#### **Unit : 5** (05)

Geomorphology : Geomorphology and its scope in photo interpretation as well as in engineering, Drainage analysis, Drainage patterns, Drainage density and Drainage frequency. Landforms

associated with igneous, secondary and metamorphic rocks, Land forms developed due to structural features like dip strike, fractures, faults, folds etc.

## **SECTION- II**

### **Unit : 6** **(04)**

Interpretation : Determination of scale of aerial photographs and satellite pictures, Determination of height and slopes, Stereoscopic exaggeration, Aerial mosaics, types of mosaics, Advantages and limitation of mosaics, Annotation of mosaics, Photo recognition elements such as tone, texture, pattern shape, size associated etc. Lineaments and types of lineaments. Factors affecting aerial photo interpretation, Effect of scale on interpretation, Colour aerial photographs

### **Unit : 7** **(05)**

Applications in Geology : Lithological interpretation. Recognizing igneous, secondary and metamorphic rocks on aerial photographic and satellite pictures. Structural interpretation. Determination of strike, dip and amount of dip, study of joints, fractures, faults, dykes, folds and unconformity etc.

### **Unit : 8** **(03)**

Application in water Resources Studies: Surface water delineation, study of floods, snow field studies, surface keys for subsurface water. Delineation of these keys on aerial photographs, Steps in water investigations of the area. Separating areas with subsurface water potential.

### **Unit : 9** **(03)**

Application in Environmental Studies: Land use study, Terrain analysis, and soil mapping with the help of remote sensing techniques, Applications in delineating forest areas. Study of damage detection. Density classification study, Meteorological interpretation.

### **Unit : 10** **(03)**

Application in Civil Engineering : In the study and selection of site for hydraulic structures, Application in locating construction material. Delineation of sand, alluvium etc. Use in Landslide, Application in transportation engineering.

### **Term Work:**

The term work shall consist of the laboratory work based upon following syllabus.

Preliminary study of aerial photographs and satellite pictures, Overlap study, Determination of scale of aerial photograph and satellite pictures, Determination of elevations of different points with the help of mirror stereoscope and parallax bar. Study of drainage density, drainage frequency etc. Delineation of igneous rock formations, secondary rock formations, metamorphic rock formation. Soil studies, study of fractures, faults, dykes, unconformities and folds, etc. Preparation of geological map. Ground truth data collection.

The oral examination based upon above syllabus of the term work.

### **Reference books :**

- 1 American Society of Photogrammetry Washington D. C. Manual of Photographic Interpretation. (1960)
- 2 American Society of Photogrammetry Washington D. C. Manual of Remote sensing. (1975)
- 3 Photogeology and Regional Mapping – J. A. E. Allum Fergaman Press, London.
- 4 Photogeology - V. C. Millar, McGraw Hills.
- 5 Remote Sensing, Principles and Interpretation –F. F. Sabins, W. H. Freeman &co.
- 6 Principles of Geomorphology – W. D. Thornbury – John Wiley and Sons, INC.
- 7 Deciphering of Groundwater from aerial photographs – K. E. Nefedov and T. A. Popova, Oxford and TMH Co.
- 8 Remote sensing in Civil Engineering – T. J. M. Kennie and M. C. Mathews, Surry University press, London.
- 9 Remote Sensing and Image Interpretation- Thomas M. Lillesand and R.W. Kiefer, Wiley & Sons Insc.
- 10 Remote Sensing of the Environment – John R. Jensen, Pearson Education Inc
- 11 Principles of Remote Sensing- P.N.Patel and Surendra Singh, Scientific Publishers, Jodhapur.
- 12 Text book on Remote Sensing –C.S.Agrawal and P.K.Garg,Wheeler Publishing, New-Delhi.
- 13 Basics of Remote Sensing and GIS –Drt. S.Kumar, Laxmi publications (P) Ltd. New- Delhi.
- 14 Fundamental of Remote Sensing- Gorge Goseph, University Press (India) Pvt. Ltd.,
- 15 Remote Sensing Principles and Applications-Dr. B. C. Panda, Viva Books Pvt. Ltd

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **HYDROLOGY AND WATERSHED MANAGEMENT**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

### **SECTION- I**

#### **Unit : 1 (06)**

##### **Runoff and River Gauging**

Estimation of Runoff by Curve Number Method, Rational Method and using Empirical formulas, Stage –Discharge Measurement, Runoff Simulation Models ( HEC)

#### **Unit : 2 (07)**

##### **Design Flood**

Definition and causes of Floods, Design Flood and its Importance, Estimation of Design Flood in Gauged and Ungauged Catchments, Flood Frequency Analysis, Rainfall Intensity-Duration and Frequency Relationships

#### **Unit : 3 (07)**

##### **Flood Routing**

Inflow-Outflow Relationship, Hydrologic Channel Routing, Hydrologic Reservoir Routing, Flood Routing Machines, Flood Forecasting, Flood Control Measures

### **SECTION- II**

#### **Unit : 5 (07)**

##### **Soil Erosion and Conservation**

Soil erosion Agents, Types of soil erosion due to water, Estimation of Soil Erosion by Soil Loss Models, Sediment Outflow Models, Bed Load Models and Sedimentation Models of water storage structures  
Soil Conservation Practices Erosion Control Structures for Agricultural and Nonagricultural Lands (viz. Contouring, Bunds Terraces, Gully Control Structures etc.)

#### **Unit : 6 (07)**

##### **Water Harvesting**

Watershed: Concept and Characteristics, Elements of Watershed



Management, Watershed Models, Water Conservation / Harvesting Measures through Appropriate Technology viz. Contour Methods, Check Dams, Ponds, Rooftop Rainwater Harvesting etc. Integrated Water Resources management, Conjunctive Use, Groundwater Recharge, Application of Remote Sensing and GIS

**Unit : 7**

**(06)**

**River Basin Management**

Types of Rivers and their characteristics, Indian rivers and their classification, Behavior of Rivers, River Regime theory, Meandering, Control and Training of Rivers

River Basin Systems, Actions Causing Disturbance in Stream System and Their Impacts, Environmental Effects of Hydraulic Structures, Water Quality in Reservoirs, Stream Pollution, River Action Plans, Stream Restoration

**Term Work:**

- 1 At least 2 assignments based on each unit
- 2 Field visit to river-gauging site
- 3 Preparing Watershed Management Report

**Reference books :**

- 1 Hydrology and Soil Conservation Engineering: By, Ghashyam Das (Prentice-Hall India)
- 2 Irrigation Engineering (Including Hydrology): By, R.K.Sharma, T.K. Sharma (S.Chand)
- 3 Hydrology- Principles, Analysis, Design: By H.M.Raghunath (Wiley Eastern Limited)
- 4 Manual of Soil and Water Conservation Practices: By Gurmel Singh, VenkatRaman G.Sastry, B.P.Joshi (Oxford and IBH)
- 5 Watershed management: By, J.V.S. Murthy. (New Age International Publishers)
- 6 River Morphology: By, R.J. Garde. (New Age International Publishers)
- 7 Water Resources Engineering: By Ralph A. Wurbs and Wesley P. James (Prentice-Hall India)

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **SITE INVESTIGATION METHODS AND PRACTICES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(06)**

Objections, site investigation in Civil Engineering process, problem solving and various stages in site investigation process, Planning and Desk Study - topographic maps, aerial photographs, applications in site investigation and interpretation of aerial photographs, Geological maps, soil and planning maps, site reconnaissance and local enquiries.

##### **Unit : 2** **(07)**

Geological methods - different stages, Geological exploration methods - General principle distribution of physical field in subsurface - Electrical resistivity, Seismic refraction methods, their principle, methods of survey, correction to field data, Interpretation and limitations. Index and Mechanical properties of rocks, Laboratory and insitu tests

##### **Unit : 3** **(07)**

Trial pits, shafts, tunnels, auguring, and different types of drilling methods, their merits and demerits, Bore hole logging techniques (subsurface geophysical exploration) - Need for logging techniques, classification and different types logging methods.

#### **SECTION- II**

##### **Unit : 4** **(05)**

Soil Exploration methods, samples, sampling procedure, sample disturbances, samplers, Factors controlling spacing and depth of bore hole,

##### **Unit : 5** **(06)**

Insitu tests, SPT, SCPT, Pressure meter tests, interpretation and application, Laboratory testing, Index properties.

**Unit : 6****(09)**

Technical Report writing, report format, recommendations for earth work structures, highway excavations and drainage works, dams, check report site preparation, investigation during construction and operation.

**Term Work:**

- 1 At least 2 assignments based on each unit.

**Text Books:**

- 1 Joyce, M.D. 'Site Investigation Practice;', ESFN. SPON Publishers, 1982.

**Reference books :**

- 1 Waste Water Engineering Metcalf Eddy Mc Graw Hill Publications.
- 2 Industrial Waste Treatment Nelson Meneroo
- 3 Industrial Waste Treatment Rao & Datta

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **ENTREPRENEURSHIP**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(07)**

Entrepreneurship: Definition entrepreneur and enterprise, need and scope of entrepreneurship, traits of an entrepreneur, present scenario of Indian industry and the place of SSI with respect to entrepreneurship, SWOT analysis for selection of business opportunities, Barriers for self growth.

##### **Unit : 2** **(06)**

Small scale industries policy resolutions since independence major features only small medium and large scale industry. Tiny industries procedures and formalities to be done to start a SSI, Infrastructure of SSI, special scheme for technical entrepreneurs, whom to approach for what?

Introduction to industries developing agencies, financial, technical, marketing such as DST, DIC, SFC, SIDBE, SSICD, SISI, ICICI export promotion councils, banks, technical consultancy organizations etc. and their role.

##### **Unit : 3** **(07)**

Selection of product: Criteria for selection of product for SSI, market survey techniques, marketing viability of the product, typical areas of civil engineering.

#### **SECTION- II**

##### **Unit : 4** **(07)**

Finance and accountancy: working capital and fixed capital assessment incentives from financial institutions and government, financial ratios, their significance, break even analysis cash flow charts financial statements.

##### **Unit : 5** **(07)**

Project report: Preliminary and final project report preparation, financial technical commercial and economic viability project implementation process project profiles.

**Unit : 6**

**(06)**

Introduction to marketing management sale and sales promotion. Industrial and commercial tax laws (major features only). Motivation risk and its analysis goal setting decision making. Communication skills effective communication and barriers. Subject may be taught with respect to suitable case studies and industrial visits. Audio video films shall be used on the above topics.

**Term Work:**

- 1 Preparation of preliminary and final project report of anyone small scale industry from civil engineering field. Report based on two industrial visits.

**Reference books :**

- 1 Planning and Industrial Unit by Jay Narayan Vyas Published by Granth Vitran, 101, Shreyas, Opp. Jain Temple Near Navrangpura Bus Stop, Navrangpura, Ahmedabad 380 009
- 2 The Practice of Entrepreneurship – Geoffery G. Meredith R. E. Nelson and P. A. Neck, Published by International Labour Office, CH 1211, Geneva 22, Switzerland
- 3 Small Scale Industry Handbook – Jay Narayan Vyas, Published by Granthvitaran, Ahmedabad
- 4 Financing an industrial Unit – Jay Narayan Vyas & Dilip Patel, Published by Granthvitaran Ahmedabad
- 5 Entrepreneurship Development Vol. I, II & III – Vasant Desai Published by Himalaya publishing house, Ramdoot Dr. Bhalerao Marg, Girgaon, Mumbai – 400 004
- 6 Entrepreneurship for the Nineties – Gordon B. Baty published by Prentice Hall Inc. College Technical Reference by Granthvitaran
- 7 Procedure and Formalities for Foreign Collaboration and Technology Transfer in India – Jay Narayan Vyas Published by Granthvitaran
- 8 Self-made Impact making Entrepreneurs – published by Entrepreneurship Development, Institute of India Bhat. P. O. Chandkhed, Dist. – Gandhinagar
- 9 Entrepreneurship – Government of India and Government of India publications (MCED)
- 10 Entrepreneurship reports – published by EDI, Ahmedabad

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - II**

#### **AIR POLLUTION AND CONTROL**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(03)**

The structure of the atmosphere, Definition and Scope of Air Pollution, Scales of air pollution

##### **Unit : 2** **(05)**

Sources of air pollution : natural and artificial, Classification of pollutant, quantity and composition of particulate & gaseous pollutant, Units of measurements

##### **Unit : 3** **(06)**

Effect of different air pollutants on man, animals, vegetation, property, aesthetic value and visibility, air pollution Episodes.

##### **Unit : 4** **(06)**

The meteorology and air pollution: Different Meteorological factors & there effect, lapse rate and stability of atmosphere, inversion phenomenon, precipitation & its relation to scavenging pollutants in the air, wind patterns, direction, velocity and fluctuations, models of diffusions and dispersion plume behavior, stack height design.

#### **SECTION- II**

##### **Unit : 5** **(05)**

Air pollution monitoring and regulatory control, Ambient Air quality standards, emission limits, ambient air & stack sampling, equipment for ambient air and stack sampling, methods of sampling, pollution monitoring of existing sources and new installations.

##### **Unit : 6** **(04)**

Chemistry of air pollution, chain reactions of hydrocarbons, nitrogen oxides, sulphuric oxides and intermediates, photochemical smog

formation, aerosols, fog, smog index.

**Unit : 7**

**(06)**

Control of pollutant emission at source, alternative fuels, process change, removal methods for particulate, principles of particulate removals, various types of particulate control equipments, settling chamber, cyclone separators and scrubbers, fabric filters, electrostatic precipitators.

**Unit : 8**

**(05)**

- a) Principles of removal of gaseous pollutants, design of incineration, absorption adsorption systems. Vehicular pollution, composition, quantity & control.
- b) Status of air pollution in India, air pollution control act and strategy for effective control of air pollution.

**Term Work:**

- 1 Assignment/ Problems on Air Pollution.
- 2 Sampling & Analysis of Ambient Air.
- 3 Sampling & Analysis of Automobile exhaust.
- 4 Demonstration of stack gas monitoring

**Reference books :**

- 1 Air Pollution – Wark and Warner
- 2 Air Pollution – Martin Crawford
- 3 Air Pollution and Industry – R. D. Ross
- 4 Air Pollution – Rao and Rao
- 5 Environmental engineering –By Peavy & Powe.
- 6 Air Pollution – Stern

### **Elective III**

- Advance Prestressed Concrete Design
- Design of Bridges
- Dynamics of Structure
- Ground Improvement
- Project Planning, Economics and Financing
- Rock Mechanics
- Water Power Engineering
- Advance Construction Techniques
- Optimization technique
- Industrial Waste Treatment



## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **ADVANCE PRESTRESSED CONCRETE DESIGN**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (07)

- a) Analysis and design of beams - Rectangular, flanged and I sections, for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes.
- b) Analysis and design of end blocks in post tensional members - primary and secondary distribution zones, Bursting and spalling tensions.

##### **Unit : 2** (07)

- a) Shear strength of prestressed concrete beams - mode of failure in beams, recommendations of I.S. code, ultimate shear strength of concrete, Design of shear reinforcement.
- b) Deflection and bond in prestressed concrete.

##### **Unit : 3** (06)

- a) Analysis and design of continuous (upto two spans) and fixed beams. Elastic analysis, secondary moments, concordant cable, linear transformations

#### **SECTION- II**

##### **Unit : 4** (06)

Analysis and design of prestressed concrete structures such as concrete pipes and Sleepers.

##### **Unit : 5** (06)

Analysis and design of portal frames, single storey and limited to two bays (fixed and hinged)

##### **Unit : 6** (08)

Design of prestressed concrete bridges (simply supported) for I.R.C. loadings or equivalent uniformly distributed loads.

##### **Reference books :**

- 1 Guyon Y. : Prestressed Concrete, Vol. I & II, John Wiley and Sons, New York.

- 2 Krishna Raju, N. : Prestressed Concrete, Tata McGraw Hill Pub. Company, New Delhi.
- 3 Lin, T. Y. : Prestressed Concrete, Tata McGraw Hill, New Delhi.
- 4 Dayaratnam, P. : Prestressed Concrete Structures.

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **DESIGN OF BRIDGES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** **(04)**

Components of bridges, Classification, importance of bridges, Investigation for Bridges.

##### **Unit : 2** **(06)**

Standard specification for Road Bridges. I.R.C. bridge code, width of carriage way, clearances, loads to be considered i.e. D.L., L.L., Impact load, wind load, Earthquake load, Longitudinal force, Centrifugal force, buoyancy, Earth pressure, water current force, thermal force etc.

##### **Unit : 3** **(10)**

General design considerations. For R.C.C. & P.S.C. bridges. Traffic aspects for highway bridges. Aesthetics of bridge design, Relative costs of bridge components. Design of reinforced concrete, deck slab, Pigeaud's theory, beam and slab and T – beam, Courbon's theory.

#### **SECTION- II**

##### **Unit : 4** **(07)**

Construction Techniques – Construction of sub structure footing, piles, cussions, construction of reinforced earth retaining wall and reinforced earth abutments, super structure – erection method for bridge deck construction by cantilever method, Inspection maintenance and repair of bridges.

##### **Unit : 5** **(08)**

Design of sub structure – abutments, Piers, approach slab.

##### **Unit : 6** **(05)**

Bearing and expansion joints – forces on bearings – Types of bearings, design of unreinforced elastomeric bearings, expansion joints.

**Reference books :**

- 1 Concrete Bridge Practice by Dr.V.K.Raina, Tata McGraw Hill
- 2 Reinforced Concrete Structures – Vol. II by Dr.B.C.Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **DYNAMICS OF STRUCTURES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** **(06)**

Single – Degree of Freedom Systems , Analytical Models, Equation of Motion , Free Vibration , Damping , Types of damping , Types of damping , Response to harmonic loading , Resonance , Support motion , Transmissibility, Vibration isolation

##### **Unit : 2** **(05)**

SDOF system subjected to periodic & impulsive loading, Fourier series loading, Rectangular pulse , Introduction to Frequency – Domain Analysis

##### **Unit : 3** **(07)**

SDOF systems subjected to general dynamic loading , Duhamel's integral , Application to simple loading cases, numerical evaluation of response integral , Piece wise exact method .

#### **SECTION- II**

##### **Unit : 4** **(07)**

MDOF systems , selection of DOFs , formulation of equations of motion , Structure matrices , Static condensation , Free Vibration Eigen Value problem , Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes by Stodola-Vianello method, Orthogonality conditions

##### **Unit : 5** **(05)**

Discrete systems , Fundamental mode analysis , Rayleigh method, Response of MDOF systems to dynamic loading, Mode superposition method, Coupled and Uncoupled equations of motion, Modal Contribution

##### **Unit : 6** **(06)**

Distributed- parameter Systems, Partial differential equations of

motion, Free and forced Vibration, Application to beams in flexure.

**Reference books :**

- 1 Dynamics of Structures-Theory and Applications to Earthquake Engineering by A.K. Chopra – Prentice Hall Publications.
- 2 Structural Dynamics - Mario Paz CBS Publication
- 3 Dynamics of Structures – R. M. Clough and Ponian ,McGraw Hill co. New Delhi
- 4 Mechanical Vibrations – G. R. Grover Roorkee University, Roorkee.
- 5 Earthquake Resistant Design of R. C. C. Structures – S. K. Gosh

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **GROUND IMPROVEMENT TECHNIQUES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (07)

Introduction: Need – methods – suitability – Mechanical modification: principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation

##### **Unit : 2** (06)

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis. Preloading, sand drains, wick drains- Thermal methods case studies

##### **Unit : 3** (07)

Chemical stabilization- cement stabilization- factors affecting soil cement mixing-admixtures- lime stabilization-effect of lime on soil properties construction of lime stabilized bases-bituminous stabilization- thermal stabilization- electrical stabilization.

#### **SECTION- II**

##### **Unit : 4** (06)

Grouting: Classification – Methods – Types – grouts – equipments, grouting design and layout, grout monitoring – applications – Case studies.

##### **Unit : 5** (07)

Earth Reinforcement- mechanism and concept- stress strain relationship of reinforced soil-design theories and stability analysis of retaining wall-tie back analysis-coherent gravity analysis-application areas of earth reinforcement

##### **Unit : 6** (07)

Geotextiles: Soil reinforcement with geotextiles- classification-concepts geotextiles as separators, filters, and drainage media-damage and durability of geotextiles

**Reference books :**

- 1 M.J.Tholinson - Foundation design and construction Robert M.Koerner - Construction and Geotechnical methods in Foundation Engineering
- 2 C.J.F.P.Jones - Earth Reinforcement and Soil structures
- 3 R.A.Jewell - Soil Reinforcement with Geotextiles
- 4 Donald P.Coduto - Geotechnical Engineering, Principles and Practices Prentice Hall India
- 5 Purusothmaraj.P., Ground Improvement Techniques, Laxmi Publication (P) Ltd., New Delhi, 2000.

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **PROJECT PLANNING, ECONOMICS AND FINANCING**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** **(05)**

Project Planning & Monitoring: Concept of Project planning; Resource Allocation; Activities in project planning, Programme schedule preparation , Project Monitoring - Earned Value Analysis, Schedule Variance Analysis, Management Information System Reports; Software Tools – MS Project, PRIMAVERA

##### **Unit : 2** **(05)**

Contracts Management: Contract Management process; Concepts & Principles of Contract Law; Contracting Methods and Pricing Agreements; Pre-Award and Award phase Activities; Contract Administration – Contract Analysis, Performance & Progress, Managing Change, Resolving Claims & Disputes, Termination.

##### **Unit : 3** **(05)**

Project Costing: Components of Project Cost; Bill of Quantities; Rate Analysis; Approaches for Cost Estimation; Types of Construction Cost Estimates; Unit method of Cost Estimation; Allocation of Joint Costs; Historical Costs data; Cost Indices based Estimation; Allocation of Construction Costs over time; Estimation of Operating Costs; Computer Aided Cost Estimation

##### **Unit : 4** **(05)**

Project Economics: Project Economics, Principal, supply and demand models, pricing, rates of interest, direct and indirect benefits due to road improvement. Transportation cost, fixed and variable costs.

#### **SECTION- II**

##### **Unit : 5** **(05)**

Economic Analysis: Methods of economic analysis, determination of annual cost, benefit cost ratio, IRR, NPV. Examples of economic analysis for different types of road improvement measures, pavement options, construction of bypasses and upgrading of intersections. Project priorities, methods of dealing with uncertainties.

**Unit : 6****(05)**

Project Financing: Project Financing Options; Public Private Partnership in Infrastructure development projects. Types of PPP BOT, BOOT and BOT-Annuity. Institutional Arrangement for Project Financing; Re-Financing of Debts; Construction Financing for Contractors.

**Unit : 7****(05)**

Financial Analysis: Financial analysis projects and introduction of computer software packages. Evaluation of Alternate Financing Plans; Risk and uncertainty in projects and their integration to decision process; Road investment decision packages.

**Unit : 8****(05)**

Project Quality Assurance & Control: Key aspects of Project Quality Control, Organising Quality Assurance; Quality Assurance Policy and its contents; Works and Material Specifications; Roles and responsibilities of Quality Assurance & Control Team; Total Quality Control; Quality Control by Statistical Methods; Quality Audits & Procedures.

**Reference books :**

- 1 Adler, Hans A (1987): Economic Appraisal of Transport Projects, The Johns Hopkins University Press, USA.
- 2 Abol Ardalan, (2000): Economic and Financial Analysis for Engineering and Project Management, Technomic Publishing Company, USA.
- 3 IRC: SP:30-1993 (First Revision) – Manual for Economic Evaluation of Highway Projects in India, IRC, New Delhi.
- 4 IRC: SP:19-2001 – Manual for Survey, Investigation and Preparation of Road Projects, IRC, New Delhi.
- 5 MoRTH (2001): Road Development Plan: Vision-2021, Min. of Road Transport and Highways, IRC, New Delhi
- 6 Peurifoy R.L. (1984): Construction, Planning, Equipment and Method, McGraw Hill Book Co., New York.
- 7 Harold Kerzner: Project Management: A Systems Approach to Planning, Scheduling, and Controlling, John Wiley and Sons
- 8 Jack Gido: An Introduction to Project Pl

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **ROCK MECHANICS**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (02)

**Introduction:** Historical development of Rock Mechanics, Application of Rock Mechanics, Defects in rocks.

##### **Unit : 2** (04)

**Laboratory Testing of Rocks:** Rock sampling, Determination of Index and Mechanical properties viz. Density, Porosity, Water absorption, Uniaxial compressive strength, Tensile strength, Shear strength, Flexural strength, Triaxial compressive strength, Swelling and slake durability, Point load strength, Factors affecting strength and deformation of rocks.

##### **Unit : 3** (06)

**Classification of Rocks:** Weathering grades of Rocks as per ISRM, Rock mass classification systems, Terzaghi's rock load classification, RQD classification, RQD when bore core is unavailable, Rock structure rating, NGI and Geomechanics classification.

##### **Unit : 4** (06)

**Field Testing of Rocks:** Geophysical Methods: - Electrical Resistivity method & its applications, Seismic refraction method.  
In-situ Tests: - Requirement of Insitu tests, Types of insitu tests, Insitu determination of shear strength, Permeability and modulus of deformation, Plate load test, Radial jacket test, Dialometer test, Flat jack test.

#### **SECTION- II**

##### **Unit : 5** (04)

**Methods of improving Rock properties:** Shortcreting, Grouting, Rock bolting, Ground freezing.

##### **Unit : 6** (04)

**Stability of Rock slopes:** Modes of failure, Methods of analysis, Improvement of slope stability and protection.

**Unit : 7****(05)**

**Foundation on Rock:** Shallow foundation, pile and well foundation, Settlement in rocks, Remedial measures for foundations on rocks, Allowable bearing pressures.

**Unit : 8****(05)**

**Tunnels:** Terminology, Rock stresses and deformation around tunnels, Underground blast design for tunnel, Rock supports, Design of tunnel lining.

**Reference books :**

- 1 Introduction of Rock Mechanics by R.E.Goodman; John Wiley & Sons.
- 2 Manual on Rock Mechanics by Central Board of Irrigation and Power.
- 3 Hand Book on Mechanical properties of Rocks by R. D. Lama and V.S. Vulukuri Vol. I to IV.
- 4 Rock Mechanics for Engineers – B.P.Varma, Khanna Publications
- 5 Rock Mechanics and Hydraulic Structures – Obert & Duvall (1967) John Wiley and Sons Ind.
- 6 Rock Mechanics in Engineering Practice – Stag and Zienkiewec (1968) John Wiley and Sons Ind.
- 7 Winterkorn H.F. and Fang H.Y, “Foundation Engineering Hand book” Van Nostand Reinhold Company, 1975
- 8 Relevant Indian Standards
- 9 Engineering in Rocks for slopes foundation & Tunnels by T.Ramamurthy, Prentice Hall of India Pvt. Ltd. New Delhi.

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **WATER POWER ENGINEERING**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (03)

Introduction: Sources of energy, types of power station, choice of type of generation, component parts of water project, types of hydro power schemes, general layouts of hydropower schemes.

##### **Unit : 2** (05)

Estimation of hydro power available 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 capacity factor, plant use factor, firm power secondary power.

##### **Unit : 3** (04)

Intake, types, level of intake hydraulics of intake, trash rack transition from gate to conduit intake gates. (vertical list and taint, general discussion only)

##### **Unit : 4** (05)

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 : 5** (03)

Surge Tank : Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, forebay.

#### **SECTION- II**

##### **Unit : 6** (04)

Power station general arrangements of power station, power house, sub-structure and super structure, main dimensions underground power station –

necessity principal, types, development and economics.

**Unit : 7** (04)

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

**Unit : 8** (03)

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

**Unit : 9** (03)

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

**Unit : 10** (03)

Tidal power stations: Classification according to the principle of operation and general description of different types, depression power plants.

**Reference books :**

- 1 Water Power Development – E. Mosonvi, Vol. I & II
- 2 Hydro-electric Engineering Practice – G. Brown, Vol. I, II & III
- 3 Hydro – Electric Hand Book – Creager and Justin
- 4 Hydro Power Structures – Varshnaya
- 5 Water Power Engineering – M. M. Dandekar, Vikas Pub. House Pvt. Ltd
- 6 Water Power Engineering – P. K. Bhattacharya, Khanna Pub., Delhi
- 7 Water Power Engineering – M. M. Deshmukh, Dhanpat Rai and Sons

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **ADVANCE CONSTRUCTION TECHNIQUES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (04)

**COMPOSITE CONSTRUCTION:** - composite v/s non composite action; composite steel-concrete construction.

##### **Unit : 2** (05)

**FORMWORK:** - Material for formwork, special types of formwork, design of formwork

##### **Unit : 3** (06)

**NEW MATERIAL** of construction such as geosynthetics, Epoxy resins, Adhesives, MDF, FRC, FRP, Polymer-based composites.

##### **Unit : 4** (05)

**LAND RECLAMATION:-** Technical progress, Drainage for land reclamation, structural improvement.

#### **SECTION- II**

##### **Unit : 5** (04)

**CONSTRUCTION** of power-generation structures, Atomic Power stations, Thermal Power stations, wind-mills.

##### **Unit : 6** (06)

- a) **Rehabilitation of bridges:** Necessity and methods of strengthening, preservation of bridges.
- b) **Retaining structures** like diaphragm walls, advanced methods of their construction.

##### **Unit : 7** (06)

- a) **Construction of concrete pavement** by techniques like vacuum processing, vibrated concrete, Roller –compacted concrete.
- b) **Use of techniques** like slip form paving in pavement construction; using Wet-MIX macadam in Road.

**Unit : 8****(04)**

Advanced Techniques, vacuum dewatering in concrete slab construction, Reinforced earth construction, foundation strengthening

**Reference books :**

- 1 Handbook of Composite construction Engg--- G.M. Sabanis
- 2 Formwork design and construction---- Wynn
- 3 Water power Engineering—Dandekar sharma
- 4 Bridge Engineering--- Raina
- 5 Bridge engineering Punnuswamy
- 6 Concrete Technology--- M.S. Shetty S.Chand publication

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## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **OPTIMIZATION TECHNIQUES**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (10)

Introduction: Importance of optimization techniques Linear programming: Formulation, graphical solution, simplex method, Big M Method, Duality, Sensitivity analysis.

##### **Unit : 2** (04)

Transportation problems: Assignment problems

##### **Unit : 3** (06)

Decision theory, decision tree, Game theory.

#### **SECTION- II**

##### **Unit : 4** (10)

Inventory models – deterministic models probabilistic model. Queuing theory, simulation applications

##### **Unit : 5** (04)

Introduction to non linear programming

##### **Unit : 6** (06)

Dynamic programming and integer programming, Forecasting techniques.

##### **Reference books :**

- 1 Optimization – S. S. Rao, Wiley Eastern Ltd.
- 2 Operation Research - H. A. Taha, Mac-Millan
- 3 Graph Theory – Narsingh Rao, Prentice Hall
- 4 Operation Research – Wagner, Wiley Eastern Ltd.
- 5 Project Management – Lick D., Gower Publication England

## **B.E. CIVIL ENGINEERING-PART-II SEM-VIII**

### **ELECTIVE - III**

#### **INDUSTRIAL WASTE TREATMENT**

##### **Teaching Scheme**

Lecture : 3 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I**

##### **Unit : 1** (05)

Use of water in industry, sources of wastewater, quality and quantity variations in waste discharge, water budgeting, characterization and monitoring of wastewater flow, stream standards and effluent standards.

##### **Unit : 2** (07)

Waste volume and strength reduction, in-plant measure, good housekeeping, process change, leakage prevention, segregation and recycling Neutralization, equalization and proportioning of waste

##### **Unit : 3** (05)

Water Quality monitoring of Streams, Self purification of streams, B.O.D. reaction rate, D.O. sag curve and D.O. deficit calculations

##### **Unit : 4** (03)

Miscellaneous methods of dissolved solids removal, sludge disposal methods

#### **SECTION- II**

##### **Unit : 5** (03)

Different types of waste treatment & their selections, Development of treatment flow diagram based on characteristics of waste

##### **Unit : 6** (09)

Manufacturing processes in major industries, water requirements, wastewater sources, composition of wastes, Viz. sugar, distillery, dairy, pulps, paper mill, fertilizer, tannery, chemical, steel industry, power plants, textile Treatment flow sheets, alternative methods of treatment, factors affecting efficiency of treatment plant

##### **Unit : 7** (03)

Acclimatization of bacteria to toxic wastes, process sensitivity,

operation and maintenance requirements

**Unit : 8**

**(05)**

Water pollution control act, organizational set up of central and state boards for water pollution control, classification of river on water use, minimal national standards, socio-economic aspects of water pollution control

**Reference books :**

- 1 Waste Water Engineering Metcalf Eddy Mc Graw Hill Publications.
  - 2 Industrial Waste Treatment Nelson Meneroo
  - 3 Industrial Waste Treatment Rao & Datta
- 

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<b>Sr. No.</b>	<b>Name of Subject in Old Syllabus</b>		
1	Design of Concrete Structures – I		
2	Quantity Surveying & Valuation		
3	Earthquake Engineering		
4	Water Resources Engg.-II		
5	Elective-I		

<b>Sr. No.</b>	<b>Name of Subject in Old Syllabus</b>		
1	Town Planning & Bridge Engg.		
2	Transportation Engineering – II		
3	Construction Practices		
4	Design of Concrete Structures-II		
5	Elective-II		

## **Annexure A**

### **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

#### **WATER RESOURCES ENGINEERING-II**

##### **Teaching Scheme**

Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

##### **Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks  
Oral Exam : 25 marks

#### **SECTION- I**

##### **Unit : 1** **(05)**

Planning of Reservoirs: Storage calculations, Control levels, silting of reservoirs, losses in reservoirs.

Dams – Necessity, types of dams, selection of site for dams, selection of type of dam

##### **Unit : 2** **(06)**

Gravity Dams - Forces acting on dam, design criteria, theoretical and practical profile, high and low dam, stability calculations, materials and methods of construction, Galleries, joints.

Arch Dams – Types, Layout of Constant angle and Constant radius arch dam

##### **Unit : 3** **(05)**

Earth Dams: Components and their functions, Design Criterians;, seepage through and below earth dam, Application of Slip circle method, Inverted Filters, Downstream drainage

##### **Unit : 4** **(04)**

Spillway, Necessity and different types , factors affecting choice and type of spillway, elementary hydraulic design, jump height and tail water rating curve, energy dissipation below spillway, gates for spillway

#### **SECTION- II**

##### **Unit : 5** **(04)**

Weirs on Permeable Foundations: Theories of seepage, Bligh's creep theory, Khosla's theory - exit gradient, , Piping and undercutting

##### **Unit : 6** **(06)**

Canals: Types, Alignment, Design – Kennedy's and Lacey's Silt theories, Canal losses, Typical canal sections, canal lining –

Necessity and types Canal Structures (Introduction): Cross drainage works and canal regulatory works – Aqueduct, Culvert, Super passage, Level Crossing, Cross and Head regulator, Canal Siphon

**Unit : 7** **(03)**

River and River Training Works: Types of rivers, Meandering phenomenon, Types of river training works, river navigation.

Water Logging and Drainage: Causes, effects, preventive and curative measures, alkaline soils.

**Unit : 8** **(04)**

Elements of Hydropower Engineering:, types of water power plants, layout and components of each type, Intakes, Conveyance system, Surge tanks, Power house types and components and layout tail race.

**Term Work:**

- 1 Assignment on each unit (minimum SEVEN Assignment)
- 2 Visit report based on Field Visits to Irrigation and Water Power Engineering Projects.

**Reference books :**

- 1 Irrigation Engineering – S. K. Garg ,Khanna Pub. Delhi
- 2 Design of Small Dam – U. S. B. R., OXFORD & IBH pub.co.
- 3 Engineering for Dam Vol. I, II, III – Justinn, Creager and Hinds
- 4 Design of Hydraulic Structures Vol. I & II – Leliavsky
- 5 Irrigation and Water Power - Priyani ,Charoter pub. House, Anand
- 6 River Behaviour, Management and Training - C B I & P
- 7 Design of Canals – Circular of Government of Maharashtra, !8 February 1995
- 8 Irrigation and Water Power Engineering – Punmia, B. C.
- 9 Irrigation – Bharat Singh ,NEW CHAND & bros. Roorkee
- 10 Irrigation Engineering Vol. I – Varshhey and Gupta
- 11 Engineering Hydrology - K. Subram anya

## **Annexure B**

### **B.E. CIVIL ENGINEERING-PART-I SEM-VII**

#### **TRANSPORTATION ENGINEERING -II**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

#### **SECTION- I (Railway Engineering)**

**Unit : 1** **(07)**

Introduction, Permanent Way, Gauges, components, rails, sleepers, ballast, sub grade formation, fixtures and fastenings, coning of wheels.

Geometric design: Alignment, gradient, horizontal curves, super – elevation, design problems on above.

**Unit : 2** **(06)**

Points & Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions.

Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.

**Unit : 3** **(07)**

Signaling and interlocking : objectives of signaling, types of signals, principles of interlocking, methods of control of train movements

Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying, Tractive resistance and tractive effort, maintenance of track.

Modern trends in railways: mention of high – speed track, ballast – less track, introduction to monorails, rack rails, underground and elevated railways.

#### **SECTION- II (Tunnel Engineering)**

**Unit : 4** **(10)**

Introduction, consideration in tunneling, shape and size of tunnel shafts, pilot tunnels.

Tunneling in hard rock, methods of attack, drilling-patterns, blasting, mucking, tunnel lining (rock bolting and guniting), advances in tunneling methods (TBM).

**Unit : 5** **(10)**

Tunneling in soft materials: Mining, timbering, mucking forepoling and shield methods.

Safety measures, ventilation, lighting and drainage of tunnels, modern tunneling methods.

**Reference books :**

- 1 Railway Engineering – K. F. Antia
- 2 A Course in Railway Engineering - Saxena and Arora, dhanpat rai & Sons Delhi
- 3 Planning and Construction of Docks and Harbors – Quinn
- 4 Dock and Harbor Engineering – Oza ,Chartor pub. house
- 5 Dock, Harbor and Tunnel Engineering – Shrinivasan Chartor pub. house
- 6 Dock and Harbor Engineering – Cormick

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**Final Year Civil Engineering**  
**List of Equivalent Subject from New Syllabus**  
**B.E. Civil Engineering Semester-VII (Pre Revised)**

<b>Sr. No.</b>	<b>Subjects as per Pre-revised Syllabus</b>	<b>Subjects as per revised Syllabus</b>	<b>Remark</b>
1	Design of Concrete Structures – I	Design of Concrete Structures-I	Refer New Syllabus
2	Quantity Surveying & Valuation	Quantity Survey and Valuation	
3	Earthquake Engineering	Earthquake Engineering	
4	Water Resources Engg.-II	Water Resources Engineering-II	Refer <b>Annexure-A</b>
5	Elective-I	As per the New Syllabus Structure	Refer New Syllabus

**B.E. Civil Engineering Semester-VII**

<b>Sr. No.</b>	<b>Name of Subject in Old Syllabus</b>	<b>Name of Subject in NEW SYLLABUS</b>	<b>Remark</b>
1	Town Planning & Bridge Engg.	Town Planning & Transportation Engineering	Refer New Syllabus
2	Transportation Engineering – II	Transportation Engineering-II	Refer <b>Annexure-B</b>
3	Construction Practices	Construction Practices	Refer New Syllabus
4	Design of Concrete Structures-II	Design of Concrete Structures-II	
5	Elective-II	Elective-II	

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