

# **SHIVAJI UNIVERSITY, KOLHAPUR**

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REVISED SYLLABUS OF  
**B. E. CIVIL ENGINEERING**  
**SEMESTER VII & VIII**

To be introduced from the academic year 2016-17 (i.e. from June 2016)

# FINAL YEAR CIVIL ENGINEERING

## SYLLABUS STRUCTURE

### B. E. CIVIL ENGINEERING SEMESTER-VII

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Design of Concrete Structure -I	4	2	---	---	6	100	25	---	---	125
2	Earthquake Engineering	3	2	---	---	5	100	50	---	---	150
3	Quantity Surveying & Valuation	3	4	---	---	7	100	50	---	25	175
4	Project Management & Construction Equipments	3	2	---	---	5	100	25	---	25	150
5	Elective-I	3	2	---	---	5	100	25	---	---	125
6	Project	---	2	---	---	2	---	50	---	---	50
7	Report on Field Training #	---	---	---	---	---	---	25	---	---	25
<b>Total</b>		<b>16</b>	<b>14</b>	<b>---</b>	<b>---</b>	<b>30</b>	<b>500</b>	<b>250</b>	<b>---</b>	<b>50</b>	<b>800</b>

# Assessment of Report on field training to be done by Project Guide along with Project Term Work Assessment Committee.

### B. E. CIVIL ENGINEERING SEMESTER-VIII

Sr. No.	Subject	Teaching scheme per week					Examination scheme				
		L	P	T	D	Total	Theory paper	TW	POE	OE	Total
1	Design of Concrete Structure -II	4	2	---	---	6	100	25	---	---	125
2	Water Resources Engineering-II	3	2	---	---	5	100	25	---	25	150
3	Transportation Engineering-II	3	---	---	---	3	100	---	---	---	100
4	*Elective-II	3	---	---	---	3	100	---	---	---	100
5	**Elective-III	3	---	---	---	3	100	---	---	---	100
6	SDD-II	--	---	---	4	4	---	50	---	25	75
7	Project	--	6	---	---	6	---	75	75	---	150
<b>Total</b>		<b>16</b>	<b>10</b>	<b>---</b>	<b>4</b>	<b>30</b>	<b>500</b>	<b>175</b>	<b>75</b>	<b>50</b>	<b>800</b>

\*Elective II from structure group

\*\*Elective III from non-structure group

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**B. E. PART-I (SEMESTER-VII)**

## B. E. CIVIL ENGINEERING PART I SEMESTER VII

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### DESIGN OF CONCRETE STRUCTURES-I

#### Teaching Scheme

Lectures: 4 Hrs/Week

Practical: 2 Hrs/Week

#### Examination Scheme

Theory Paper: 100 Marks

Term Work: 25 Marks

#### Course Objective:

1. To understand the concept of RCC structural design
2. To conceive the elementary design of different structural elements.

**Course Outcome:** After successful completion of course student will be able to

1. Convey the concepts of structural design procedure
2. Design the individual members and hence building.

### SECTION- I

#### Unit : 1

(08)

Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Different design philosophies, various limit states, Characteristic 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

(08)

a) 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.

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

### SECTION- II

#### Unit : 4

(08)

a) Design of slabs: Cantilever Slab, Simply supported One way slab, Two way slab with different support conditions as per IS:456-2000

b) Design of Simply Supported single flight and Dog legged staircase.

**Unit : 5**

**(08)**

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

**Unit : 6**

**(08)**

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

**Term work:** At least two assignments on each unit

**Reference books :**

1. IS 456-2000, Relevant Special publications of BIS
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

## B. E. CIVIL ENGINEERING PART I SEMESTER VII

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### EARTHQUAKE ENGINEERING

#### Teaching Scheme

Lectures: 3 Hrs/Week

Practical: 2 Hrs/Week

#### Examination Scheme

Theory Paper: 100 Marks

Term Work: 50 Marks

#### Course objectives:

1. To understand behavior of earth during earthquake.
2. To understand the concepts of mathematical modeling.
3. To understand dynamic behavior of structure.
4. To understand earthquake resistant philosophy of structure.
5. To understand modern techniques of earthquake resistant method.

#### Course Outcomes:

Students will be able to

1. prepare mathematical modeling of structure.
2. design earthquake resistant structure.
3. know the concept of modern techniques.

### 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**

**Part A :**

**(04)**

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

**Part B :**

**(06)**

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

**Unit : 5**

**(04)**

Masonry Structures: Behavior of unreinforced masonry and reinforced masonry, RC bands, vertical reinforcement, openings, Provisions of I.S. 4326, Repairs and strengthening of masonry and RC members.

**Unit : 6**

**(06)**

Introduction to Earthquake resistant modern techniques – Base Isolation- Elastomeric, Sliding, Combined.

Seismic Dampers - Friction Dampers, TMD, Visco elastic dampers.

**Term work:**

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 - Manish Shrikhande and Pankaj Agarwal, Prentice Hall of India Pvt Ltd, New Delhi
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

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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.
17. IITK-BMTPC Earthquake Tips, National Information Centre of Eartquake Engineering, IIT Kanpur.
- 18 Earthquake Resistance Design of Structure – Vinod Hosur, Wiley Publication

**QUANTITY SURVEYING AND VALUATION**

**Teaching Scheme**

Lectures: 3 Hrs/Week

Practical: 4 Hrs/Week

Paper duration: 4 hr.

**Examination Scheme**

Theory Paper: 100 Marks

Term Work: 50 Marks

Oral Exam: 25 Marks

**SECTION- I**

**Unit : 1**

**(05)**

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**

**(07)**

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, labor. Task work, schedule as basis of labor 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**

**(10)**

a) Detailed estimate of buildings, R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works.

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) Preparation of schedule for steel as reinforcement.

**SECTION- II**

**Unit : 4**

**(07)**

- a) Contracts, Types of Contracts, 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) 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.
- c) Introduction to non conventional contract such as B.O.T, B.O.O.T, B.O.L.T.
- d) Introduction to Indian Arbitration and conciliation Act 1996.

**Unit : 5**

**(06)**

- a) Principles of valuation, definition of value, price and cost. Attributes of value, Different types of values. 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.
- c) 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.

**Unit : 6**

**(05)**

**Valuation Methods**

- 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 base.
- e) Comparison method.
- f) Depreciation, different methods of calculating depreciation – straight line method, declining balance method, sinking fund method, quantity survey method. Depreciated cost, Obsolescence.

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

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### **Term Work:**

1. Detailed estimate of G + 1 Framed Structure.
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 ten civil engineering items.  
(One each from Roads, Irrigation works, Water Supply & Sanitation & seven from buildings)
5. Rate Analysis of ten civil engineering items.
6. Schedule of reinforcement for the following
  - a) Beams
  - b) Slab,
  - c) Staircase
  - d) Column & Column footing
7. Preparation of contract document for building mentioned in Term Work 1.
8. At least one assignment based on software application.

### **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 – hakroborty 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. schedules of rates.

**PROJECT MANAGEMENT AND CONSTRUCTION EQUIPMENTS**

**Teaching Scheme:**

Lecture: 3 hours per week  
Practical: 2 hours per week

**Examination scheme:**

Theory paper: 100 marks  
Term Work: 25 marks  
Oral Exam: 25 marks

**Course Outcomes:**

On completion of this course, students will be able to-

1. Understand the importance of Project Management tools.
2. Plan and Schedule the Project by using CPM, PERT and MSP.
3. Understand the working of various construction equipments.
4. Know the importance of Safety and Risk Management in Construction.

**SECTION I**

**UNIT 1:** **(10)**

1. Project Management – Objectives, Agencies, Phases; Work Breakdown Structure.
2. Project Planning - Bar Chart, Mile Stone Chart, CPM
3. Development of CPM Network – Time Estimates, Floats, Critical Path.
4. Network Compression, Resource Allocation- (Concept only), Network Updating

**UNIT 2:** **(06)**

1. PERT - Concept of Probability, Normal and Beta Distribution, Time Estimates, Slack, Probability of Project Completion
2. Precedence Network: Concept only.
3. Introduction to Management Software- MSP.

**UNIT 3:** **(04)**

1. Safety Engineering – Importance of Safety, Classification of Accidents, Causes of Accidents, Safety Policy, Safety Organization, Safety Plan, Safety Training, Various Safety Equipment used on site.
2. Risk Management – Definition, Types, Risk Identification Process, Sources of Risk, Risk Classification, Risk Mitigation- Risk Reduction, Risk Acceptance, Risk Avoidance.

**SECTION II**

**UNIT 4: (08)**

Mechanical v/s manual construction, Excavation in Earth: Earth moving equipment- Tractors, Bulldozers, Scrappers, Power shovel, Hoes.

**UNIT 5: (06)**

Drag line, Clamshell, Trenchers, Compactors, Tippers, Cranes.

**UNIT 6: (06)**

1. Excavation in hard rock: Rippers, Jack Hammers, Drills, Compressors and Pneumatic Equipment.
2. Blasting Explosives, Detonators, Fuses, Drainage in excavation –Necessity and Methods of Dewatering.

**Term work**

1. Two assignments on each unit of Section I and one assignment on each unit of Section II.
2. Planning and Scheduling of a Small Project by using MSP.

**References:**

1. Project Planning and Control with PERT and CPM – Dr. B. C. Punmia and K. K. Khandelwal.
2. PERT and CPM: Principles and Applications – L. S. Srinath
3. Construction Project Management – K. K. Chitkara
4. Construction Project Management – Kumar Neeraj Jha
5. Construction Engineering and Management – S. Seetharaman.
6. Construction planning equipment and methods—R.L. Peurifoy
7. Heavy Construction – Planning ,Equipment, Methods—Jagman Singh
8. RAMP – Risk Analysis and Management of Projects by Institution of Civil Engineers and the Faculty of Institute of Actuaries, Thomas Telford Publication, London.
9. Construction Safety Manual Published by National Safety Commission of India.
10. Safety Management in Construction Industry – A Manual for Project Managers by NICMAR, Mumbai.
11. Concerned ISI for Safety in Construction – Bureau of Indian Standards.

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

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

#### **Teaching Scheme**

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

#### **Examination Scheme**

Term Work: 50 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 shall be allotted Maximum TWO groups 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 SEMESTER VII**

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### **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-II 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.**

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

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**ELECTIVE -I**

<b>Sr. No.</b>	<b>Name of Subject</b>
1.	Advanced Structural Analysis
2.	Experimental Stress Analysis
3.	Advanced Foundation Engineering
4.	Advanced Traffic Engineering
5.	Open Channel Hydraulics
6.	Advanced Engineering Geology
7.	Remote Sensing and GIS Applications in Civil Engineering
8.	Solid Waste Management
9.	Optimization Techniques
10.	Ground Improvement Techniques

**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

**SECTION- I**

**Unit : 1** (05)

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

**Unit : 2** (10)

Beams Curved in Plan : Determinate and Indeterminate beams curved in plan. Fixed Arches : Analysis of fixed arches by Elastic Center Method

**Unit : 3** (05)

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

**SECTION- II**

**Unit : 4** (06)

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

**Unit : 5** (09)

Analysis of Space Trusses by Tension Coefficient Method  
Analysis of Secondary Stresses in Plane Frames

**Unit : 6** (05)

Unsymmetrical Bending and Shear Center

## B. E. CIVIL ENGINEERING PART I SEMESTER VII

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### **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
- Design of Steel Structures- B.C.Punmia, A.K.jain, Laxmi Publication(p)  
Ltd.Delhi

**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

**SECTION- I**

**Unit : 1**

**(08)**

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

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 : 2**

**(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 : 3**

**(05)**

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 : 4**

**(06)**

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 : 5**

**(07)**

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

## B. E. CIVIL ENGINEERING PART I SEMESTER VII

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

### **Unit : 6**

**(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.

### **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

**ELECTIVE – I**

**ADVANCED FOUNDATION ENGINEERING**

**Teaching Scheme**

Lecture : 3 hrs/Week

Practical : 2 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

Term Work : 25 marks

**SECTION- I**

**Unit 1: (06)**

Shallow foundations- Types, Depth of foundation, calculation of bearing capacity by various approaches (Terzaghi, IS code method), Proportioning of footing (isolated, combined rectangular and combined trapezoidal), Eccentrically loaded footing, Calculation of foundation settlement (immediate and consolidation settlement).

**Unit 2: (07)**

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

**Unit 3: (07)**

Deep foundation: Classification of piles, Calculations of load capacity of single pile by static and dynamic formulae, Group action of piles, Negative skin friction and its estimation, Under reamed piles, Settlement of piles, Cyclic pile load test

**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: (06)**

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 of cofferdams

**Unit 6:**

**(08)**

Foundations in difficult soils and soil stabilization: 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

Soil stabilization: Mechanical stabilization, cement stabilization, lime stabilization, bituminous stabilization, chemical stabilization, stabilization by grouting

**Term Work:**

1. At least one assignment on each unit.

**Reference books :**

1. Bowles.J.E, Foundation Analysis and Design Mc 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



**ELECTIVE I**

**ADVANCED TRAFFIC ENGINEERING**

**Teaching Scheme**

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

**Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks

**Course learning objectives:**

1. Provide an insight on traffic and its components, factors affecting road traffic.
2. Provide an insight on traffic movements and speed studies.
3. Provides clear understanding on conducting various types of traffic surveys, data collection, analysis, inference and presentation.
4. To identify the role of various modes of Mass Transportation like Bus and Rail and its Planning and Management.
5. Learn the objectives, benefits in ITS and functional areas in ITS.

**Course learning outcomes:**

After the completion of the course students should be

1. Able to acquire and apply knowledge of traffic, its components, factors affecting road traffic.
2. Able to analysis traffic speed study data and its presentation.
3. Able to apply the knowledge of sampling data in conducting various surveys and analysis.
4. Able to understand various modes of mass transit system.
5. Able to appreciate the advantages of ITS and suggest the appropriate technologies for field conditions

**SECTION- I**

**Unit: 1**

**(05)**

**Introduction:** Infrastructure & its role in developing society; Transport sector in India – policy framework; Development plans – Airports, Highways – National highway development program (NHDP); JNNURM, Asian highways network(AH).

**Unit: 2**

**(07)**

**Traffic characteristics:** Traffic characteristics – Road user characteristics, General human characteristics, Physical characteristics. Vision eye – movement peripheral vision, Visual attention, Visual sensitivity to light and

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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: 3**

**(08)**

**a) Traffic Engineering & Speed Analysis:** Introduction, Speed studies, journey time and delay studies, Sampling in traffic studies & application, Traffic surveys-types of volume count Planning, Problems on PCU, moving observer method and spot speed.

### **b) Traffic operation and management.**

Traffic systems management and Travel demand management - Congestion management-Cost effective management measures, Traffic control aids, Street furniture, Road Arboriculture-Traffic Regulation, Traffic Sign and Road Markings.

## **SECTION II**

### **Unit: 4**

**(06)**

**Trip generation and distribution:** Factors governing trip generation and attraction –Application of Regression Analysis- Methods of trip distribution; Growth and Synthetic Models Calibration and Application of gravity model.- Category analysis.

### **Unit: 5**

**(08)**

**a) Introduction to intelligent transportation systems (ITS)** – Definition, Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques –Detectors, Automatic vehicle location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection.

**b) ITS functional areas** – Advanced traffic management systems (ATMS), Advanced traveller information Systems (ATIS), Commercial vehicle operations (CVO), Advanced vehicle control systems (AVCS), Advanced Public transportation systems (APTS), Advanced rural transportation systems (ARTS).

**Unit: 6**

**(06)**

**Public transport system**

History and role of Transit, Transit system and transit mode characteristics, Transportation technology Vision-2020, Role of various modes of Mass Transport and their Impact, Indian condition Bus Rapid Transit Systems (BRTS)-Rapid transit rail-Metro&Mono rails.

**Term Work:**

Assignment on each unit

**On field practices.**

- 1) Volume study
- 2) Spot speed study
- 3) Parking study
- 4) Marking study

**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. ParthaChakroborty 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

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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. Papacostas, C.A., Fundamentals of Transportation Engineering', Prentice-Hall of India Private Limited, New Delhi.2000.
13. Road Development Plan, Indian Road Congress, November 2000.
14. [www.nhai.org](http://www.nhai.org)

**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

**Course Outcomes:**

After successful completion of this course, student will be able to:

- 1) Understand the stratigraphic sequence of India.
- 2) Understand and apply the knowledge of tectonic activities in Deccan traps.
- 3) Acquire and apply knowledge of the preliminary geological investigations for civil engineering projects.
- 4) Study the behavior of subsurface water and acquire knowledge of natural resources and environmental impact of civil engineering structures.
- 5) Develop skills to apply geophysical methods for geological investigation of civil engineering sites.

**SECTION- I**

**Unit 1:**

**(05)**

**STRATIGRAPHY AND INDIAN GEOLOGY:** 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:**

**(06)**

**SEISMIC ACTIVITY OF DECCAN TRAP 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.

**Unit 3:**

**(09)**

**SUBSURFACE EXPLORATION:** Various steps in the geological studies of project site, Engineering consideration of structural features. Exploratory drilling—observations, preservation and limitations, core logging, Graphical representation, Bore hole problems.

**SUBSURFACE WATER:** Groundwater—aquifer parameters, water bearing

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capacity of common rocks, springs, cone of depression and its significance in civil Engineering, Natural and artificial recharge of aquifers, Saline water intrusions - control and prevention. Interpretation of groundwater quality based on Piper trilinear, Gibbs, Wilcox and USSL diagrams.

### SECTION- II

#### Unit 4:

(08)

**ENGINEERING GEOLOGY OF DECCAN TRAPS:** 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 and fractures, red bole, tachylitic basalt and Volcanic breccia. Laterites-Origin, occurrence and engineering aspects. Occurrence of groundwater in Deccan Trap region, Geological conditions suitable and unsuitable for construction of percolation tanks. Nature of alluvium and sand of Deccan Trap region, Scarcity of sand in Deccan Trap area.

#### Unit 5:

(06)

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

#### Unit 6:

(06)

**RESOURCE ENGINEERING:** Renewable and non renewable resources, Coal and Petroleum-- genesis, occurrence and reserves in India, Geothermal energy.

**ENVIRONMENTAL GEOLOGY:** Environmental implications of dam, road and canal construction.

#### **Term Work:**

The term work shall consist of the laboratory work based upon following experiments. [Any 8]

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.

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5. Core logging of exploring drill hole.
  6. Study and constructions of sections based upon drill holes data.
  7. Problems on width of outcrop.
  8. Structural geological maps with faults and inclined dykes.
  9. Use of electrical resistivity method for determining depth of bedrock or groundwater.
  10. Various case studies of engineering geological investigations.
- Educational study tour to the places important from civil engineering point of view.

### 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. Environmental Geology,-Indian Context By K. S. Valdia, TMcGH Publishing company Ltd., New Delhi.
10. Engineering and General Geology-By Dr. P. T. Sawant, New India Publishing Agency, New Delhi.
11. Principles of Engineering Geology and Geotechnics- By D. P. Krynine & W. R. Judd, CBS Publishers & Distributors, New Delhi.

**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

**SECTION- I**

**Unit : 1**

**(06)**

**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**

**(08)**

**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**

**(06)**

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

Transitions and contractions in open channel flow, Subcritical & Supercritical flow through sudden transitions and constrictions, Standing wave flume, Flow between bridge piers, Flow through culvert, Flow through Trash Racks.



**SECTION- II**

**Unit : 4**

**(06)**

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

**Unit : 5**

**(08)**

**a) Dispersion in Open Channels:** Diffusion and dispersion, Some classical solutions of the diffusion equation, Discharge measurement using tracer techniques

**b) Hydraulics of Mobile Bed Channels:** Initiation of motion of sediment, Bed forms, Sediment Load,design of Erodible Channels, Regime Theory for Alluvial Channels

**Unit : 6**

**(06)**

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

**Term Work:**

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 McGraw Hill Publsh. Co. Ltd.
- 4 Flow in Open Channels: By, K. Subramanyam, Tata McGraw Hill Publsh. Co. Ltd.
- 5 Open-Channel Flow: By, M. HanifChaudhary, Prentice-Hall International Publications

**ELECTIVE – I**

**REMOTE SENSING AND G.I.S IN CIVIL ENGINEERING**

**Teaching Scheme**

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

**Examination Scheme**

Theory Paper: 100 Marks  
Term Work : 25 marks

**Course Objectives:**

1. To study the evolution of Remote Sensing and G.I.S
2. To get a basic and advanced level insight into the approach of latest remote sensing techniques.
3. To Understand the subject of Geographical information system as an extension of application software in civil engineering

**Course Outcomes:**

On successful completion of this course students will be able to,

1. Adopt the principles of physics of Electromagnetic radiation as applied to remote sensing.
2. Learns the interrelationship of civil, environmental and geological studies.
3. Formulate and apply remote sensing and GIS concepts to engineering problems.

**SECTION- I**

**Unit : 1**

**(04)**

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, Data requirements of users. Topo sheets, Evolution of G.I.S. Technology.

**Unit : 2**

**(08)**

Space System: Technique of aerial photography, Photographic flight mission, Factors influencing flight mission, Numbering of aerial photographs.  
Remote Sensing Technique of satellite imaging - Important units of satellite and functioning of satellite, height, and coverage. Stages in remote sensing,

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Electromagnetic radiation, and electromagnetic spectrum, Interaction of electromagnetic radiation with atmosphere and earth surface. Sensors, Types of Resolutions used in remote sensing. Introduction to the application of computer in analysis of satellite pictures, Digital Image processing.

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

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, Landforms developed due to structural features like dip strike, fractures, faults, folds etc.

## **SECTION- II**

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

**G.I.S**-Fundamentals of GIS, Definition, Components, Types of data inputs in GIS, spatial data, thematic characteristics, rasters and vectors, databases and database management.

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

Application of RS and G.I.S in Civil Engineering: In the study and selection of site or hydraulic structures, Application in urban planning. Use in Landslide, Application in transportation engineering.

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

Application of RS and G.I.S in water Resources Studies: Surface water delineation, study of floods, surface keys for subsurface water. Delineation of these keys on aerial photographs, Steps in water investigations of the area.

Application of RS and G.I.S in Environmental Studies: Land use study, Terrain analysis, and soil mapping with the help of remote sensing techniques, Applications in delineating forest areas.

### **Term Work:**

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

1. Study of topo sheets.
2. Preliminary study of aerial photographs – scale, ground coordinates, and mosaic.
3. Determination of elevations of different points with the help of mirror stereoscope and parallax bar.
4. Study of drainage density, drainage pattern, watershed from Soil and water Maps.
5. Ground truth data collection using Total station and G.P.S.
6. G.I.S- Open Source Quantum GIS for practical's.
  - a. Georeferencing of toposheets.
  - b. Vectorisation (digitization) of raster Images.
  - c. Converting Google map kml files into shape files.

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) and (1975)
- 2) Remote Sensing, Principles and Interpretation –F. F. Sabins, W. H. Freeman &co.
- 3) Principles of Geomorphology – W. D. Thornbury – John Wiley and Sons, INC.
- 4) G.I.S- Anji Reddy , publishers- MGH
- 5) Remote sensing in Civil Engineering – T. J. M. Kennie and M. C. Mathews, Surry University press, London.
- 6) Remote Sensing and Image Interpretation- Thomas M. Lillesand and R.W. Kiefer, Wiley & Sons Insc.
- 7 ) Remote Sensing of the Environment – John R. Jensen, Pearson Education Inc
- 8) Principles of Remote Sensing- P.N.Patel and Surendra Singh, Scientific Publishers, Jodhapur.
- 9) Text book on Remote Sensing –C.S.Agrawal and P.K.Garg,Wheeler Publishing, New-Delhi.
- 10) Introduction to geomatics –QGIS user guide – Mr.C.V. Nishinkanth, Mrs.Annu Nishinkanth, Dr S S Vasudevan, Dr P Ramkumar, Publishers-

**ELECTIVE – I**

**SOLID WASTE MANAGEMENT**

**Teaching Scheme**

Lecture: 3 hrs/Week

Practical: 2 hrs/Week

**Examination Scheme**

Theory Paper: 100Marks

Term Work : 25 marks

**Course Outcomes:**

At the end of successful completion of course, the students will be able to--

1. State the importance of solid waste management.
2. Describe different types and sources of solid waste.
3. Illustrate different solid waste collection methods & process.
4. Identify the various process of Solid waste
5. Understand the disposal of solid waste by sanitary land filling, Composting, and Incineration methods

**SECTION- I**

**Unit: 1**

**(06)**

Solid waste management: Introduction, rule & regulation, present status, objectives, effects, sources, types, refuse analysis, composition and quantity of refuse.

Introduction to Biomedical waste & Hazardous waste management

**Unit: 2**

**(09)**

Functional outline of solid waste management, Generation rate, Factors affecting generation rate, different methods of collection, collection systems, Storage, transfer and transportation of refuse.

**Unit: 3**

**(05)**

Solid waste processing techniques, reduction, segregation, recovery of by – products, recycling & reuse of solid waste.

**SECTION- II**

**Unit: 4**

**(07)**

Sanitary landfilling - Introduction, components of landfilling, methods of landfilling, site selection, construction techniques, maintenance and

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precautions, landfill gas and leachate and its control measures, Closure & end-use.

### **Unit: 5**

**(07)**

Composting-Theory, types of composting, factors governing composting, mechanical composting plant, recovery of Bio – gas energy.

### **Unit: 6**

**(06)**

Incineration -Theory and types of incinerators, site selection criteria, factors affecting incineration, pyrolysis and its by-products, Energy recovery, Air pollution and its control.

### **Term Work:**

1. Assignment on each unit.
2. Visit to solid waste processing plant & its report.

### **References:**

- 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 on Solid Waste Disposal – Techabonglaus
- 6 Manual on Municipal Solid Waste Management by Ministry of Urban Development, Govt. of India.

**ELECTIVE - I**

**OPTIMIZATION TECHNIQUES**

**Teaching Scheme**

Lecture : 3 hrs/Week

Practical : 2 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

Term Work : 25 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.

**Term Work:**

At least one assignment based on each unit.

**Reference books :**

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

**ELECTIVE - I**

**GROUND IMPROVEMENT TECHNIQUES**

**Teaching Scheme**

Lecture: 3 hrs/Week

Practical: 2 hrs/Week

**Examination Scheme**

Theory Paper: 100Marks

Term Work : 25 marks

**Course objectives:**

1. Convey the importance of ground improvement to the students
2. Make the students familiar to the different ground improvement techniques
3. Make the students understand the theoretical background for different ground improvement techniques such as stone column, soil nailing
4. To elaborate the design methods for some ground improvement techniques
5. Make the students aware of the applications of ground improvement techniques

**Course outcomes:**

At the end of course, following will be the outcomes:

1. Students would have understood the importance of the ground improvement
2. Students would be familiar with different ground improvement techniques
3. Students would have conceptual clarity regarding the different ground improvement techniques
4. Students would be in position to design stone column and reinforced retaining wall
5. Students would be aware of application areas for different ground improvement techniques

**Unit 1**

**(07)**

Definition of ground improvement, objectives, classification of ground improvement techniques, suitability of different techniques, preloading: need, preloading without vertical drain, preloading with vertical drain, dynamic consolidation

**Unit 2**

**(06)**



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Stone column, Design of stone column: unit cell concept, area replacement ratio, spacing and diameter, depth, stress ratio, Load bearing capacity of individual stone column, settlement of stone column, Failure mechanism

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

Ground anchors, components, load transfer mechanism, rock anchors, anchors in granular soil, anchors in cohesive soil, Rock bolt, types, action of rock bolt, Soil nailing, analysis of nailed soil

## **SECTION II**

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

Soil stabilization: cement, lime, fly ash, factors affecting. Grouting: classification, types of grouts, equipments, grouting design and layout, applications, case histories

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

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

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

Geosynthetics – Types, functions, Application of geosynthetics: reinforcement, separator, filter, drainage, Selection of geosynthetics; damage and durability of geosynthetics.

### **Term Work:**

At least one assignment based on each unit.

### **References:**

1. Ground improvement techniques by Dr. P Purushothma Raj
2. Ground improvement by Klaus Kirsch
3. An introduction to ground improvement engineering by Satyendra Mittal
4. Ground improvement techniques by NiharRanjanPatra
5. Reinforced soil and its engineering applications by Swami Saran
6. Earth reinforcement and soil structures by Colin JFP Jones
7. An introduction to soil reinforcement and geosynthetics by G. L. SivakumarBabu
8. Geotechnical engineering by Shashi K Gulhati and ManojDatta

**B. E. PART-II (SEMESTER-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

**Course Objectives:**

3. To study the concept of torsion, Design for torsion, Design of continuous beams, design of water tanks
4. To study concept of prestressed concrete, losses in prestress, analysis & design of prestressed concrete sections.

**Course Outcomes:**

After successful completion of course student will be able to design -

3. Sections subjected to torsion
4. Continuous beams/ slabs
5. Water tanks resting on ground
6. Prestressed concrete sections

**SECTION- I**

**Unit : 1**

**(07)**

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**

**(08)**

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

**Unit : 3**

**(09)**

Design of water tank - Introduction to working stress method for water tank design, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks with flexible and rigid joint between wall and floor, (ii) rectangular water tanks.

**SECTION- II**

**Unit : 4**

**(08)**

Basic concept of prestressing. Historical development. Types and systems of prestressing. Analysis of rectangular and symmetrical I sections. Different cable profiles.

**Unit : 5**

**(06)**

Losses of prestress in Pre & Post tensioned members. Flexural strength of prestress concrete section

**Unit : 6**

**(10)**

Design of prestress concrete - rectangular and Symmetrical I sections for following criteria:

(i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.

**Term Work:**

At least one assignment on each unit.

**Reference books :**

1 IS: 456-2000

2 IS:1343, IS 3370

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

**WATER RESOURCES ENGINEERING-II**

**Teaching Scheme**

Lectures: 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)**

**Introduction to dams:**

Types of dams, selection of site for dams, selection of type of dam, Storage Calculations using mass curves, Area elevation curve & Elevation capacity curve, Control levels, silting of reservoirs, control of Losses in reservoirs.

**Earthen dam:** Types of earthen dams, Components and their functions, methods of construction of earthen dam, Design criterion, plotting of phreatic line, Modes of failure, seepage control measures-Drainage & filters, stability of slopes for sudden drawdown & steady seepage.

**Unit- 2**

**(07)**

**Gravity Dams:** Forces acting on dam, Design Criterion-theoretical and practice profile, high and low dam, fixing section of dam, stability analysis, and methods of construction, galleries and joints in dams. Arch dams- Introduction & types only. Introduction to instrumentation in dams.

**Unit-3**

**(05)**

**Spillway:** Necessity and function components of spillway, different types, factors affecting choice of type of spillway. Elementary hydraulic design, types of energy dissipation arrangements, gates for spillway.

**Outlets in Dams:** Outlets through concrete and earth dams, different types.

**SECTION II**

**Unit-4**

**(06)**

**Diversion Head Works:** component parts & their functions, types of weir and barrages, Causes of failure and remedies, Introduction to Theory of seepage- Bligh's creep theory, critical exit gradient, Khosla's theory,

**Unit-5**

**(07)**

**Canals:** Types, alignment, typical sections of canals, balancing depth Kennedy's and Lacey's silt theories, canal lining-purpose, types, selection and economics.

**C.D.Works:** Necessity, Types.

**Canal Regulatory Works:** head regulator, cross regulator, canal fall, canal escape, standing wave flume.

**Unit-6**

**(07)**

**River Engineering:** Classification and types of river, meandering phenomenon,

**River training works:** Classification-Marginal bunds, Guide banks and Groynes.

River navigation. Interlinking of rivers, National perspective plan.

**Elements of hydro-power:** Hydro-power & importance, typical layout & functions of components parts-Intakes, conveyance system, surge tanks, Power house, Tail race, Types of hydro-power plants.

**Term work:**

Ten assignments of the following

1. Determination of height of dam: demand/supply reservoir calculation and control levels and free board
2. Earthen dam: Determination of section (drawing of one plate), one slip circle calculations, Types of failure
3. Gravity dam: Forces acting, Modes of failure,
4. Gravity dam: Elementary and practicle profile with stability calculations (drawing of one plate) types of arch dam.
5. Spillway: Geometrical section, energy dissipation arrangement and gates, Outlet through earth dam and gravity dam.
6. Typical section diversion headwork, Blighs & khoslas theory.
7. Typical sections of canal, kenedy & lacey's theory
8. Types of CD work and canal regulatory works
9. Different types of river training work, Interlinking of rivers
10. Atypical layout & components parts of Hydropower plant and its functioning
11. Report based on field visit to dam & CD work.

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

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### **Recommended books:**

1. Priyani, 'Irrigation and water power', Charotar Publication, Anand.
2. Punmia, 'Irrigation and water power engineering', 1986. Standard Publications, New Delhi.
3. U.S.B.R., Oxford and IBH Publ.Co. 'Design of small dams';
4. Justinn, Creager and Hinds, 'Engg.For Dams.Vol.I, II, III'
5. Bharat Singh,'Irrigation', New Chand and Bros., Roorkee.
6. Varshney, 'Design of hydraulic structures'.
7. Leliavsky, 'Design of hydraulic structures,.
8. S.K.Garg, 'Irrigation Engg.'
9. P.N.Modi. 'Irrigation and water power engineering'
10. Satyanarayan Murty, 'Water resources Engg', New age international private Ltd.
11. River Behaviour and Management and Training,-CBIP publication.

## B. E. CIVIL ENGINEERING PART II SEMESTER VIII

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### TRANSPORTATION ENGINEERING-II

#### Teaching Scheme

Lectures: 3 Hrs/Week

#### Examination Scheme

Theory Paper: 100 Marks

#### Course learning objectives:

1. Provides a basic knowledge on Urbanisation and its trend.
2. Deals with different types of plan, its implementation, regional development and management for sustainable urban growth.
3. To expose the various aspects of planning and designing of rail transportation system.
4. Identify the input parameters required for design of a bridge structures.

#### Course learning outcomes:

1. Able to understand importance of town planning and its past trends.
2. Able to understand with a different types of urban strategies and management for sustainable urban growth.
3. Decide the selection of a bridge structures; list the factors affecting, design of a various parameters of bridge structures.
4. Able to understand railway engineering design parameters and its importance.

### SECTION- I

#### Unit: 1

(05)

- a) Necessity and scope and principles of Town Planning, 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

(08)

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),Rehabilitation of slum and urban renewal

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**Unit: 3**

**(07)**

- a) Development control rules with respect 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, superelevation, 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**

**(05)**

- 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, Safety in railways

**(B) Bridge Engineering**

**Unit : 6**

**(09)**

- 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.

## B. E. CIVIL ENGINEERING PART II SEMESTER VIII

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c)Types of bridge foundations, Bridge piers, Abutments, Wing walls, Bearings, Construction and maintenance of bridges-Introduction; Recent trends in bridges.

### **Reference books :**

- 1 Town and country Planning-G.K. Hiraskar& K. G. Hiraskar, By DhanpatRai 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.

**STRUCTURAL DESIGN AND DRAWING-II**

**Teaching Scheme**

Practical: 4 Hrs/Week

**Examination Scheme**

Term Work: 50 Marks

Oral Exam: 25 Marks

**Course Objectives:**

1. To apply holistic approach of planning, analysis, segmentation & design of RCC building & other Civil Engineering Structures
2. To get an exposure to the method of analysis & design using software.

**Course Outcomes:**

After successful completion of course student will be able to

1. Translate the ideas into workable plans
2. Classify the components
3. Design the units & hence the structure as a whole
4. Draft the details for execution
5. To read and understand the supplied drawing for execution on site.

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 sq mt.) 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) Design of footing (Raft foundation /pile foundation)
3. Analysis and design of RCC framed structure using software.

**Note:**

At least one site visit to be conducted to show the onsite detailing.

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

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

#### **Teaching Scheme**

Practical: 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 group of to FIVE students. (As per AICTE Guide Lines)

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

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**ELECTIVE -II: STRUCTURE GROUP**

<b>Sr. No.</b>	<b>Name of Subject</b>
1.	Advanced Design of Concrete Structures
2.	Design of Industrial Structures
3.	Structural Design of Foundation and Retaining Structures
4.	Advanced Pre-stressed Concrete Design
5.	Design of Bridges
6.	Dynamics of Structures
7.	Finite Element Method

**ELECTIVE-II**

**ADVANCED CONCRETE DESIGN**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 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

**ELECTIVE-II**

**DESIGN OF INDUSTRIAL STRUCTURES**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**Objectives:**

The course deals with some of the special aspects with respect to Civil Engineering Structures in industries. At the end of this course the student shall be able to design some of industrial structures.

**SECTION- I**

**Unit : 1**

**(07)**

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

**Unit : 2**

**(07)**

Types of column configuration in case of knee-braced trussed bent with gantry loads. Design of stepped columns and bases under various load combinations.

**Unit : 3**

**(06)**

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

**SECTION- II**

**Unit : 4**

**(07)**

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

**Unit : 5**

**(07)**

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

**Unit : 6**

**(06)**

Open web frames for industrial shed.



**Term Work:**

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

**Reference books :**

1. Steel Designers Manual: ELBS Low Priced 4th Edition Year
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. Limit State Design of Structural Steel, M.R. Shiyekar, PHI Learning Pvt. Ltd., Second Edition, 2013
6. Handbook of Machine Foundation , Shrinivasulu P. and Vaidyanathan C. Tata McGraw Hill , 1978.
7. SP:6 -1964, Handbook for Structural Engineers.
8. IS 800:2007, Code of Practice for General Construction in Steel.

**ELECTIVE-II**

**STRUCTURAL DESIGN OF FOUNDATION AND RETAINING STRUCTURES**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(07)**

Combined footings: Introduction, necessity and types of combined footings, design of slab type and slab-beam type of combined footing

**Unit : 2**

**(05)**

Pile foundations: Types, design and placement. Design of pile caps for 3, 4 and 6 piles group.

**Unit : 3**

**(08)**

Raft foundation: Introduction, necessity and types of raft or mat foundation. 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: Introduction, Functions and types of retaining walls. Analysis and design of RCC cantilever type of retaining wall for various types of backfill conditions

**Unit : 6**

**(05)**

Break Waters: Design and methods of construction

## B. E. CIVIL ENGINEERING PART II SEMESTER VIII

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### **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 HandBook” 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 HillBook 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 & IBHPublishing Co. Pvt. Ltd., New Delhi
7. Swami Saran, “Soil Dynamics and machine foundation”, GalgotiaPublications 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 HillBook Company”

**ELECTIVE – II**

**ADVANCE PRESTRESSED CONCRETE DESIGN**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1 (08)**

- 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 (08)**

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, Bond in prestressed concrete.

**Unit : 3 (04)**

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

**SECTION- II**

**Unit : 4 (04)**

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

**Unit : 5 (08)**

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

**Unit : 6 (08)**

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

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

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### **Reference books:**

1. IS 1343: Code of Practice for Prestressed Concrete by Bureau of Indian Standards.
2. Guyon Y.: Prestressed Concrete, Vol. I & II, John Wiley and Sons, New York.
3. Krishna Raju, N.: Prestressed Concrete, Tata McGraw Hill Publications Company, New Delhi.
4. Lin T. Y.: Prestressed Concrete, Tata McGraw Hill, New Delhi.
5. Dayaratnam P., Prestressed Concrete Structures.

**ELECTIVE-II**

**DESIGN OF BRIDGES**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(04)**

Introduction & Brief History of bridges, Classification, Importance of bridges, Components 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, Repair, Strengthening, and Rehabilitation of Existing Bridges

**Unit : 5**

**(08)**

Design of sub structure – Abutments, Piers, Approach slab.

**Unit : 6**

**(05)**

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

**Reference Books :**

1. Reinforced Concrete Structures – Vol. II by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
2. Concrete Bridge Practice, Analysis, Design and Economics by Dr. V. K. RAINA, Tata McGraw- Hills Publishing Company Limited.
3. Bridge Engineering by S. Ponnuswamy, Tata McGraw-Hills Publishing Company Limited.
4. Design of Bridges by N. Krishna Raju, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. IRC Codes – IRC: 5, IRC: 6, IRC: 18, IRC: 27, IRC: 45, IRC: 78, IRC: 83.

**ELECTIVE - II**

**DYNAMICS OF STRUCTURES**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(07)**

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

**Unit : 2**

**(06)**

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**

**(06)**

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**

**(07)**

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.
- Earthquake Resistant Design of R. C. C. Structures – S. K. Gosh

**ELECTIVE-II**

**FINITE ELEMENT METHOD**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**Objectives:**

FEM is a powerful tool for the numerical solution of a wide range of Engineering Problems. With advance in computer technology and CAD systems, complex problems can be modeled with relative ease. The section I of this course consists of understanding of basic concepts of FEM, Development of [k] for 1-D, 2-D and 3-D elements, relevant structural applications. The section-II consists of Isoparametric formulation of FEM, axisymmetrical elements.

**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)**

Basic Concept and Procedure of FEM. 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; Classification- Isoparametric, Sub-parametric, Super-parametric elements. 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 axi-symmetric elements.

**Term Work:**

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, Tata Mc Graw Hill co. New Delhi.
5. Introduction to Finite Element in Engineering – T R Chandrupatla and A D Belegundu University Press, India.
6. Finite Element Analysis- Theory and Programming- Krishnamurty-Tata McGraw Hill Co. Ltd. New Delhi.
7. Finite Element Analysis-S.S. Bhavikatti, New Age International Publisher, New Delhi.

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

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**ELECTIVE -III: NON-STRUCTURE GROUP**

<b>Sr. No.</b>	<b>Name of Subject</b>
1.	Pavement Analysis, Design and Evaluation
2.	Hydrology and Watershed Management
3.	Water Power Engineering
4.	Site Investigation, Methods and Practices
5.	Air Pollution and Control
6.	Industrial Waste Treatment
7.	Advanced Construction Techniques

**ELECTIVE-III**

**PAVEMENT ANALYSIS, DESIGN AND EVALUATION**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(07)**

**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**

**(07)**

**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 McLeod Method , CBR Method, including IRC: 37-2012.

**Unit : 3**

**(06)**

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

**SECTION- II**

**Unit : 4**

**(06)**

**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:58-2011 method of design, Design of continuously reinforced concrete pavements.

**Unit : 5**

**(07)**

**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**

**(07)**

**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.

**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.

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

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- 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.

**ELECTIVE - III**

**HYDROLOGY AND WATERSHED MANAGEMENT**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 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 : 4 (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 : 5 (07)**

**Water Harvesting**

Watershed: Concept and Characteristics, Elements of Watershed Management, Watershed Models, Water Conservation / Harvesting



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

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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 : 6**

**(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, VenkatRamanG.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)

**ELECTIVE - III**

**WATER POWER ENGINEERING**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(06)**

Introduction: Sources of energy, types of power station, types of hydro power schemes ,Estimation of hydro power available, gross head, net head, storage and pondage, 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 : 2**

**(07)**

Intake: types, hydraulics of intake, trash rack , transition from gate to conduit ,intake gates.  
Surge Tank : Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, forebay

**Unit : 3**

**(07)**

Water Conveyance Systems : Power canals – Hydraulic Design  
Pen-stock : types , hydraulic design and economic diameter pipe, supports, anchor blocks,  
Tunnels : classification, location and hydraulic design, tunnel linings.

**SECTION- II**

**Unit : 4**

**(07)**

Power station : General arrangements of power station, power house, sub-structure and super structure, main dimensions  
underground power station – necessity, types, development and economics. Advantages and disadvantages.

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### **Unit : 5**

**(06)**

Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitation, Tail Race ,draft tubes, function and types, Hydraulic Design

### **Unit : 6**

**(07)**

**a)** Pumped storage plants: purpose and general layout of pumped storage schemes, types, economics of pumped storage plants.

**b)** Tidal power stations: Classification , general description of different types, depression power plants.

### **Reference books :**

- 1 Water Power Development – E. Mosoni, 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 – Varshney
- 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, DhanpatRai and Sons

**ELECTIVE-III**

**SITE INVESTIGATION METHODS AND PRACTICES**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**Course Outcomes:**

At the end of successful completion of course, the students will be able to--

6. State the importance of site investigation in Civil Engineering process
7. Describe different site investigation methods
8. Illustrate different subsurface exploration by non destructive test
9. Identify the various Soil Exploration methods for soil sampling
10. Examine the various field and lab test on soil
11. Interpret how to write the technical report for site investigation

**SECTION- I**

**Unit: 1**

**(07)**

**Introduction to Site investigation:**

Introduction, the Importance of Site Investigation, Purposes of a Site Investigation, Objectives, Need for Site investigation, Advantages of Site Investigation, Phases in site investigation process, Approach to site investigation.

**Unit: 2**

**(07)**

**Methodology of site investigation:**

Preliminary site investigation: Preliminary desk study, Topographical maps, Geological records, Mining records, Air-photography and remote sensing, Photogrammetry, Air-photo interpretation, Site walk-over survey, Reconnaissance of site works.

**Unit: 3**

**(06)**

**Site Investigation using Non-Destructive Tests:**

Introduction, Electrical Methods, Magnetic Methods, Gravity Methods, Acoustic Emission Methods, Seismic Methods

**SECTION- II**

**Unit: 4**

**(06)**

**Site investigation using in situ testing:**

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Introduction, Penetration testing - Standard penetration test & Cone penetration test, Strength and compressibility testing - Field vane shear test, Pressure meter test, Plate loading test.

### **Unit: 5**

(07)

#### **Sampling:**

Introduction , Sample sizes, Soil Disturbance, Soil disturbance during drilling , Soil disturbance during sampling ,Disturbance after sampling , Undisturbed sampling techniques , Sand Sampling , Preparation of disturbed samples for testing ,Preparation of undisturbed samples for testing .

### **Unit: 6**

(07)

#### **Laboratory testing for site investigation:**

Introduction, Purpose of soil testing, Purpose & Significance of following test – Soil classification tests , Particle size distribution tests (Sieve analysis, Hydrometer analysis) , Plasticity tests (Liquid limit, Cone penetrometer test, Plastic limit) ,Compaction tests (Proctor compaction test) , Particle density(Specific gravity) determination ,Tests for Geotechnical parameters - Strength tests ( CBR test, Lab vane test, Direct shear test, Triaxial test) ,Seepage and permeability tests

**Technical Report writing**-Standard format for a site investigation report

#### **References:**

1. Site investigation by Clayton, Mathews and Simons
2. Site Investigation Practice by Joyce, M.D.; ESN. SPON Publishers, 1982.
3. Instrumentation in geotechnical engineering by K.R. Saxena and V.M. Sharma.
4. Hvorslev M.J. Subsurface exploration and sampling of soils for Civil Engg. purposes.
5. Geotechnical Engineering Investigation Manual by R.E. Hunt, Mc Graw Hill Co. New York
6. Geotechnical and Geophysical Site Characterization, An-Bin Huang, Paul W Mayne, CRC Press, 2008, ISBN 0415469368, 9780415469364.
7. Compendium of Indian Standards on Soil Engineering Parts 1 and II 1987 - 1988.

**ELECTIVE-III**

**AIR POLLUTION AND CONTROL**

**Teaching Scheme**

Lectures: 3 Hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**Course objectives-**

Upon completion of this course you should be able to:

1. Describe current air pollution issues;
2. Know the main air pollutants and its effect on human health and environment;
3. Understand the regulations and policies to manage air pollution;
4. Have knowledge of technologies used to control and remove air pollutants

**Out comes-**

Student will be able to

1. Scope of air pollution
2. Design air pollution control devices
3. Know the air pollution monitoring and regulatory control.

**SECTION-I**

**Unit: 1**

**(08)**

The structure of the atmosphere, Definition and Scope of Air Pollution, Sources of air pollution: Natural and artificial, Chemistry and Classification of pollutant, quantity and composition of particulate & gaseous pollutant, Unit of measurements.

**Unit-2**

**(04)**

Effect of different air pollutants on living and non-living things. Various air pollution Episodes.

**Unit- 3**

**(08)**

The meteorology and air pollution : Different Meteorological factors & their effect, lapse rate and stability of atmosphere, inversion phenomenon, various meteorological factors like precipitation & scavenging,

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

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humidity, temperature, wind patterns, direction, velocity and fluctuations, models of diffusion and dispersion plume behavior, stack height design.

### **SECTION-II**

#### **Unit: 4**

**(07)**

Introduction to application of software for air quality. 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: 5**

**(07)**

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

#### **Unit: 6**

**(06)**

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

#### **Reference books:**

1. Air Pollution- Wark and Warner
2. Air Pollution- Martin Crawford
3. Air Pollution and Industry – R.D.Ross
4. Rao, C.S.Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
5. Environmental engineering- By Peavy & Powe.
6. Air Pollution- Stern
7. Anjaneyulu, D., "Air Pollution and Control Technologies:", Allied Publishers, Mumbai, 2002.
8. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata-Mc Graw-Hill, New Delhi, 1996

**ELECTIVE - III**

**INDUSTRIAL WASTE TREATMENT**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(08)**

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. Miscellaneous methods of dissolved solids removal, sludge disposal methods

**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

**SECTION- II**

**Unit : 4**

**(06)**

Different types of waste treatment & their selections, Development of treatment flow diagram based on characteristics of waste  
Acclimatization of bacteria to toxic wastes, process sensitivity operation and maintenance requirements

**Unit : 5**

**(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 : 6**

**(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 McGraw Hill Publications.
- 2 Industrial Waste Treatment Nelson Meneroo
- 3 Industrial Waste Treatment Rao&Datta

**ELECTIVE - III**

**ADVANCED CONSTRUCTION TECHNIQUES**

**Teaching Scheme**

Lecture : 3 hrs/Week

**Examination Scheme**

Theory Paper: 100 Marks

**SECTION- I**

**Unit : 1**

**(07)**

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

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

**Unit : 2**

**(07)**

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

**Unit : 3**

**(06)**

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

**SECTION- II**

**Unit : 4**

**(06)**

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

**Unit : 5**

**(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 : 6**

**(08)**

- a) **Construction of concrete pavement** by techniques like vaccum processing, revibrated concrete, Roller –compacted concrete.
- b) **Use of techniques** like slip form paving in pavement construction; using Wet-MIX macadam in Road. Advanced Techniques, vaccum 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—Dandekarsharma
- 4 Bridge Engineering--- Raina
- 5 Bridge engineering Punnuswamy
- 6 Concrete Technology--- M.S. Shetty S.Chand publication

Shivaji University , Kolhapur

Syllabus Structure

B E Civil Engineering Semester VII and Semester VII

Subject Equivalences

Sr No	Subject in old syllabus	Subject in Revised Syllabus
<b>Semester I</b>		
1	Design of Concrete Structures -I	Design of Concrete Structures -I
2	Quantity Surveying and Valuation	Quantity Surveying and Valuation
3	Earthquake Engineering	Design of Earthquake Resistant Structures
4	Transportation Engineering	<b>Additional TWO Chances</b>
5	Elective I	Elective I
6	Project Work	Project Work
7	Report on Field Training	Report on Field Training
<b>Semester II</b>		
1	Town Planning and Transportation Engineering	<b>Additional TWO Chances</b>
2	Construction Practices	<b>Additional TWO Chances</b>
3	Design of Concrete Structures II	Design of Concrete Structures II
4	Elective II	Elective II
5	Elective III	Elective III
6	Structural Design and Drawing II	Structural Design and Drawing II
7	Project Work	Project Work