SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

CIVIL ENGINEERING

Syllabus for

B.E. (Civil Engineering) w. e. f. Academic Year 2015-16

w. e. f. Academic Year 2015-16

Solapur University, Solapur
Structure of B .E. (Civil Engineering)
w. e. f. Academic Year 2015-16.

B.E. (Civil Engineering) Semester –VII

Sr. No.	Subject	Teaching/Week					Examination scheme				
		L	Pr.	Tu.	Dr.	Total	Theory	TW	POE	OE	Total
1	Design of Concrete Structures-I	3	-	1	-	4	100	25	-	-	125
2	Quantity Surveying & Valuation	3	4	-	-	7	100	50	50	-	200
3	Earthquake Engg.	3	2	-	-	5	100	25	-	-	125
4	Water Resources Engg. II	3	2	-	-	5	100	25	-	25	150
5	Elective - I	3	2	-	-	5	100	25	-	25	150
6	Seminar	-	2	-	-	2	-	50	-	-	50
7	a) Project work b) Assessment of report on field training-II	-	2	-	-	2	-	25 25	-	-	25 25
Total		15	14	1	-	30	500	250	50	50	850

B.E. (Civil Engineering) Semester –VIII

Sr. No.	Subject	Teaching/Week					Examination scheme				
		L	Pr.	Tu.	Dr.	Total	Theory	TW	POE	OE	Total
1	Design of Concrete Structures-II	4	2	-	-	6	100	25	-	-	125
2	Construction Practices and Town Planning	4	-	-	-	4	100	25	-	-	125
3	Elective - II	3	2	-	-	5	100	25	-	25	150
4	Elective - III	3	2	-	-	5	100	50	-		150
5	R. C. C. Structural Design & Drawing-II	-	-	-	4	4	-	50	-	50	100
6	Project work	-	6	-	-	6	-	100	-	100	200
Total		14	12	-	4	30	400	275	-	175	850

Notes:

(1) Project group be of @ 7 students.

(2) Elective subject can be offered from the following list, if minimum 15 students opt for that subject.

(3) Term work assessment: Term Work assessment shall be a continuous process based on the Performance of the student in assignments, class tests, quizzes, attendance and interaction during theory and lab sessions, journal writing, report presentation etc., as applicable

B. E. (CIVIL) - LIST OF ELECTIVES

B. E. Civil Part-I		B. E. Civil Part-II			
ELECTIVE I		ELECTIVE II		ELECTIVE III	
5.1	Open Channel & River Hydraulics	3.1	Advanced Engg. Geology	4.1	Advanced Design of Steel Structures
5.2	Air Pollution & control	3.2	Ground improvement Techniques	4.2	Industrial Waste Treatment
5.3	Design of Foundations	3.3	Traffic Engg. & Control	4.3	Water Power Engg.
5.4	Advanced Design of Concrete Structures	3.4	Infrastructural Engineering	4.4	Advanced Concrete Technology
5.5	Managerial Techniques	3.5	Project Appraisal	4.5	Reliability Engg.
5.6	Computer Applications in Civil Engg	3.6	Solid and Hazardous & Waste Management	4.6	Finite Element Method
5.7	Advanced structures	3.7	Dynamics of Structures	4.7	Experimental Stress Analysis
5.8	Entrepreneurship	3.8	Environmental Management	4.8	Optimization Techniques
5.9	Remote Sensing and GIS Applications	3.9	Design of Bridges	4.9	Disaster Management

w. e. f. Academic Year 2015-16

. **B.E. CIVIL – PART- I**

1. DESIGN OF CONCRETE STRUCTURES – I

Teaching Scheme:

Lecture: 3 Hrs. / Week

Tutorials: 1 Hr. / Week

Examination Scheme:

Theory Paper: 100 Marks

Term work: 25 Marks

Course objectives:

1) To understand the concept of working stress and limit state methods
2) To gain the knowledge of limit state design for flexure, shear, bond and anchorage
3) To understand the behavior of columns subjected to eccentric load and use of interaction diagrams

Course Outcomes:

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

1) Use IS code of practice for the design of concrete elements
2) Design the beams, slab and columns
3) Design and prepare detailed drawings of various RCC structural elements

SECTION I

Unit 1: Introduction **(5)**

Philosophies of Design and their relative advantages and disadvantages, Types and classification of limit states, Characteristics strength and characteristics load, load factor, Partial safety factors. Limit State of Serviceability – Significance of deflection, I.S. Recommendations.

Unit 2: Design of Slabs (Limit state method) **(6)**

One Way, One way continuous, Two Way slabs with different end conditions as per IS Code, cantilever slab.

Unit 3: Limit state of Collapse (Flexure, Shear and Bond) **(6)**

Analysis and Design of singly and doubly reinforced rectangular sections.

Unit 4: Analysis and Design of Flanged Sections **(6)**

Analysis and Design of Singly and doubly Reinforced T & L Beams for flexure .

SECTION II

Unit 5: Design of Continuous beams **(6)**

Design of Continuous beams by Limit State Method.

Unit 6: Limit State of Collapse (Torsion): **(6)**

Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion, Design of beams for torsion.

Unit 7: Design of columns: **(10)**

Analysis and Design of axially and eccentrically (uni-axial) loaded Circular and Rectangular Columns, Introduction to biaxial bending of columns, Interaction diagrams, Circular columns with helical reinforcement.

Note:

1. Problems based on above syllabus shall be covered in tutorials.
2. Only IS: 456-2000 shall be allowed in University Exam.
3. Unless otherwise mentioned separately, all the design should be by Limit State method.

Text Books:

1. Limit State Theory & design –Karve & Shah Structures Pub., Pune
2. Reinforced Concrete Design (Limit State) - A.K. Jain
3. Reinforced Cement Concrete - B.C. Punmia
4. Design of R.C.C. structural elements by S.S. Bhavikatti (Volume I & II).

Reference Books:

1. IS: 456-2000
2. Fundamentals of Reinforced Concrete- Sinha & Roy
3. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi.
4. Handbook of Reinforced Concrete: SP- 16

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B. E. (CIVIL) PART – I

2. QUANTITY SURVEYING & VALUATION

Teaching Scheme:

Lecture: 3 Hrs / Week

Practical: 4 Hrs / Week

Examination Scheme:

Theory Paper: 100 Marks

Term Work: 50 Marks

POE: 50 Marks

Course objectives:

1) To study writing specifications for different items and preparing estimates of Civil Engineering works.
2) To learn methodology of rate analysis for different items of work
3) To grasp various methods for valuation of land and buildings
4) To grasp the idea of professional ethics.

Course outcomes:

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

1) Write specifications and prepare estimates for various Civil Engineering works.
2) Carry out analysis of rates for various items of works of construction.
3) Carry out valuation of land and buildings.
4) Demonstrate professional ethics in Civil Engineering sector.

SECTION – I

Unit 1: **(06)**

a) General introduction to Quantity surveying – purpose of estimates. Types of estimates, Various items to be included in estimates, Principles in selecting units of measurement for items, Various units and modes of measurement for different trades, Administrative approval and technical sanction to estimates. I.S. 1200, Introduction to D.S.R.

b) Specifications – Purpose and basic principles of general and detailed specifications; Detailed specifications for various items of work.

Unit 2: **(07)**

a) Prime cost, provisional sums and provisional quantities, taking out quantity –P.W.D. method, Centre line method. Measurement and abstract sheets and recording.

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

Unit 3: **(08)**

a) Approximate estimates- purpose, various methods used for buildings and other civil engineering works such as bridge, water supply, drainage, road- railway projects, school buildings, industrial sheds.

b) Detailed estimate of buildings, Factory shed including structural steel truss, R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works. Preparing bar bending schedule.

c) Different methods of executing works. Essentials of legally valid contract. Contract between engineer and Employers, Contract between Employer and Contractor, Appointment and authority of Engineer for executing civil construction works.

Unit 4: **(02)**

Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost.

SECTION – II

Unit 5: **(08)**

a) Competitive bidding- Local competitive bidding, global bidding, item rate contract, percentage rate contract and Lump sum contract. Preparing tender papers- Invitation of tenders, tender notice, tender documents, various terms and conditions to contracts, E-tendering submission, Scrutiny and acceptance, Two envelope method, Award of jobs, Rights and responsibilities of parties to contracts.

b) Negotiated contracts, Cost plus percentage. Cost plus fixed fees, Cost plus sliding scale of fees. Target cost as based on sharing risk and profits. Turnkey contracts, More than two party contracts. Introduction to BOT, BOOT, BOLT, etc.

c) Introduction to acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.

Unit 6: **(05)**

a) Principles of valuation, definition of value, price and cost. Attributes of value, Different types of values- Book value, salvage value, scrap value, replacement value, reproduction value, earning value, Market value, Potential value, Distress value, Speculation value, Sentimental value. Accommodation value, Essential characteristics of market value.

b) Valuer and his duties, purpose of valuation and its function. Factors affecting the valuation of properties-tangible and intangible properties, Landed properties- free hold and leasehold properties, different types of lease.

Unit 7: **(04)**

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- item wise, carpet area basis, unit basis, cubic content basis.

c) Development method of valuation for building estate.

d) Valuation on profit basis for lodges, cinema theatres, hotels, motels etc. valuation for compulsory acquisition of land, structure by the Government. Valuation for rating purpose, Methods for assessing ratable value of property, Rental method, Comparison method, fundamental principles of rating valuation e.g. Communibus Annis, Ritussic, stantibus etc.

Unit 8: **(05)**

a) Valuation from yield and from life, gross yield and net yield, outgoing, capitalized value, Year's purchases-Single rate and dual rate, reversion value of land, annuity-perpetual, whole life, deferred, Sinking fund.

b) Depreciation and different methods of calculating depreciation (straight line method, declining balance method, sinking fund method, quantity survey method), Depreciated cost, Obsolescence.

TERM WORK

1) Reading the Drawings (Plan and section) Minimum 3- drawings need to be given for (reading only) such as

a) Watchman's cabin b) Compound wall. c) Septic tank / water tank. d) Building drainage system. e) Kitchen platform. f) Cement godown. g) Staircase block. h) A small culvert

2) Market survey of basic material rates and labour wages

3) Detailed specification for minimum five civil engineering items. (One each from Roads, Irrigation works, Water Supply & Sanitation & three from buildings)

4) **Computer aided**

a) Detailed estimate for a two storied building

i) Selecting the items from drawing.

ii) Preparing abstract as per DSR or standard building items.

iii) Take of quantities related to buildings (all items need to be taken)

iv) Preparing the bill of quantity (BOQ).

Note: Estimate shall include compound wall with gate, sanitary schedule and electrification schedule.

b) Estimate for structural steel shed.

5) Rate Analysis: (Civil engineering items.)

One each from (Road, Irrigation work, Water supply and sanitation) and five from buildings.

6) Schedule of reinforcement any two of the following

a) Column and column footing.

b) Beam and Slab

c) Staircase.

7) Valuation reports for any two of the following:

a) A building for residential purpose or commercial purpose.

b) A hotel.

c) A theater

d) Any one construction machine.

The report shall include valuation certificate also.

TEXT BOOKS:

1. Civil Estimating and Costing, A. K. Upadhyay, S. K. Katuria and Sons
2. Elements of Estimating and Costing – S. C. Rangwala - Charotar Publication
3. Civil Engineering Contracts and Estimates – B. S. Patil- Orient Blackswan publication
4. Professional Practice (Estimating and Valuation) – Roshan Nanavati – Lakhani Book Depot.
5. Estimating and Costing – B. N. Dutta- UBS publishers
6. Estimating and Costing – Birdi- Charotar Publishing House Ltd.
7. Estimating, Costing and Specification in civil engineering – Chakroborty
8. Valuation of real Properties – S. C. Rangwala- Charotar Publishing House Ltd.

REFERENCE BOOKS:

1. Relevant Indian Standard Specifications (IS 1200)
2. World Bank Approved Contract Documents.
3. FIDIC Contract Conditions.
4. Acts Related to Minimum Wages, Workman's Compensation, Contract, and Arbitration.
5. C.P.W.D. specifications
6. C.P.W.D. schedule of rates.
7. Standard specifications Volumes I & II (P. W. D. Maharashtra)

B.E. CIVIL – PART I

3. EARTHQUAKE ENGINEERING

Teaching Scheme:	**Examination Scheme:**
Lectures:- 3 Hrs/week	Theory Paper: 100 Marks
Practicals:- 2 Hrs/Week	Term Work: 25Marks

Course objectives:

1) To introduce the basics of Earthquake Engineering
2) To master the engineering seismology, building geometrics & characteristics, structural irregularities,
3) To discuss codal provisions and their application on different types of structures

Course Outcomes:

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

1) Apply the Principles of Earthquake Engineering in planning, design and construction of building
2) Demonstrate the dynamic analysis of structures under earthquake load
3) Incorporate Earthquake resistant features for various types of construction.

SECTION – I

Unit: 1 Elements of Seismology **(5)**

General effects of an earthquake, terminology, structure of earth, causes of an earthquake, plate tectonic theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelerogram, soil liquefaction, prominent earthquakes of India.

Unit: 2 Free vibrations of single degree-of-freedom systems **(8)**

Dynamic loads and dynamic analysis, degrees of freedom, Undamped free vibrations, multiple elastic forces, viscously damped vibrations, equations of motion and solution, logarithmic decrement.

Unit: 3 Forced vibrations of single degree-of-freedom systems (8)

Forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution, Force transmitted to foundation, transmissibility, response to harmonic support excitations.

Unit: 4 Response spectrum theory: (5)

Response to general dynamic loading, Duhamel's integral, rectangular and triangular loading, Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation and structural damping on design spectrum.

SECTION – II

Unit: 5 Principles of earthquake resistant design (5)

Planning aspects, symmetry, simplicity, regularity. Resistance of structural elements and structures for dynamic load, design criteria, strength and deflection.

Unit: 6 Evaluations of Seismic Forces (5)

Philosophy of earthquake resistant design, Provisions of IS 1893 (All Parts), Soft storey, Design spectrum of IS 1893, evaluation of lateral loads due to earthquake on multistory buildings.

Unit: 7 Ductile detailing of RCC members- (5)

Concept of ductility, different ways of measuring ductility, factors affecting ductility, energy absorption, provisions of IS 13920.

Unit: 8 Earthquake resistant construction - (5)

Failure mechanism of different types of masonry construction, Construction aspects of Masonry and Timber structures, Retrofitting and strengthening techniques of low cost and low rise buildings. Provisions of I.S. 4326 and IS 13935.

TERM WORK

The term work shall consist of at least one assignment on each unit**.**

TEXT BOOKS:

1. Elements of Earthquake Engineering – Jai Krishna, South Asian Pub. New Delhi
2. Earthquake Resistant, Design of Masonry and Timber Structures – A.S. Arya
3. Earthquake Resistant Design of R. C. C. Structures – S. K. Ghosh

REFERENCE BOOKS:

1. Dynamics of Structures –A.K. Chopra
2. Structural Dynamics - Mario Paz CBS Publication
3. Earthquake Resistant Structures –D.J. Dowrick John Wiely Publication
4. Dynamics of Structures – R. M. Clough and Penzian ,McGraw Hill co.New Delhi
5. Mechanical Vibrations – G. R. Grover Roorkee University, Roorkee
6. Analysis and Design of Foundations for Vibrations – P. J. Moove. Oxford and I. B. H. Publication, Delhi
7. Foundation Design Manual – N. V. Nayak, Dhanpatrai and sons, Delhi
8. Manual of Earthquake Resistant Non engineering Construction, University of Roorkee
9. Elements Seismology – Rochter
10. IS 1893-2002 –Part I, IS 13920, IS: 4326 and IS 13935.
11. Earthquake Tips published by NICEE, IIT Roorkee.
12. Government of Maharashtra Earthquake resistant Design of house guiding lines and assessment of damages.

B.E. Civil – Part I

4. WATER RESOURCES ENGINEERING – II

Teaching Scheme:	**Examination Scheme**
Lecture : 3 Hrs / Week	Theory Paper: 100 marks
Practical: 2 Hrs / Week	Term Work: 25 marks
	Oral Exam: 25 Marks

Course Objectives:

1) To study the different aspects of design of hydraulic structures
2) To design different types of dams
3) To provide knowledge on various hydraulic structures such as energy dissipaters, head and, Cross regulators canal falls and structures involved in cross drainage works
4) To understand the analysis of seepage and hydraulic jump

Course Outcomes:

After studying this subject the students will be able to

1) Plan and design the reservoirs depending upon the water resources potential.
2) Analyze and design Gravity dams and Earth dams (Simple Designs).
3) Demonstrate the design principles of Arch dams.
4) Solve seepage problems for Weirs on Permeable Foundations
5) Demonstrate the knowledge of water power engineering and river training.

SECTION – I

Unit 1: **(5)**

a) Planning of Reservoirs: Storage calculations, Control levels, silting of reservoirs, reservoir sedimentation surveys, reservoir losses. Use of remote sensing for reservoir sedimentation surveys.

b) Dams – Necessity, types of dams, selection of site for dams, selection of type of dam, Introduction to dam instrumentation

Unit 2: **(8)**

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

b) Arch Dams – Types, Layout of Constant angle and Constant radius arch dam, Forces acting on arch dams.

Unit 3: **(5)**

Earth Dams: Components and their functions, Design Criterions; Seepage through and below earth dam, Application of Slip circle method, Inverted Filters, Downstream Drainage, relief wells, Construction of earth dam.

Unit 4: **(5)**

a) Spillways: Necessity and different types , factors affecting choice and type of spillway, elementary hydraulic design, jump height and tail water rating curve, energy dissipation below spillway, gates for spillway. Spillway operations for different discharge values.

b) Outlets through Dams: types and energy dissipation in outlets transition

SECTION – II

Unit 5: **(6)**

a) Weirs on Permeable Foundations: Theories of seepage, Bligh's creep theory, Khosla's theory - exit gradient, Piping and undercutting, Concept of flow net etc. Kolhapur type weirs- working principles, suitability and construction.

Unit 6: **(6)**

a) Canals: Types, Alignment, Design – Kennedy's and Lacey's Silt theories, Canal losses, Typical canal sections, canal lining – Necessity and types, Economics of canal lining.

b) Canal Structures (Introduction): Cross drainage works and canal regulatory works - Aqueduct, Culvert, Super passage, Level Crossing, Cross and Head regulator, Canal Siphon, Canal Escape, canal fall, canal outlet

Unit 7: **(5)**

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

b) Water Logging and Drainage: Causes, effects, preventive and curative measures, alkaline soils, soil efflorescence, drainage arrangements.

Unit 8: **(5)**

Elements of Hydropower Engineering: Power crisis and competing uses of water, need of harnessing solar energy. Types of water power plants, small hydropower plants, layout and components of each type, Intakes, Conveyance system, Surge tanks, Power house types, components and layout, tail race. Managing power demand using various sources of power.

TERM WORK

A) Minimum seven assignments from the following:

1) Determination of height of dam: Reservoir capacity calculations based on demand and Supply, fixing control levels of dam.
2) Design of gravity dam: Elementary and practical profile with stability calculations
3) Earth dam
   a) Design- Determination of section – slip circle calculations.
   b) Filters and Drainage arrangements.
4) Spillway: Geometrical section, Design of spillway; Energy dissipation arrangements and gates.
5) Arch dam layout of constant angle and constant radius
6) Drawing sheet: Outlets through earth dam. Masonry dam, layout.
7) Drawing sheet: Typical plan and section of Kolhapur type barrage.
8) A typical layout of Hydropower plant and its functioning. Calculating reservoir capacity for hydropower plant
9) Design of any one Canal Structure / Cross Drainage Works

B) Report based on Field visits to Irrigation and Water Power Engineering Projects

ORAL EXAMINATION

Oral Examination will be based on the TERM WORK.

TEXT BOOKS:

1. Irrigation Engineering – S. K. Garg , Khanna Pub. Delhi
2. Irrigation and Water Power Engineering - Priyani , Charoter pub. House, Anand
3. Irrigation and Water Power Engineering – Punmia, B. C.
4. Irrigation – Bharat Singh, NEW CHAND & bros. Roorkee
5. Irrigation Engineering Vol. I – Varshhey and Gupta
6. Engineering Hydrology - K. Subramanya
7. Design of Canals – Circular of Government of Maharashtra, !8 February 1995

REFERENCE BOOKS:

1. Design of Small Dam – U. S. B. R., OXFORD & IBH pub.co.
2. Engineering for Dam Vol. I, II, III – Justinn, Creager and Hinds
3. Design of Hydraulic Structures Vol. I & II – Leliavsky
4. River Behaviour, Management and Training - C B I & P Publication

B.E. (CIVIL) PART – I

5. ELECTIVE I

5.1 OPEN CHANNEL AND RIVER HYDRAULICS

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To learn principles of flow in open channels, conservation laws and various types of flow
2) To learn analytical and numerical techniques for flow analysis
3) To study the fundamental principles governing open channel hydraulics for the design of engineering systems.
4) To develop the skills needed for systematic decomposition and solution of real world problems.

Course Outcomes:

By studying this subject, the students will be able to

1) Demonstrate basic principles of the open channel flow.
2) Analyze the various types of flows viz. uniform flow, gradually varied flows rapidly varied flow etc.
3) Apply the knowledge of open channel hydraulics to for river engineering.
4) To perform model analysis studies.

SECTION – I

Unit 1: **(5)**

Basic fluid flow concepts, Classification of open channel flow, Velocity and pressure distribution. Energy and Momentum Equation applied to open channel flow, Energy and momentum coefficients, Channel Geometry and geometrical elements.

Unit 2: **(5)**

Uniform and critical flow computations: Energy depth relationships, Resistance formulae, Concepts of First and Second hydraulic exponent, Determination of critical and normal depth, hydraulically most efficient channel sections, Channel transitions.

Unit 3: **(6)**

Gradually varied flow: Different equation governing GVF, Classification analysis and control sections of profiles, Computation of GVF profiles by different methods.

Unit 4: **(6)**

Rapid varied flow: Type, Analysis and characteristics of Hydraulic jump in rectangular channels, Location of jump, Introduction to jump in non-rectangular channel and on sloping floor, Use of jump as Energy dissipater. Flow Measurement –Weir, spillways, critical depth flumes.

SECTION – II

Unit 5: **(5)**

River gauging: Dominant discharge, Methods of gauging, current meter rating curve, automatic water level recorder, stage discharge relationship of a river.

Unit 6: **(7)**

Fluvial Hydraulics- Sediment transport, Mode of sediment motion and formation, Threshold movement, Total sediment load, Suspended and bed load Theories, Reservoir Sedimentation.

Unit 7: **(6)**

River Management and Training:

Type of river, river morphology, meandering and braiding of River training work-Classification Types-Guide banks, Groynes, Deflectors, Embankments, Cut-offs, Bank Protection Stable channel nature river training works, river morphology.

Unit 8: **(5)**

Similitude and model analysis: Basic principles, fixed bed and models, distorted models.

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TERM WORK

Assignment / problems based on above syllabus.

TEXT BOOKS:

1) Open channel Hydraulics - Ven Te Chaw, McGraw Hill book Co. New York.

2) Flow through open channel - Ranga Raju

3) Flow in open channel –K. Subramanya, Tata McGraw Hill Publications

4) Mechanics of Sediment transport and alluvial river problems-R. J. Garde New Age Publications New Delhi.

REFERENCE BOOKS:

1) Open Channel Flow-F. M. Henderson.

2) River Gauging –Chitale and Hiranandani

3) River Mechanics-Vol. I &II, Hsieh Wen Shen.

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B.E. (CIVIL) PART - I

5. ELECTIVE- I

5.2 AIR POLLUTION AND CONTROL

Teaching Scheme:	**Examination Scheme:**
Lectures: 3Hrs/ Week	Theory paper: 100 Marks
Practical: 2Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 marks

Course Objectives:

1. To study Sources, Causes & effects of Air Pollution.
2. To study the relation between Meteorology and Air Pollution.
3. To learn methods used for controlling air pollution.
4. To study Air pollution Prevention and legislation.

Course Outcomes:

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

1. Identify the sources of air pollutants and their effect on human, plants and materials.
2. Apply knowledge of meteorology for controlling air pollution
3. Design of air pollution controlling equipments.
4. Use knowledge of legislation for prevention and control of air pollution.

SECTION –I

Unit 1: Introduction **(3)**

The Structure of the atmosphere, Composition of dry ambient air and properties of air. BIS Definition and scope of Air Pollution, Scales of air pollution, Types of exposures.

Unit 2: Air pollution sources **(5)**

Air Pollutants, Classifications, Natural and Artificial, Primary and Secondary, point and Non-Point, Line and Area Sources of air pollution. Stationary and mobile sources. composition of particulate & gaseous pollutant, units of measurement.

Unit 3: Effects of Air pollutants **(6)**

Effect of different air pollutants on man, animals, vegetation, property, aesthetic value and visibility, air pollution episodes. Global effects of air pollution- global warming, ozonedepletion, acid rain and heat island effect.

Unit 4: Meteorology and Air pollution **(8)**

Solar radiation, wind circulation, factors affecting dispersion of pollutants, Lapse rate, stability conditions, wind velocity profile, Maximum mixing depth (MMD), visibility, Wind rose diagram, General characteristics of stack plume (Plume behaviour). Gaussion diffusion model for finding ground level concentration. Plume rise. Formulae for stack height and determination of minimum stack height.

SECTION –II

Unit 5: Air sampling and analysis **(5)**

Air pollution survey, basis and statistical considerations of sampling sites, devices and methods used for sampling gases and particulates. Stack emission monitoring, isokinetic sampling. Analysis of air samples chemical and instrumental methods. Ambient air quality monitoring.

Unit 6: Photochemical smog, Odour pollution and Indoor pollution **(6)**

Chemistry of air pollution, Chain reactions of hydrocarbons, nitrogen oxide, Sulphuric oxides and intermediates, photochemical smog formation, air pollution indices -aerosols, fog, smog index.

Odour pollution: Theory, sources, measurement and methods of control of odour pollution. Indoor air pollution: Causes of air pollution, sources and effects of indoor air pollutants, changes in indoor air quality, control of indoor air pollutants and air cleaning systems.

Unit 7: Control of air pollution **(8)**

By process modification, change of raw materials, fuels, process equipment and process operation. By use of air pollution control equipment for particulate and gaseous pollutants. Design of control equipment as Settling chamber, Cyclone, Fabric filter, Electro static precipitator and Wet scrubber.

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Unit 8: Control of gaseous pollutants and Legislation (4)

Principles of removal of gaseous pollutants, design of incineration, absorption adsorption systems. Control of air pollution from automobiles. Vehicular pollution, composition, quantity and control.

Air (Prevention and Control) Pollution Act, 1981.Emission standards for stationary and mobile sources. National Ambient air quality standards, 2009 (NAAQS).

TERM WORK

1. Assignments / problems on Air pollution.
2. Sampling and analysis of Ambient Air
3. Sampling and analysis of Automobile exhaust
4. Demonstration of stack gas monitoring

Viva/Oral examination will be based on above theory syllabus and term work

TEXT BOOKS:

i. Air pollution – Wark and Warner
ii. Air Pollution – Rao and Rao, TMH
iii. Environmental Engineering – by Peavy and Rowe, TMH.
iv. Air Pollution and Control- Murali Krishna, Jain Brothers

REFERENCE BOOKS:

i. Air pollution – Martin Crawford
ii. Air Pollution and Control Technologies- Y.Anjaneyulu, Allied Publishers
iii. Fundamentals of Air Pollution- Raju BSN, IBH Publisher
iv. An Introduction to Air Pollution- R. K. Trivedi and Goyal, BS Publications.

B.E. (CIVIL) PART-I

5. ELECTIVE- I

5.3 DESIGN OF FOUNDATIONS

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course objectives:-

1. To study the requirements of foundations of for satisfactory performance under the give loading
2. To judge suitability of various shallow and deep foundations for the given loading and field conditions.
3. To learn the constructional procedure of various types of foundations.

Course outcome:-

By the end of the course students should be able to

1. Evaluate the bearing capacity of soil analytically as well as by field test such as plate load test, Standard Penetration test etc.
2. Design the different shallow foundation and deep foundation to meet the site requirement and loading conditions
3. Apply suitable soil improvement techniques such as soil isolation, Geotextiles or using CNS soil for the give field condition.
4. Design the simple machine foundations using codal provision.

SECTION – I

Unit 1: **(6)**

Soil Investigation: Object of soil investigation for new and existing structures. Depth of exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the following types of samples.

Open Drive samples, Stationery piston sampler, Rotary sampler, Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T.

Unit 2: **(10)**

Bearing Capacity: Types of failure, Terzaghi's formula, Meyerhoff formula, Skempton's formula, BIS formula , Vesic's formula, Hansen's formula – Effect of water table , eccentricity of load, Bearing Capacity evaluation- Plate Load Test and SPT, Housel's perimeter shear concept. Bearing capacity of layered soil, Methods of improving bearing capacity.

Stress distribution, consolidation settlement, immediate settlement, Study of Elastic mechanism, undrained case for clays and drained case for sands. Corrections to computed settlements, Rigidity of the footings, location of footing below ground water surface, variability in E and μ.

Unit 3: **(4)**

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

Unit 5: **(4)**

Foundation on expansive soil - Characteristics of B. C. soils, problems of foundations in B.C. soils, foundation techniques in B.C. soils

SECTION – II

Unit 5: **(8)**

Pile Foundations: Classification, Load carrying capacity, Static and dynamic methods, Negative skin friction, Batter piles, Pile Caps, Pile Load tests, Rock Socketing, Pull out resistance , Laterally Loaded piles, Special piling systems-Granular Piles / Stone Columns, Bored Precast Piles, Element piles, Bored Compaction Piles, Micro piles, Lime Piles. Pile Groups: Design of pile groups - Group Efficiency, Pile spacing, Pile cap (2 piles, 3 piles); Under-reamed piles- Single and Multi-Bulb, URP's, Equipment, construction and precautions, Design.

Unit 6: **(2)**

Shoring and underpinning

Requirements for shoring and under-pinning, Methods of shoring, Methods of underpinning.

Unit 7: **(4)**

Well Foundations: Types of well foundations, open well, box and Pneumatic caisson foundations , Design of well foundations, analysis of Lateral Stability , Construction of open and Pneumatic wells.

Unit 8: **(07)**

Machine Foundations- Dynamic response of soil, Types of machine foundations, Study of stress v/s strain under applied static and oscillatory stresses, Permissible amplitude, Criteria for satisfactory machine foundations, Introduction to analysis and design of simple machine foundations using I.S. Code, Vibration isolation

TERM WORK

Term work consists of Minimum 8 sets of exercise based on each of the theory part of syllabus.

TEXT BOOKS:

1. Soil Mechanics and Foundation Engineering"- B.C. Punmia, Laxmi Publications Pvt.Ltd
2. "Foundation Engineering" by B.J. Kasmalkar, Pune Vidyarthi Griha Prakashan
3. "Soil Dynamics and machine foundation", Swami Saran, Galgotia Publications Pvt. Ltd., New Delhi
4. "Foundation Analysis and Design" by J.E. Bowles, Tata McGraw Hill Book Company.
5. Foundation Engineering by Kameshwar Rao, John Wiley

REFERENCE BOOKS:

1. "Foundation Engineering Hand Book" by Winterkorn H.F. and Fang H.Y, VanNostand Reinhold Company, 1975
2. "Foundation Design Manual" by N.V .Naik, Dhanpat Rai and sons
3. "Pile Foundation Analysis and Design", by Poulos, H.G. and Davis, E.H., JohnWiley and Sons, New York.

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4. Mohan, Dinesh (1990). “Pile Foundations”, Oxford & IBH Publishing Co. Pvt. Ltd.New Delhi.
5. W. C. Teng, “Foundation Design”, Prentice Hall of India Pvt. Ltd., New Delhi
6. P. Shrinivasu “Hand Book of Machine Design” Tata McGraw Hill Book Company”
7. Ronald F. Scott “Foundation Analysis”, Prentice Hall Inc.

B. E. (CIVIL) PART – I

5. ELECTIVE – I

5.4 ADVANCED DESIGN OF CONCRETE STRUCTURES

Teaching Scheme:	**Examination Scheme:**
Lecture – 3 Hrs / Week	Theory Paper – 100 Marks
Practical - 2 Hrs / Week	Term Work – 25 Marks
	Oral- 25 Marks

Course objectives:

1) To study analysis and design of Flat Slab, Grid Slab and Circular Slab
2) To learn analysis and R. C. C design of footings, rafts and piles used in foundations
3) To acquaint with design methods of GSRs, ESRs and USR for water storage using various IS codes.

Course Outcomes:

Upon successful completion of the course the students will be able to :

1) Analyse and design Grid Slab and Circular Slab
2) Analyse and design footings, rafts and piles
3) Analyse and design G.S.R and E.S.R and U.S.R .

SECTION – I

Unit 1: **(7)**

Analysis and Design of Flat Slab, Grid Slab and Circular Slab.

Unit 2: **(8)**

Analysis and Design of Combined Footing and Raft Foundation.

Unit 3: **(7)**

Analysis and Design of pile foundation with pile cap.

SECTION – II

Unit 4 : **(8)**

Water Tanks : Design criteria, permissible stresses, Design of circular water tanks G.S.R and E.S.R by approximate method and I. S. code method. .

Unit 5: **(8)**

Design of rectangular tanks G.S.R and E.S.R by approximate method and I. S. Code method.

Unit 6: **(7)**

Design of underground circular water tanks.

Note: Use of IS 3370 part II and IV and IS 456-2000 is allowed in the examination.

TERM WORK

Problems based on above topics.

Text Books:

1. Reinforced Concrete, Limit State Design by Ashok K. Jain, New Chand and Bros. Roorkee.
2. Advanced Reinforced Concrete Design by N. Krishnaraju- CBS Publishers & Distributors.
3. Reinforced Concrete Structures Vol. I & Vol. II by Jain and Jaikrishna
4. Reinforced Concrete Structures Vol. I & Vol. II by B.C. Punmia, A. K. Jain, Arun K. Jain

Reference Books:

1. Advanced Reinforced Concrete Design by P.C. Varghese- Prentice Hall of India.
2. IS: 456-2000
3. Fundamentals of Reinforced Concrete- Sinha & Roy
3. Limit State Design of Reinforced Concrete - P.C. Varghese, Prentice Hall of India, New Delhi.
5. Handbook of Reinforced Concrete: SP- 16

B. E. (CIVIL) PART – I

ELECTIVE – I

5.5 MANAGERIAL TECHNIQUES

Teaching Scheme:-	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To develop an understanding of total quality management principles, frameworks, tools and techniques for Civil Engineering works.
2) To provide an introduction to the fundamental concepts of statistical process control, total quality management, six sigma and the application of these concept to Civil Engineering industry.
3) To acquaint the students with reliability analysis, value analysis and value engineering.

Course Outcomes:

Upon successful completion of course the students will be able to:

1) Exhibit understanding on Total Quality management philosophies and frameworks
2) Apply quality tools and techniques in civil engineering industry
3) Apply reliability analysis principles and cost reduction technique for civil engineering works

SECTION – I

Unit 1: **(06)**

Introduction: Productivity, work study and its applications to civil engineering. Method study: Recording techniques, critical examination methods, development activity charts, diagrams process charts.

Unit 2: **(07)**

Time study, time allowance standard time, predetermined motion time standards, Analytical estimation, work specification, production studies. Job evaluation and wages, role of trade unions and human behaviour in Context to Work study.

Applications of work study to civil engineering works like brick laying, brick work, Prefabricated building units, concreting etc.

Unit 3: **(07)**

Total Quality management: Philosophy and concept by Dr J.M. Juran, Deming, Febingham, Elements of TQM, Implementation Strategies, Introduction to 5S Techniques, Kaizen

Unit 4: **(04)**

TQM, implementation strategies of TQM, steps in TQM, 5S techniques, contribution by Juran.

SECTION – II

Unit 5: **(07)**

Work sampling techniques, Purpose principles. Statistical basis, normal, binormal, Poissson's distribution, accuracy, confidence. Random numbers and application.

Unit 6: **(07)**

Reliability analysis – Evaluation of reliability analysis and distribution or changes of failure of products standard deviation, failure probability, reliability, curves, reliability assurance of sampling reliability design single, double limit operations, Redundancy, application of civil engineering.

Unit 7: **(07)**

Value analysis and value engineering – Value analysis as a cost reduction technique information, search analysis creative thinking and judgment types of value, value Analysis procedure and applications in value engineering value control.

TERM WORK

A) Work study procedures in building unit manufacture element.

B) Preparation of flow Process charts.

C) Motion study of:

1. Concreting.
2. Erection of roof trusses.
3. Factory sheds.
4. Brick laying.
5. Flooring etc. preparation of flow processes charts.

D) Actual working stoppage utilization. Avoidable stoppages time sampling, frequency and control charts calculations (from civil engineering works).

E) Work sampling in increasing the productivity, finding idle timings and efficiency of items of works in a small civil engineering works.

F) One problem on Reliability Analysis.

G) Value Analysis and Value Engineering.

TEXT BOOKS:

1. Work Study Applied to Building – Geary
2. Work Study – R. M. Currie, the English language book co.
3. Motion and time Study – Marvind Mandel, Prentice hall of India ltd.
4. Quality Control and Reliability – N. L. Enrick
5. Work Sampling – M. V. V. Raman
6. Value Engineering – Miles

REFERENCE BOOKS:

1. Work Study- I. L. G., Universal pub. corporation
2. Value Engineering – A practical approach for owners – Designers and Constructors –
3. Larry Zimmerman and Glent Hart, CBJ pub.& Distributors

B. E. (CIVIL) PART – I

5. ELECTIVE –I

5.6 COMPUTER APPLICATION IN CIVIL ENGINEERING

Teaching Scheme:	**Examination Scheme**:
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To learn to write computer programs for design of steel structures
2) To learn to R.C.C. design of structures with help of computers
3) To learn structural drafting using software tools
4) To learn popular structural analysis application software

Course Outcomes:

By the end of the course students should be able to

1) Write computer programmes for analysis and design of variety of structural elements.
2) Use computer aided design and drafting software tools using suitable application.
3) Develop elementary application software tools for Civil Engineering applications

SECTION-I

Unit 1: **(10)**

Computer aided design of steel structures: Development of software for basic structural Elements such as beam, column base, gantry girder, using IS: 800 specifications.

Unit 2: **(12)**

Computer aided design of R.C.C. Structures: Development of software for basic Structural elements such as rectangular beam, T beam, one – way and two – way slabs, Columns and isolated column footings using IS: 456.

SECTION – II

Unit 3: **(11)**

Structural Drafting: Structural drafting and detailed drawings of components design using AutoCAD, AUTOLISP and WINDOWS, application of simple structural steel and R.C.C. elements, drawings of plan elevation of structures

Unit 4: **(12)**

Use of software for analysis of structures, preparation of input data, output and interpretation of results, application of software for plane trusses, portal frames. Term work shall consist of at least two applications on each of the units based on theory of syllabus

REFERENCE BOOKS:

1. Matrix Operations on Computer – L. L. Bhirud, Oxford and IBM Pub. Co.
2. Matrix, Finite Element, Computer and Structural Analysis – Madhujit Mukhopadhyaya, Oxford and IBM Pub. Co.
3. Mastering in AutoCAD by George Omura.
4. Reference Manual of AutoCAD by Autodesk

TEXT BOOKS:

1. Numerical Concrete, Fundamental approach – Edward G. Nawy- Prentice Hall New Jersey.
2. Numerical Algorithm – E. V. Krishnamurthy & S. K. Sen, Affiliated Best West Press Pvt. Ltd.
3. AutoCAD 3D – by Geoge Head.

B. E. (CIVIL) PART – I

5. ELECTIVE –I

5.7 ADVANCED STRUCTURES

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam. : 25 Marks

Course objectives:

1) Study of Influence lines for various types of beams
2) Analysis of beams curved in plan and fixed arches
3) Learning Approximate methods for analysis of portal frames subjected to lateral loads
4) Study of plane frames and space trusses

Course outcomes:

By the end of the course students should be able to

1) Draw influence lines for various types of beams
2) Analyze of beams curved in plan and fixed arches
3) Use approximate methods for analysis of portal frames subjected to lateral loads
4) Analyze plane frames and space trusses

SECTION – I

Unit 1: **(6)**

Influence lines: Muller Breslau principle, I.L.D. for propped cantilever, fixed beam, continuous beam

Unit 2: **(5)**

Beams curved in plan.

Unit 3: **(5)**

Fixed arches elastic center method.

Unit 4: **(6)**

Approximate methods for analysis of portal frames subjected to lateral loads -Portal and Cantilever method

SECTION – II

Unit 5: **(6)**

Analysis of Secondary Stresses in Plane Frames

Unit 6: . **(6)**

Analysis of space trusses by tension coefficient method.

Unit 7: **(6)**

Beams on elastic foundations.

Unit 8: **(5)**

Unsymmetrical Bending & Shear center

TERM WORK

Assignments Based on above Syllabus

Text & Reference books:

i) Advanced Structural Analysis – Vazirani and Ratwani

ii) Design of Steel Structures – Ramachandra Vol. II, Standard book house Delhi

iii) Strength of Materials – Vol. II Timoshenko, East-West Press ltd. Delhi

iv) Mechanics of Structures – S. B. Junnarkar Vol. III, Charotar pub. House Anand

B.E. Civil (Part-I)

5. ELECTIVE – I

5.8 ENTREPRENEURSHIP

Teaching Scheme	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper – 100 Marks
Practical:2 Hrs/Week	Term Work –25 Marks
	Oral – 25 Marks

Course Objectives:

1. To familiarize the students with the concept of Entrepreneurship, Entrepreneur and Women Entrepreneur opportunities in the country.
2. Acquaint the student's innovative business ideas in emerging industrial scenario with 'small scale industries' policy resolutions.
3. Introduce the student's with finance and accounting aspects, Industrial and commercial tax laws AND marketing management of entrepreneurship.

Course outcomes:

By the end of the course the students should be able to

1) Exhibit skills necessary to craft strategies and initiatives which can enable growth and sustainability in an entrepreneurial venture.
2) Prepare preliminary and final project report
3) Exhibit higher-level critical thinking skills, evidenced by analysis, evaluation, and synthesis.
4) Demonstrate skills to establish and manage the accounting process, to employ break even and cost-volume-profit tools.

SECTION – I

Unit 1: **(08)**

Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship, risks involved with entrepreneurship, barriers to Entrepreneurship, Factors affecting entrepreneurial growth.

Entrepreneur, qualities of a successful entrepreneur, types of entrepreneurs (on basis of business, motivation, stages of development, entrepreneurial activity), functions of an entrepreneur, entrepreneurial competencies, types of entrepreneurial competencies. Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship. Creativity and Innovation, Innovation and Entrepreneurship.

Unit 2: **(06)**

Women Entrepreneurship:- Meaning, Characteristic features, Problems of Women Entrepreneurship in India, Developing Women Entrepreneurship in India, reasons for the slow growth of women entrepreneurship, remedies to solve the problems of women entrepreneurs. Measures taken for the development of women.

Entrepreneurship In India:- Training of Rural Youth For Self Employment, BANKS, NABARD, Industrial Policy, FICCI Ladies Organization (FLO), National Alliance of Young Entrepreneurs (NAYE).

Unit 3: **(08)**

Role of Government in promoting Entrepreneurship, MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centres (DIC), Small Industries Service Institute (SISI),Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

Financial Support System: Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions. Finance, Institutional finance to Entrepreneurs, Preparation of Business Plans, Commercial Banks, Other financial institutions like IDBI,IFCI, ICICI, IRBI, LIC, UTI, SFCs, SIDCs, SIDBI, EXIM.

Bank Institution Support to Entrepreneurs: Need for Institutional support - Small Entrepreneurs: NSIC, SIDO, SSIB, SSICS, SISI, DICs, Industrial Estates Specialized Institutions.

SECTION – II

Unit 4: **(08)**

Finance Analysis and accountancy: Estimation of cost of project and means of financing, working capital requirement and its financing, estimates of working results working capital and fixed capital assessment incentives from financial institutions and government, financial ratios, their significance, break even analysis cash flow charts financial statements.

Unit 5: **(07)**

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

Unit 6: **(08)**

Introduction to Marking, Market study, Goal sitting, Sale and Sales Promotion. Industrial and commercial tax laws (major features only), Risk and Risk analysis, goal setting and decision making, Communication skills development and barriers.

Note: The subject may be taught with respect to suitable case studies and industrial visits. Audio video films shall be used on the above topics.

TERM WORK

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

TEXT BOOKS:

1) Patterns of Entrepreneurship, Jack M. Kaplan Wiley Publications.
2) Planning and Industrial Unit, Jay Narayan Vyas, GranthVitran Shreyas, Opp. Jain Temple Near Navrangpura Bus Stop, Navrangpura
3) Financing an Industrial Unit, Jay Narayan Vyas and Dilip Patel,Granthvitaran Ahmedabad .
4) Entrepreneurship Development Vol. I, II & III, Vasant Desai, Himalaya Publishing house.

REFERENCE BOOKS:

1) Entrepreneurship for the Nineties, Gordon B. Baty, Prentice Hall Inc. College Technical Reference by Granthvitaran.
2) Small Scale Industry Handbook, Jay Narayan Vyas, Granth Vitaran Ahmedabad
3) The Practice of Entrepreneurship, Geoffery G. Meredith R.E. Nelson and P. A. Neck, Published by International Labour Office, CH 1211, Geneva 22, Switzerland
4) Entrepreneurship Theory at Cross Road, Mathew J. Manimala, Biztantra publications.
5) Entrepreneurship and small business, WEBER, LEWIS, VOLERY, SCHAPER, Wiley publications.

B.E. (CIVIL) - I

5. ELECTIVE – I

5.9 REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM APPLICATIONS

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To gain understanding of the physics of remote sensing and an introduction to the major remote sensing systems that are in operation today.
2) To provide introductory understanding and working knowledge of Geographic Information Systems (GIS)
3) To gain applied experience in using GIS through a number of case study exercises.
4) An understanding of current research, technology and policy developments in the GIS/RS area and their potential applications to environmental and sustainability issues.

Course Outcomes:

By the end of the course students should be able to

1) Demonstrate the principles of remote sensing and digital image processing;
2) Exhibit knowledge of geographic information systems (GIS);
3) Apply remote sensing and GIS to solve problems in Civil Engineering
4) Use image processing and GIS application software.

SECTION-I

Unit No. 1 **(6)**

Introduction to Remote Sensing system: data acquisition and processing, Applications, Multi concept in remote sensing.

Unit No. 2 **(8)**

Physical Basis of Remote Sensing: EMR nature, definition, nomenclature and radiation laws; Interaction in atmosphere-nature, its effects in various Wave-length regions, atmospheric windows; Interaction at ground surface soils Geometric basis of interaction.

Unit No. 3 **(8)**

Platform and Sensors: Terrestrial, aerial and space platforms, Orbital characteristics of space platforms, sun- and geo-synchronous; Sensor systems-radiometers, opto-mechanical and push broom sensor; resolution : spectral, spatial, radiometric and temporal; IFOV, FOV, GRE; geometric characteristics of scanners, V/H and S/N ratio; Data products from various air and spaceborne sensors-aerial photographs, LiDAR, Landsat, SPOT, IRS, ERS, IKONOS etc.,

SECTION-II

Unit No.4 **(5)**

Image Interpretation: elements of interpretation; digital image processing and interpretation; Field verification Field verification;

Unit No.5 **(10)**

Geographical Information systems: components of GIS-data acquisition, spatial and attribute data, pre-processing, storage and management; data structures raster and vector data; GIS analysis functions; Errors and corrections; data presentation and generation of thematic maps;

Unit No.6 **(8)**

Civil engineering application of remote sensing techniques and GIS.

TERM WORK

Based on above syllabus with minimum one case study with GIS Software.

Reference Books:

1. A. M. Chandra and S. K. Ghosh, Remote Sensing and GIS, Narosa Pub, 2007.
2. Remote sensing and Geographical information System, M. Anjireddy, B.S. publications
3. Fundamentals of Geographic Information System, Michael N. Demers, Wiley publications
4. I. Heywood, S. Cornelius and S. Carver, An Introduction to GIS; Pearson Education-2nd Ed, 2002.
5. T .M. Lillisand, R.W. Kaifer and J. W. Chipman, Remote Sensing and Image Interpretation ; John Wiley and sons Inc,6th Edition Nov 2007.

B.E. (Civil) Part-I

6. SEMINAR

Teaching Scheme:

Practical: 2 hours / week / batch

Examination Scheme:

Term Work – 50

Objectives

1) To expose the students to a variety of subjects and research activities in Civil Engineering in order to enrich their academic experience.
2) To acquaints department members with all final year students within the department and learn about each students' seminar activities.
3) To give an opportunity for students to develop skills in presentation and discussion of various topics in a public forum.

The topic for the Seminar may be related to Civil Engineering area and inter-disciplinary area related to Civil Engineering such as

1) Structural Engineering
2) Environmental Engineering
3) Geotechnical Engineering
4) Transportation Engineering
5) Infrastructural Engineering
6) Water Resources Engineering
7) Town & Country Planning
8) Construction Engineering
9) Surveying & Remote Sensing Techniques
10) Project Management
11) Legal Aspects in Civil Engineering
12) Earthquake Engineering
13) Disaster Management

B.E. (Civil) Part-I

7. a) PROJECT WORK

Teaching Scheme: **Examination Scheme:**

Practical: 2 hours / week Term Work: 25 marks

Objectives:

1) To carry out a thematic design project in one of the specializations of civil engineering
2) To carry out a project that will make the students aware of the different facets of civil engineering.

The topic for the Project Work may be from any Civil Engineering and inter-disciplinary area related to Civil Engineering as mentioned in content at B.E. (Civil) Part-I. Practical work at B.E. (Civil) part-I will comprise of literature survey / problem formulation / preparation of experimental setup as the case may be of the identified problem.

B.E. (Civil) Part-I

7. b) ASSESSMENT ON REPORT OF FIELD TRAINING

Examination Scheme:

Term Work – 25 Marks

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

The training may be may be related to any of the Civil Engineering areas or inter-disciplinary areas such as:

1) Structural Engineering
2) Environmental Engineering
3) Geotechnical Engineering
4) Transportation Engineering
5) Infrastructural Engineering
6) Water Resources Engineering
7) Town & Country Planning
8) Construction Engineering
9) Surveying & Remote Sensing Techniques
10) Project Management
11) Legal Aspects in Civil Engineering
12) Earthquake Engineering
13) Disaster Management

Student shall submit a report of the field training undergone. The students should obtain a certificate of completion of training from the concerned organization and submit it to the department office. Assessment of the training report will be done by the 'Project Guide' to whom the concerned student is allotted.

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B.E. Civil – Part II

1. DESIGN OF CONCRETE STRUCTURES – II

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 Hrs. / Week	Theory Paper: 100 Marks
Practical: 2 Hr. / Week	Term work: 25 Marks

Course Objectives:

1. To study staircase, column footings, counter fort retaining walls and RCC water tanks design by approximate and IS method
2. To learn the principles, materials, methods and systems of prestressing
3. To learn the design methodology of prestressed concrete beams for flexural, shear and tension and to calculate ultimate flexural strength of beam
4. To learn the design of anchorage zones of post tensioned PSC beams.

Course Outcomes:

Upon successful completion of the course the student will be able to:

1) Design of staircases and footing by Limit State Method
2) Design of counter fort retaining walls and RCC water tanks by approximate and Indian Standard method.
3) Design a prestressed concrete beams accounting for losses
4) Design the anchorage zone for post tensioned members

SECTION I

Unit 1: Staircases (Limit state method) **(7)**

Design of Staircases, types of staircases, design of simply supported and Dog-legged staircases, Open well staircase with solid waste slab

Unit 2: Column Footings **(7)**

Design of Isolated square and rectangular column footing, column footings subjected to eccentric load.

Unit 3: **(8)**

Analysis and design of cantilever and counter fort retaining walls

Unit 4: **(8)**

Design of water tank: Design criteria, permissible stresses, Design of circular, rectangular GSR by approximate & IS code method

SECTION II: PRESTRESSED CONCRETE

Unit 5: **(5)**

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

Unit 6: **(7)**

Analysis of Symmetrical and unsymmetrical sections, thrust line, cable profiles.

Unit 7: **(5)**

Losses in prestress. - Pre & Post tensioned members.

Unit 8: **(7)**

Design of rectangular and Symmetrical I sections.

Unit 9: **(6)**

Analysis and design of end blocks by various methods, stress concentration.

NOTE:

Only IS: 456-2000 shall be allowed in University Exam.

TERM WORK:

Ten Design Assignments on above syllabus.

REFERENCE BOOKS:

1. IS: 456-2000 and IS 1343

2. Reinforced Cement Concrete - B.C. Punmia

3. Reinforced Cement concrete - Jain Vol.I & II

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4. Prestressed Concrete – T.Y.Lin John Willey & sons, Newyork.
5. Prestressed Concrete – Sinha & Roy, S.Chand & Co., New Delhi
6. Prestressed Concrete – N.Krishnaraju.
7. Prestressed Concrete – P. Dayaratnam.
8. Prestressed Concrete – Leon Hardt.

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B.E. Civil –Part II

2. CONSTRUCTION PRACTICES AND TOWN PLANNING

Teaching Scheme:

Lecture: 4 Hrs / Week

Examination Scheme:

Theory Paper : 100 Marks

Term work : 25 Marks

Course objectives:

1) To study various construction methods and practices for Civil Engineering Projects
2) To learn prefabricated construction methods and safety at work
3) To impart basic knowledge of Town Planning to civil engineering students.
4) Learning town surveys, town aesthetics, M. R. Town Planning act

Course Outcomes:

By the end of the course students should be able to

1) Prepare layout of small towns
2) Identify and select various inputs for town planning
3) Calculate output of construction machines
4) Execute various items of construction work using construction machinery and adopt appropriate safety measures.

SECTION – I

TOWN PLANNING (2 CLOCK HOURS PER WEEK)

Unit 1: Necessity- Contribution- layouts (12)

Necessity and scope of Town Planning, Brief history. Greek and Roman towns, planning in ancient India - Indus Valley civilization. Vedic period. Buddhist period. Medieval period. Contribution of town planners in modern era such as Sir Patrick Geddes. Sir Ebenezer Howard. Clarence stein sir Patrick Abercrombie, Le corbusier Present status of town planning in India. Layout of residential units, neighbourhood unit planning, Radburn plan, grid iron pattern. Cul de sacs shoe string development. Growth pattern of towns, concentric satellite, ribbon, scattered.

Unit 2: Elements of Town-surveys-Town aesthetics (10)

Elements of town, various zones, Types of zoning. Urban roads- Objective and classification of roads, various road networks.

Surveys- physical, social, economic civic etc., Analysis of data, Town aesthetics, Treatment of traffic islands, open spaces, walks ways, public sit-outs. Sky walk, Continuous park system. Green ways.

Unit 3: M.R.T.P. –Land acquisition – rural development. (08)

Importance of MRTP in town planning.

Land acquisition act – necessity and procedure of acquisition. Village planning- Planning process, Multilevel planning, Decentralization concepts. Rural developments- planning methodology, Growth centre approach, Area Development approach, Integrated rural development approach

SECTION – II

CONSTRUCTION PRACTICES (2 CLOCK HOURS PER WEEK)

Unit 1: Earthwork Equipments (14)

Introduction -Conceptual planning of new project, site access and services, Mechanical v/s Manual construction.

Excavation in Earth: Earth moving equipments - Tractors, Bulldozers, Scrappers, Power shovel, Hoes, simple numerical problems based on cycle time and production rates, Drag line, Clamshell, Trenchers, Compactors- types and performance, operating efficiencies.

Unit 2: Prefabricated Units and Hoisting/ Erection Equipments (10)

Prefabricated construction – relative economy, elements and simple connections, cranes. Floating and dredging equipments. Asphalt mixing and batching plant (hot mix plant), sensor paver for rigid roads, Diaphragm Walls – Purpose and Construction Methods

Unit 3: Construction safety (6)

Safety against accidents on various construction sites such as building, dam, road, tunnel, bridge, fabrication and erection works, etc. Safety at various stages of construction.

Safety measures in construction, prevention of accidents

TERM WORK

Two Assignments per unit based on above syllabus.

REFERENCE BOOKS:

TOWN PLANNING

i) Town and country Planning- N.K. Gandhi, Indian Town and Country Planning Association, 1973.

ii) Fundamentals of Town Planning-G.K. Hiraskar, Dhanpat Rai Publication, 17th Edition.

iii) Town Planning- S. C. Rangawala, Charotar Publications, Pune .

iv) MRTP Act 1966.

v) Land Acquisition Act – 1894.

vi) Urban Pattern by Gallion, Eisner.

vii) Rural development Planning – Design and method : Misra S.N., Satvahan Publications , New Delhi.

viii) Economic development in Third world: Todaro Michael, Orient Longman Publication, New-Delhi

ix) Construction Safety Manual, National safety Commission of India.

CONSTRUCTION PRACTICES

i) Construction, Planning, Equipment and methods - R. L . Peurifoy McGraw hill book co New Delhi

ii) Erection of Steel Structures – Thomas Baron

iii) Reinforced Concrete Bridges – Taylors

iv) Planning and Construction of Docks and Harbors – Quin

v) Construction Equipment Guide, David A. Day, Neal B. H. Benjamin, John Wiley & Sons.

vi) Construction Equipment – Mahesh Varma ,Metropolitan book co ,New York

vii) Hand Book of Heavy Construction – Stubbs

viii) Concrete Construction Hand Book – Wadel

ix) Heavy Construction – Planning, Equipment and methods – Jagman Singh, Oxford and IBH publishers, New Delhi.

x) Construction of Diaphragm Walls, I Hajnal, I Marton, F. Regele Wiley Interscience Publication, John Wiley & Sons.

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xi) Structural & cut off Diaphragm walls, R.G.H. Boyes, Applied Science Publishers Ltd., London.

xii) Construction Technology, Prof. S. S. Ataev, Mir Publishers, Moscow.

w. e. f. Academic Year 2015-16

B.E. (CIVIL) PART–II
3. ELECTIVE II

3.1. ADVANCED ENGINEERING GEOLOGY

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Mark
Practical: 2 Hrs/Week	Oral Exam: 25 Marks
	Term Work: 25 Marks

Course Objectives:

1) To impart knowledge of geological formations of India
2) To learn about seismic zones of India and Seismic activity of Deccan trap region.
3) To know geological studies required for Civil Engg. project site
4) To study characterization of soils derived from different types of rocks
5) To Introduce Geophysics and Rock Mechanics
6) To impart knowledge of earth renewable and non renewable resources

Course outcomes:

By the end of the course students should be able to

1) Demonstrate knowledge of seismic zones of India and seismic activity in Deccan trap region.
2) Undertake geological studies required for Civil Engineering project site
3) Characterize various soils derived from different types of rocks
4) To select appropriate technique of Geophysics for site exploration
5) Select suitable sites and sources for obtaining earth renewable and non renewable resources
6) To identify aquifer zones in project site.

SECTION – I

Unit 1: Stratigraphy and Indian Geology (6)

Definition and scope, Geological Time scale, Physiographic division of India and their geologic, geomorphologic and tectonic characteristics, General study of important geological formations of India namely Dharwar , Vindhyan, Cuddapah, Gondwana and Deccan traps , Tertiary with respect to:

1. Introduction and general information.
2. Distribution.
3. Litho logy.
4. Tectonics.
5. Economic importance, Significance of these studies in Civil Engineering.

Unit 2: Seismic Activity of Deccan Trap Regions (6)

Continental Drift Theory and plate Tectonics in brief, Seismic zones of India, world, Seismic activity of Deccan trap region. Various theories on the origin of the seismic activity of Deccan Trap region, Reservoir induced seismicity, characteristics of seismic activity of Deccan Trap region. Tectonics of Deccan Trap region. Tectonic nature of seismic activity of Deccan Trap region. Prediction and precaution of earthquake. Earthquake proof constructions. Numerical problems based on seismic data.

Unit 3: Subsurface Exploration (4)

Various steps in the geological studies of project site, Engineering consideration of Structural features like dip, strike, joints, fractures, faults, folds, dykes etc. Exploratory drilling, observations during drilling, preservation of cores, core Logging, Graphical representation of core log, Limitations of exploratory drilling method, Numerical problems on core drilling.

Unit 4: Subsurface Water (7)

Runoff, Fly off and percolation of surface water, Ground water, Juvenile, connate and meteoric water, water table, zones of subsurface water, perched water table, types of aquifer. Requirements of good aquifer, Porosity and permeability of rocks, Darcy's law, hydraulic gradient, regional problems in ground water, water bearing capacity of common rocks, springs, hot springs and geysers, Artesian wells, cone of depression and its significance in civil Engineering, Natural and artificial recharge of aquifers, Saline water intrusions - control and prevention, Numerical problems related to Groundwater. Photogrammetry, Remote sensing and GIS /GPS, Water management.

SECTION II

Unit 5: Engineering Geology of Deccan Traps **(6)**

Types of Basalts and associated volcanic rocks, Engineering characteristics of these rock types, Engineering significance of variation in size, number and infillings of gas Cavities, Compact and amygdaloidal basalt as construction material, Effect of Jointing, hydrothermal alteration and weathering on engineering behavior of Various varieties of Deccan traps. Tail channel erosion problem in Deccan Trap region, suitability of Basalts from tunneling point of view. Problems due to columnar Basalt, dykes, red bole, Vesicular Basalt, volcanic breccias and fractures, Laterites -Origin, occurrence and engineering aspects. Ground water bearing capacity of the rocks of Deccan Trap region, Percolation tanks, Geological conditions suitable and unsuitable for construction of Percolation tanks

Unit 6: Geology of Soil Formations **(3)**

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

Unit 7: Geophysics **(5)**

Various geophysical methods, Basic principles of seismic, magnetic, gravitational and electrical resistivity methods, electrical resistivity. Use of electrical resistivity method using Wenner, Schlumberger, Inverse slope Configuration in Civil Engineering problems such as

i) Finding out the thickness of over burden and depth of hard rock.

ii) Locating the spot for ground water well.

iii) Seepage of water finding.

iv) Water harvesting techniques

Unit 8: Rock Mechanics **(5)**

General principles of rock mechanics, various engineering properties of rocks and their dependence upon geological characters, In-built stresses in rocks, measurements of these stresses by various methods.

Unit 9: Resource Engineering **(4)**

Types of resources, Earth renewable and non renewable resources, Coal and Petroleum as energy resources, Genesis, occurrence and reservoir of coal and Petroleum in India, geothermal energy. Mining methods, Mining laws, Mineral dressing techniques.

TERM WORK

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

1) Study of geological map of Maharashtra state and India.
2) Study of Civil Engineering aspects of important rock types.
3) Study and identification of important rocks and minerals in Megascopic and thin section under Microscope.
4) Three point problems.
5) Core logging of exploring drill hole.
6) Study and constructions of subsurface sections based upon data of the series of drill holes.
7) Completion of outcrop on contoured geological map and drawing a section of it.
8) Photogrammetry, Remote sensing and GIS
9) Use of electrical resistivity method for determining depth of bedrock, or ground water, Problems on confined and unconfined aquifers.
10) Education tour to the projects to study engineering geological aspects.

ORAL EXAMINATION

The oral exam will be based upon the above syllabus of the term work

TEXT BOOKS:

1. Introduction to Rock Mechanics by Verma B. P., Khanna Publisher Delhi.
2. Engineering Geology –By B. S. Sathya, Narayanswami.
3. Introduction to Engineering and General Geology – by Dr. P. T. Sawant, New India
4. Publishing Agency- NIPA, New Delhi.
5. Engineering Geology- A. Parthsarathy, Wiley India Pvt. Ltd. New Delhi
6. Fundamentals of Engineering Geology: F. G. Bell, B. S. Publications

REFERENCE BOOKS:

1. Geology of India and Burma – D.N Wadia, M. S. Krishnan, Higginbotham Pvt. Ltd;

2. Groundwater Hydrology by Tod 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.

B.E. (CIVIL) PART-II

3. ELECTIVE II

3.2 GROUND IMPROVEMENT TECHNIQUES

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course objectives:

1. Students will know about various types of difficult soils and learn appropriate ground improvement techniques to improve performance of soil.
2. Students will know various methods of drainage and dewatering, during construction stage and post construction stages
3. Students will learn about the use of geosynthetics in ground improvement methods.
4. Students will be familiar with various slope stabilization techniques and their limitations.
5. Students will be conversant with various soil stabilization techniques

Course outcomes:

By the end of the course students should be able to

1. Suggest suitable ground modification option in dealing with difficult soils
2. Design shallow compaction system as well as deep dynamic compaction system
3. Design PVD system, sand drains, stone columns, dewatering systems
4. Apply suitable stabilization techniques which suits the soil at the site
5. Suggest suitable treatment to soil to improve its Engineering properties.

SECTION I

Unit 1: **(4)**

Introduction: Ground modification option in dealing with difficult soils, objectives of ground improvement. Role of ground improvement in foundation engineering – classification of ground modification techniques – Geotechnical problems in alluvial, lateritic and black cotton soils –Factors to be considered in the selection of the best soil improvement technique.

Unit 2: **(10)**

Mechanical modification: Introduction, aim of mechanical modification; surface compaction of soil, various equipment for compaction and their suitability for different soils.

In-situ Densification methods in cohesionless soils: Rapid impact compaction, Deep Dynamic compaction, Vibro flotation, Sand compaction piles and deep compaction and blasting.

In-situ Densification methods in cohesive soils: Introduction, Consolidation, Preloading with sand drains, and fabric drains, Stone columns and Lime piles, installation techniques, simple design , relative merits of above methods and their limitations.

Unit 3: **(8)**

Hydraulic modification: Dewatering, purpose of dewatering during construction stage and post construction stage, methods of dewatering such as ditch and sump method, Well point system , deep well system, Vacuum dewatering system, Electro-osmotic method ; advantages and limitations of each method Seepage analysis for two dimensional flow, fully penetrating slots in homogeneous deposits (simple cases only).

SECTION II

Unit 4: **(6)**

Thermal modification and slope stabilization: Heat treatment of soils, methods of heating soil in situ; ground freezing introduction, techniques of in situ artificial ground freezing,

Slope stabilization Concept, various methods, Growing vegetation, drainage, anchoring, micro piling bolting Soil nailing etc.

Unit 5: **(8)**

Physico-Chemical modification:

Mechanical stabilization: Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

Lime and Bituminous Stabilization: Types of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

Unit 6: **(9)**

Modification by inclusions and confinement:

Grout injections, suspension and solution grouts, grouting equipment and methods, Applications. Reinforced Earth: Principles, components of reinforced earth, factors governing design of reinforced earth walls, Introduction to reinforced earth, load transfer mechanism and strength development, soil types and reinforced earth, anchored earth nailing reticulated micro piles, soil dowels, soil anchors, reinforced earth retaining walls

TERM WORK

At least two assignments shall be given on each unit based on concept, theory and design of ground improvement technique. Minimum 12 assignments shall be given.

TEXT BOOKS:

1. Engineering principles of ground modification by M. R. Hausmann, McGraw hill publication
2. Ground Improvement Techniques- Purushothama Raj P. (1999), Laxmi Publications, New Delhi.
3. Construction and Geotechnical Method in Foundation Engineering- Koerner R.M. (1985) - McGraw Hill Pub. Co., New York.

REFERENCE BOOKS:

1. Foundation and earth retaining structures by Muni Budhu John Wiley and sons
2. Ground Improvement by M.P. Moseley and K. KirschSpon press
3. Das, B.M., Principles of Foundation Engineering, Fourth Edition, PWS Publishing, 1999.
4. Boweven R., Text Book on Grouting in Engineering Practice, Applied Science Publishers Ltd.
5. Donald .H. Gray & Robbin B. Sotir, Text Book on Bio Technical & Soil Engineering Slope Stabilization, John Wiley
6. Rao G.V. & Rao G.V.S., Text Book On Engineering with Geotextiles, Tata McGraw Hill
7. Soil stabilization, Principles and Practice—Ingles C.G. and Metcalf J. B. (1972), Butter worth, London.

8. Shroff A. V. “Grouting Technology in Tunneling and Dam, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi-1999
9. Moseley M. D. Ground Treatment, Blackie Academic and Professional, 1998
10. Van Impe W. E., Text Book on Soil Improvement Techniques and Their Evolution, Balkena Publishers.

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B.E. (CIVIL) PART-II

3. ELECTIVE II

3.3 TRAFFIC ENGINEERING AND CONTROL

Teaching Scheme:	**Examination Scheme**
Lectures: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1. Learning basics of traffic engineering, road user characteristics and vehicular characteristics.
2. Familiarizing the students to various traffic studies their methodologies, application and analysis of traffic data.
3. To learn about nature of traffic flow, capacity studies for urban and rural roads and concept of Passenger Car Unit (PCU).
4. To know the various traffic control regulations, traffic control devices, Intelligent Transportation System (ITS) and instruments used in the traffic studies.

Course Outcomes:

By the end of the course students should be able to

1. Undertake various traffic studies and analysis of traffic data including parking studies and calculation of parking demand.
2. Establish relation between flow, density, speed, concept of level of service for urban and rural area.
3. Define traffic regulations on vehicle, driver and speed. Also able to understand various traffic control devices like different signs, markings, signals and lighting.
4. Demonstrate Intelligent Transport System (ITS) and their application in traffic engineering.
5. Demonstrate the use of various instruments used in traffic studies and their applications.

SECTION-I

Unit 1: **(8)**

a) Introduction: Components of road traffic, the vehicle, driver and road, Objectives-Scope of Traffic Engineering.

b) Traffic characteristics: Road user characteristics, vehicular characteristics-static and dynamic characteristics, power performance of vehicles, Road Characteristics, Resistance to the motion of vehicles – Reaction time of driver – Problems on above.

Unit 2: **(8)**

Traffic parameter studies and Analysis: Objectives and Method of study – Definition of study area- Sample size – Data Collection and Analysis- Interpretation of following Traffic Studies- Volume, Spot Speed, Speed and Delay , Origin and Destination, - parking on street and off street Parking- space consideration, parking demand, parking load and duration, space demand relation. Accidents- Causes, Analysis (right angle collision only with parked vehicle), Measures to reduce Accident. Numerical problems.

Unit 3: **(6)**

Traffic Flow and Capacity: Nature of Traffic flow, Approaches to understand Traffic Flow, Parameters connected with Traffic flow, Categories of Traffic flow, Uninterrupted traffic flow model. Analysis of speed, flow and density relationship, Empirical studies of traffic stream Characteristics. Highway capacity and levels of service, capacity of urban and rural roads, PCU concept.

SECTION-II

Unit 4: **(8)**

Traffic Regulation: General regulations, regulations on vehicles- Vehicle registration requirements and accessories, vehicle inspection, inspection coverage, general control for motorist pedestrian, regulations on drivers-driver licensing, speed control-methods of control devices speed zoning, one way street – necessity, requirements, advantages and disadvantages.

Unit 5: **(7)**

Traffic Control Devices: Traffic signs, traffic Markings, islands and traffic signals- vehicle actuated and synchronized signals, signal coordination, Road Lighting and Intelligent Transport System- Definition, Necessities, Application in the present traffic scenario.

Unit 6: **(8)**

Automated Traffic Measurement – Traffic volume measurement – In-situ Technologies (Intrusive and non- Intrusive technologies), detectors and magneto-meter/Passive magnetic systems, pneumatic tube detector, Inductive Detector Loop (IDL), Weigh in motion (WIM) detector system, Video image detection (VID), Infrared Sensors. Speed and delay survey-Floating Car Data (FCD), GPS-based FCD, application of Radio-frequency identification (RFID), Travel Time Data collection Technique, ITS probe vehicle data collection systems. Bump Integrator, Portable skid resistance tester, sideways force test vehicle and miscellaneous equipment.

TERM WORK

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

TEXT BOOKS:

1. Traffic Engineering by Matson, Smith and Hurd, McGraw Hill & Co publication.
2. Traffic Engineering and Transport Planning by Dr. L.R.Kadiyali., Khanna Publishers.
3. Highway Engineering by Khanna and Justo, Nem Chand &Bros publication.
4. Traffic Engineering – An Introduction by Wells, G.R., Griffin, London publication.

REFERENCE BOOKS:

1. Traffic Engineering by Pignataro, Prentice Hall publications
2. Highway Traffic Analysis and Design by Salter, R.J and Hounsell, N.B., Mac Millan publishers, 1996.
3. Highway capacity Manual-2000.
4. An Introduction to Transportation Engineering by Jotin Khistey and Kent Lall, Prentice Hall publication, 2002.

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B.E. (CIVIL) PART –II

3. ELECTIVE II

3.4 INFRASTRUCTURAL ENGINEERING

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:-

1) To have an Overview of Power, Transportation, Water Supply, Sanitation, and Telecommunications Sector in India.
2) To study policies related to Special Economic Zones, Concerned organizations and role of players in the field of infrastructure.
3) Acquaint the Information Technology and Systems for successful infrastructure management.

Course Outcomes:-

Upon successful completion of course the students will be able to:

1) Apply Infrastructure Engineering concepts and a understand Public Private Partnership in Civil Engineering.
2) Understand policies, economics, operation research, and technologies prevailing in infrastructural engineering and the social aspects of infrastructure development.
3) Apply the Information Technology and Systems tools for successful infrastructure Management.

SECTION –I

Unit 1: **(08)**

An Overview of Basic Concepts Related to Infrastructure

Introduction to Infrastructure, Overview of the Power Sector, Transportation Sectors, Water Supply and Sanitation Sector, Road, Rail, Air, and Port Telecommunications Sector Urban Infrastructure, Rural Infrastructure in India

An introduction to Special Economic Zones, Organizations and players in the field of Infrastructure, The Stages of an Infrastructure Project Lifecycle, Infrastructure Project Finance.

Unit 2: **(08)**

Public private partnership in Infrastructure

Historical Overview: - Infrastructure privatization the benefits of Infrastructure privatization Problems with infrastructure privatization.

Challenges in privatization of Water Supply, Privatization of Power, Privatization of Infrastructure in India: Water Supply project- Privatization of road transportation infrastructure in India

Unit 3: **(07)**

Challenges to Successful Infrastructure Planning and Implementation

Economic and demand risks, Political risks, Socio-Environmental risks, Cultural risks in international infrastructure projects, Legal and contractual issues in Infrastructure. Challenges in construction and maintenance of infrastructure.

SECTION –II

Unit 4: **(08)**

Strategies for Successful Infrastructure Project Implementation

Risk management framework for Infrastructure Projects, Shaping the planning phase of infrastructure projects to mitigate risks, Designing Sustainable Contracts, Introduction to fair process and negotiation, Negotiating with multiple stakeholders on infrastructure projects, Sustainable development of infrastructure

Unit 5:

Advanced Infrastructure **(08)**

Information Technology and Systems for successful infrastructure Management, Innovative design and maintenance of infrastructure facilities, Performance Modelling and Life Cycle Analysis techniques, Capacity Building, Improving the Government's role in infrastructure implementation ,An integrated framework for successful Infrastructure

Unit 6: **(06)**

Planning, and Management – Infrastructure Management Systems and Future directions

TERM WORK

Assignments based on above syllabus. Minimum five field visits with visit reports.

TEXT BOOKS:-

1) Infrastructure Engineering and Management, Grigg, Neil, Wiley Publication, (1988).
2) Infrastructure management: Integrating design, Construction, Maintenance, Rehabilitation, and Renovation, Hudson, Haas, and Uddin, Tata McGraw Hill Publication, (1997).

REFERENCES BOOKS:-

1) Indian Road Congress Journal.
2) Indian Railways Journal.
3) Indian Water Works Association Journal.
4) World Development Report 1994: Infrastructure for Development (1994).

B.E. (CIVIL) PART –I I

3. ELECTIVE II

3.5 PROJECT APPRAISAL

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To understand the formulation and identification of project.
2) To familiarise with proper methodology and various technical, financial and Investment Criteria, Appraisal and risk analysis for Civil Engineering project
3) To guide for documentation and report making.

Course Outcomes:

By the end of the course students should be able to

1) Formulae projects and identify projects for various locations and sites.
2) Apply proper methodology and various Technical, Financial and Investment Criteria, Appraisal and risk analysis for Civil Engineering projects.
3) To prepare the reports for presentation and administration the project.

SECTION – I

Unit 1: **(08)**

Project formulation and Identification:-

Project- Concepts, Capital investments, Generation and Screening of Project Ideas.

Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno Economic Feasibility Report, Detailed Project Report – Different Project Clearances required.

Unit 2: **(08)**

Technical Analysis:- Plant Capacity, Materials and Utilities, Environmental considerations, Project charts and layouts, Location and site, Infrastructure costs, Environmental aspects, Project Implementation, Considering alternatives

Market and Demand analysis: - Collection of Information, Conduct of Market Survey, Characterisation of Market, Demand Forecasting, Marketing Plan.

Unit 3: **(07)**

Financial analysis and Investment Criteria:-

Financial Analysis:- Estimates of Sales and Production, Cost of production, Capital cost, Engineering economic and Comparison, investment and capital flow of the outlay cash project and its significance profit, Probability and break even analysis.

Investment Criteria:- Internal Rate of Return, Benefit Cost ratio, Net Present Value, Account Rate of Return, Pay Back Period, study influence of inflation on profitability influence of inflation and escalation on the projects.

SECTION – II

Unit 4: **(07)**

Social Aspects: Social cost benefit analysis (SCBA):- Rationale for SCBA – UNIDO approach objectives, direct – indirect costs and benefits – tangibles, intangibles and their conversion, levy subsidy concepts. Net benefit in terms of economic prices - Little and Mirlee's approach to SCBA.

Unit 5: **(08)**

Appraisal: Decision making criteria and selection from alternatives using the Discounting and Non-Discounting criteria, Assessment of Various Methods, Indian Practice of Investment Appraisal, International Practice of Appraisal.

Analysis of Risk:- Selection of a Project and Risk Analysis in Practice using Sensitivity analysis and Market analysis, application of decision tree analysis and game theory.

Unit 6: **(07)**

Project Review and Administration aspects:-

Control of In-Program projects, post completion audits, Abandonment Analysis, project management after completion.

Administrative aspects of Capital Budgeting, Agency Problem, Evaluating Capital Budgeting systems of an organization. Preparation of project report and norms and its presentation. Definition of entrepreneurship and entrepreneur qualities.

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

TEXT BOOKS:-

1) Projects- Planning, Analysis, Selection, Implementation Review, Prasanna Chandra, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
2) United Nations Industrial Development Organisation (UNIDO) Manual for the Preparation of Industrial Feasibility Studies, (IDBI Reproduction) Bombay, 1987.
3) Project Management, S.Choudhury, Tata McGraw Hill Publishing Co., Ltd.
4) Financial Management, Ravi.M.Kishore, Taxman Publications.

REFERENCE BOOKS:-

1) Water resources Project Economics, Edward Kuiper, Butterworths, 1971.
2) Cost Benefit Analysis, E. J. Mishan.
3) The Practice of Entrepreneurship, Geoffery G. Meredith, R. E. Nelson.
5) Construction Project Management, Planning, Scheduling and Control, Krishan K. Chitkara, Tata McGraw Hill Publishing Co., ltd.
6) Project Management, K. Nagarajan, New Age International, 2004.
7) Project Management, Merdith & Gopalan, Wiley India Ltd. 2011.

B.E. (CIVIL) PART –II

3. ELECTIVE II

3.6 SOLID AND HAZARDOUS WASTE MANAGEMENT

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2 Hrs/Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To study the types, sources, generation of solid &hazardous waste.
2) To impart basic knowledge of collection, transportation, treatment and disposal of solid waste
3) To study handling and storage of solid and hazardous waste.

Course Outcomes:

Upon successful completion of course, the students will be able to:

1) Suggest waste reduction and resource recovery methods
2) Explain various waste disposal methods
3) Examine legal, political and administrative considerations in design and operation of solid and hazardous waste management

SECTION I

Solid Waste Management

Unit 1: **(06)**

Solid Waste management: Functional outlines of refuse, storage, transportation of refuse, analysis, composition and quantity of refuse, Economic aspects of refuse collection and transport.

Solid waste in industries, common types of solid waste, classification, collection and transportation. Concept of biomedical & Hazardous waste management.

Unit 2: **(05)**

Solid waste handling and Processing methods, Segregation and salvage recovery of bye-products, use of solid waste as raw material in industries. Recycling of solid waste.

Unit 3: **(06)**

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

Unit 4: **(06)**

Incineration: Theory and types of incinerators, location, planning aspects, effects of feed, composition, rate and temperature, air supply, design of incineration plant, pyrolysis and its by-products, energy recovery.

Solid waste management rules, status of solid waste management in India.

SECTION –II

Hazardous Waste Management

Unit 5: **(06)**

Definition of Hazardous waste, Characteristics and nature of hazards, natural and man- made hazards, classification of hazards.

Unit 6 : **(04)**

Qualitative estimation of damages, risk assessment and management.

Unit 7: **(06)**

Types of hazardous waste, characteristics, Site assessment waste minimization resource recovery. Strategy for minimization of damage due to natural and manmade hazards.

Unit 8: **(06)**

Storage and handling of hazardous waste, Site Selection, Transportation of hazardous wastes. Case Studies of hazards, episodes. Sanitary landfill site selection, types of land filling, maintenance and precaution, leachate and its control, control of contamination of ground water.

TERM WORK

1. Analysis of solid waste

2. Project on Design of Refuse collection & Disposal System for medium size town or a part of city.

3. Case study of Hazards and Episodes (Any Two).

4. Assignments (One Assignment on each unit)

TEXT BOOKS:

i) Solid Waste Management – Dr. A.D. Bhide

ii) Hazardous Waste Management – C. A. Wentz McGraw Hill International Edition

iii) Management of Municipal Solid Waste- T. V. Ramchandra, Capital Publishing company, New Delhi

iv) Solid and Hazardous Waste Management- M. N. Rao and Razia Sultana BS Publication

REFERENCE BOOKS:

i) Solid Waste Management – George Tchobanoglous, Mc Graw Publication

ii) Manual on Municipal Solid Waste management by ministry of Urban Development of Govt. of India.

iii) Solid Waste Management- I. H. Khan, and Naved Ahsan, CBS Publishers and Distributors, New Delhi.

B.E. (CIVIL) PART –I I

3. ELECTIVE II

3.7 DYNAMICS OF STRUCTURES

Teaching Scheme:-	**Examination Scheme:**
Lecture : 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks.

Course Objectives:

1) To introduce the fundamental theory of dynamic equation of motions
2) To acquaint with the fundamental analysis methods for dynamic systems
3) To learn the dynamics response of single and multi-degree-of-freedom systems

Course Outcomes:

At the conclusion of this course, the students will be able to:

1) Create mathematical models for engineering structures using knowledge of structural dynamics
2) Interpret dynamic analysis results for design, analysis and research purposes
3) Apply structural dynamics theory to earthquake analysis and design of structures

SECTION – I

Unit 1: SDOF Systems Subjected to General Dynamic Loading (8)

Duhamel's integral, Application to simple loading cases, numerical evaluation of response integral, Piece wise exact method, Newmark's-Beta method.

Unit 2: Free Vibration Analysis of MDOF systems - I (8)

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

Unit 3: Free Vibration Analysis of MDOF systems – II **(7)**

Modal analysis method for free vibration analysis, modal combination rules, systems with and without damping, proportional damping.

SECTION – II

Unit 4: Forced Vibration Analysis of MDOF systems **(6)**

Governing equations, modal analysis, numerical evaluation of modal equations by Newmark's-Beta method, mode combinations.

Unit 5: Distributed- Parameter Systems **(10)**

Partial differential equations of motion, Free and forced Vibration, Application to beams in flexure

Unit 6: Energy Methods **(6)**

Rayleigh method for Discrete and continuous systems, Fundamental mode analysis.

TERM WORK

Problems / Tutorials based on above topics

REFERENCES BOOK:

1. Dynamics of Structures –A.K. Chopra, Dhanapat Rai & sons, New Delhi
2. Structural Dynamics - Mario Paz, CBS Publication
3. Dynamics of Structures – R. M. Clough and Penzian, McGraw Hill Co., New Delhi

TEXT BOOKS:

1. Mechanical Vibrations – G. R. Grover, Roorkee University, Roorkee.
2. Dynamics of Structures- Patrick Paultre, Wiley India Pvt. Ltd, New Delhi

B.E. (CIVIL) PART –I I

3. ELECTIVE II

3.8 ENVIRONMENTAL MANAGEMENT

Teaching Scheme:	**Examination Scheme:**
Lecture : 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course Objectives:

1) To study principles of Environmental Management System.
2) To acquaint students with different Environmental pollution control acts.
3) To study the electronic, biomedical and industrial waste properties and waste management systems
4) To inculcate idea of Environmental Impact Assessment.

Course outcomes:

Upon successful completion of course the students will be able to:

1) Demonstrate basic principles of Environmental Management System.
2) Explain different Environmental pollution control acts.
3) Select appropriate technology for management of electronic, biomedical and industrial waste
4) Perform Environmental Impact Assessment small project

SECTION-I

Unit 1: **(6)**

Fundamentals of environmental management system (EMS) and ISO 14000 series: History Background and development of ISO 14000, TC-207, ISO 14000series. Environmental management Plans- Principles and elements. The ISO 14001-Environmental management systems standard, Definitions, Eco labeling, Auditing

Unit 2: **(6)**

Environmental management acts related to environmental protection: Air, Water, Soil and Hazardous Waste. Detailed study of following acts - Water act 1974(Prevention and control of pollution), Air act 1981 (Air pollution prevention and control of pollution), Hazardous waste management handling rules -1989. Municipal solid waste rules- 2000, Noise pollution regulation and control rules 2000 **(7)**

Unit 3 : **(5)**

Electronic waste management: Objectives, Classification of E-waste, guidelines for environmentally sound management of E-waste, environmentally sound treatment technology for E-waste, guidelines for environmentally sound integrated E-waste recycling and treatment policy International scenario, hazardous substances that can occur in E-waste.

Unit 4: **(5)**

Biomedical waste management: Introduction, Classification, Types, segregation, packaging and transportation and storage, possible hazards, Effects, Detailed study of Biomedical waste management and handling rules 1998.

SECTION –II

Unit 5: **(4)**

Air pollution control:, Air quality standards, Air pollution control technologies for oxides of sulphur: Reducing SOx levels through dilution by increasing stack height, use of alternative fuels. Extraction of sulphur from fuels. Reduction of sulphur in combustion process, fuel gas desulfurization.

Air pollution control technologies for oxides of Nitrogen: Emission of nitrogen oxides. Control technologies for oxides of nitrogen emissions. Air pollution control technologies for volatile organics, Hydrocarbons and hydrogen sulphide.

Unit 6: **(5)**

Advanced waste water treatment: Carbon adsorption, Ion exchange, sodium and hydrogen cycle. Membrane process. Electro dialysis process, pressure membrane process and membrane performance characterization. Nutrients removal such as nitrogen and phosphorus

removal. Land treatment systems: Irrigation, rapid infiltration and overland flow systems. Wetland flow Systems.

Unit 7: **(7)**

Environmental Impact Management (EIA)

I) Definition, Objectives of EIA .EIA procedure in detail, Role of different actors in EIA, components of EIA, Areas of human concern (Impact categories), Contents of EIA, Categories of projects under EIA, Introduction to Impact assessment methods such as Leopold matrix Legal provision for public participation in India,

Role of general public in Environmental clearance. Limitations of EIA

II) The environmental rules 1999, sitting for industrial process, methodology for preparing environmental impact assessment, role of regulatory agencies and control boards in obtaining Environmental clearance for project.

III) **Case studies:-**Positive and negative environmental impacts of Dams, Express highways, Major industries, Power plants

Unit 8: **(7)**

Miscellaneous Topics

I) **Removal of Chromium:** General, control methods, reduction precipitation, Ion Exchange, RO, Lime coagulation and adsorption

II) **Removal of Mercury:** General, measurement of mercury, mercury losses in Chlor-Alkali industries, removal of mercury from gaseous streams, removal of Mercury through liquid streams.

III) **Treatment of phenolic effluents:** Introduction, sources of phenols, Treatment and removal.

TERM WORK

Term work shall consist of assignments on all above units and following chapters and one industrial visit report.

Oral examination shall be based on above term work.

TEXT BOOKS:

1. Environmental engineering and management- Dhameja, Katson publications, Delhi
2. Air Pollution and control, K.V.S.G. Murli Krishna, Jain Brothers, Delhi
3. Water Management, K.V.S.G. Murli Krishna, Environmental Protection Soc., Kakinada

REFERENCE BOOKS:

1. Indian standards BIS

-IS/ISO 14001

- IS/ISO 14004
- IS/ISO 14011
- IS/ISO 14010
- IS/ISO 14012

2. Wastewater treatment and reuse- Metcalf and Eddy, TMG, Delhi
3. Pollution control in process industries- S. P. Mahajan, TMG, Delhi
4. Environmental science and engineering- Henry and Henke, PHI, New Delhi
5. For all environmental acts and updates - **http://www.envfor.nic.in**

B.E. (CIVIL) PART –I I

3. ELECTIVE II

3.9 DESIGN OF BRIDGES

Teaching Scheme:	**Examination Scheme:**
Lectures: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 25 Marks
	Oral Exam: 25 Marks

Course objectives:

1) To learn various elements of bridges and their significance in the load transfer mechanism.
2) To understand different loading on bridges and their evaluations as per the codal provisions.
3) To make students able to design various elements of superstructure and substructure of bridges using IRC Codes.
4) To understand the different techniques available for repair and maintenance of bridges.

Course outcome:

By the end of the course students should be able to

1) Evaluate different loads coming on the bridges as per the IRC bridge code
2) Design the different types of Deck slabs such as Solid slab and T beam type slab for two lane and four lane bridges.
3) Verify the adequacy of the Pier and Abutments for the given data
4) Identify the most suitable techniques for the maintenance and repair of the bridge under the given conditions

SECTION – I

Unit 1: **(4)**

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

Unit 2: **(8)**

Standard specification for Road Bridges. I.R.C. bridge code, width of carriageway, 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. Introduction to prestressed concrete bridges - PSC Box girder bridges

Unit 3: **(10)**

General design considerations for R.C.C. & P.S.C. Bridges., Relative costs of bridge components. Design of reinforced concrete deck slab for two lane and four lane bridges,, Pigeaud's theory, beam and slab and T–beam, Courbon's theory.

SECTION – II

Unit 4: **(8)**

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

Unit 5: **(8)**

Design of sub structure, abutments, Piers, approach slab, well foundation

Unit 6: **(7)**

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

TERM WORK

A set of tutorials based on above topics of syllabus.

TEXT BOOKS:

1. Essentials of Bridge Engg. by D. Johnsons Victor, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Design of RCC Bridges- Jagdish Jayaram
3. Reinforced Concrete Structures – Vol. II by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.

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REFERENCE BOOKS:

1) Concrete Bridge Practice by Dr. V. K. Raina, Tata McGraw Hill

2) Bridge Engg. by S. Ponnuswamy, Tata McGraw Hill

3) K. S. Rakshit, Design and Construction of Highway Bridges, New Central Book agency

IRC CODES:

1) IRC 6 (2000), Section II: Loads and stresses.
2) IRC 16 (1989), Section for priming of base course with bituminous primers
3) IRC 18 (2000), Design criteria for PC road bridges (post tensioned concrete)
4) IRC 21(2000), Section III : Cement concrete (Plain and reinforced)
5) IRC 78 (2000), Section VII: Foundations and substructures
6) IRC 83 (1982), Section IX: Bearings, Part I: Metallic bearings (1994)
7) IRC 83 (1987), Section IX: Bearings, Part II: Elastomeric bearings(1994)
8) IRC 83 (1987), Section IX: Bearings, Part III: POT and PTFE bearings (1994)

WEBSITES:

www.mahapwd.com

www.irc.org.in

B. E. (CIVIL) PART – II

4. ELECTIVE – III

4.1 ADVANCED DESIGN OF STEEL STRUCTURES

Teaching scheme:	**Examination scheme:**
Lectures: 3 Hours per week	Theory paper: 100 marks
Practical: 2 Hour per week	Term work: 50 marks

Course Objectives:

1. To introduce the concept of plastic analysis
2. To study the behaviour and design of Multistoried Steel Buildings and Moment Resisting Frames
3. To study the design of Fixed and continuous beams by Plastic analysis
4. To learn analysis and design of Cold-formed light gauge steel sections
5. To study the behavior and design Concrete-steel composite sections

Course Outcomes:

Upon successful completion of the course the students will be able to:

1. Demonstrate the conceptual understanding of plastic analysis approach
2. Design trussed girder bridges and Cold-formed light gauge steel sections
3. Design multistoried steel buildings and moment resisting frames
4. Design fixed and continuous beams by Plastic analysis
5. Design Concrete-steel composite sections

SECTION – I

Unit 1: **(8)**

Design of Trussed girder bridges and bearings. Deck type, through type bridges, bracing systems, end bearings, mechanical and elastomeric bearings.

Unit 2: **(7)**

Multistory steel buildings, load transfer mechanism, lateral resisting systems, Design of moment resistant frames.

Unit 3: **(8)**

Cold-formed light gauge steel sections, special design considerations for compression elements, design of light gauge beams, behavior under repetitive loads and temperature effects.

SECTION – II

Unit 4: **(8)**

Plastic analysis, plastic bending of beams, plastic hinge, upper and lower bond theorems, uniqueness theorem, yield criteria, analysis and design of fixed and continuous beams.

Unit 5: **(7)**

Plastic analysis and design of portal frames, collapse mechanisms, multi story multi bay frames, plastic moment distribution method, minimum weight design, variable repetitive loads, introduction to limit states in steel Design.

Unit 6: **(7)**

Concrete-steel composite sections, elastic behavior of composite beams, Design of composite beams, Design of encased steel columns.

PRACTICAL WORK:

Problems based on above topics of syllabus.

TEXT BOOKS:

1. Design of steel structures- A. S. Arya, J. L. Ajamani, Nemchand and brothers.
2. Structural analysis and design of tall buildings by B. S. Taranath, McGraw Hill.
3. Design of Steel Structures, N. Subramanian, Oxford higher education, 2008
4. Limit State Design in Structural Steel by M.R. Shiyekar
5. Design of steel structures- Vol. II by Ramachandran, Standard Book House, Delhi.

REFERENCE BOOKS:

1. Limit State Design of Steel Structures, S. K Duggal
2. Structural analysis and design of tall buildings by B. S. Taranath. McGraw Hill.

3. Steel skeletal Vol II. Plastic behavior and design by J. F. Bekar, M. R. Horne, J. Heyman. ELBS.
4. Plastic methods of structural analysis by Neal B. G. Chapter and Hall.
5. Teaching Resource for structural steel Design – Vol.III by IIT Madras, Anna University Chennai, SERC, Madras and Institute for Steel Development and Growth (INSSDAG), Kolkata.

B.E. (CIVIL) PART –I I

4. ELECTIVE III

4.2 INDUSTRIAL WASTE TREATMENT

Teaching Scheme:	Examination Scheme:
Lecture – 3 Hrs / Week	Theory Paper – 100 Marks
Practical - 2 Hrs / Week	Term Work – 50 Marks

Course Objectives:

1. To understand sources of waste water in different industries.
2. To study waste water treatment options for different industries.
3. To acquire knowledge about disposal of effluents and the standards for disposal

Course Outcomes:

On successful completion of this course the students will be able to:

1. Characterize different industrial wastes
2. Suggest treatment alternative based on characteristics of industrial waste.
3. Demonstrate basic knowledge of legislation for pollution control

SECTION -I

Unit 1: **(5)**

Use of water in industry, Sources of wastewater, quality, and quantity variation in waste discharge, water budgeting, characterization and monitoring of wastewater flow, Grab samples and Composite samples. Population equivalent, Relative stability and Theoretical oxygen demand. Water quality criteria and effluent standards. Introduction to water quality index (WQI), methods used.

Unit 2: **(7)**

Waste volume and strength reduction, In-Plant measure, good housekeeping, Process change, leakage prevention, segregation, recycling, neutralization, equalization and proportioning of waste. In line equalization, Side line equalization. Methods for determining volume of equalization tank.

Unit 3: **(7)**

Water quality monitoring of streams, Self-purification of stream, Streeter Phelphs equation, Classification of streams. B.O.D. reaction rate - Method of least squares, Thomas method and Fuji mato method. D.O. Sag curve and D.O. deficit calculations.

Unit 4: **(4)**

Miscellaneous methods of dissolved solids removal- Ion-exchange, Electro dialysis, Reverse osmosis and Evaporation, Adsorption. Sludge disposal methods.

SECTION –II

Unit 5: **(4)**

Different types of waste treatment and their selections, Development of treatment flow diagram based on characteristics of waste. Pollution characteristics of common Industries.

Unit 6: **(9)**

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. Effect of above industrial wastes on receiving water bodies.

Unit 7: **(4)**

Introduction to the concept of zero discharge, Recycling and reuse and recovery Introduction to 3R principles to convert waste into wealth, Acclimatization of bacteria to toxic wastes, process sensitivity, operation and maintenance requirements.

Unit 8: **(5)**

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, socioeconomic aspects of water pollution control.

Introduction to Wetland treatment – Root zone cleaning system. Introduction to green processes in the industries.

TERM WORK

1) Visit to any four of the following industries

i. Sugar industry

ii. Distillery industry

iii. Dairy industry

iv. Textile industry

v. Tannery

vi. Paper and Pulp

vii. Common effluent treatment plant (CETP)

Note: - Detailed visit report shall be prepared for each of the industrial visit

2) One assignment on each unit.

TEXT BOOKS:

1. Industrial Waste Treatment - Nelson Nemerow, Addison - Wesley

2. Industrial Waste Treatment – Rao & Datta, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi

3. Industrial Waste Water Treatment- Dr. A. D. Patwardhan, Prentice Hall of India

REFERENCE BOOKS:

1. Water and Waste Water Engg.- Fair G.M., Gayer J.C. and Okun D.A. , John Wiley Publication

2. Water and Waste Water Technology, M. J. Hammer and M. J. Hammer(Jr.)

3. Waste Water Engineering – Metcalf Eddy - Mc Graw Hill Publications.

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4 ELECTIVE – III

4.3 WATER POWER ENGINEERING

Teaching Scheme	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper – 100 Marks
Practical: 2 Hrs / Week	Term Work – 50 Marks

Course Objectives:

1) To estimate the available hydropower potential
2) To understand types of hydro-power stations
3) To study the components and functions of hydro-power system
4) To learn the types of hydro-power system
5) To study the different types of loads on power plants

Course Outcomes:

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

1) Estimate the available hydropower in a project
2) Select suitable types of hydro-power system for particular site conditions
3) Design penstock and anchor blocks
4) Analyze the different types of loads on power plants
5) Design the components of Tidal power plant

SECTION – I

Unit 1: **(5)**

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

Unit 2: **(4)**

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

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

factor, firm power secondary power

Unit 3: **(5)**

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

Unit 4: **(3)**

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

Unit 5: **(5)**

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

SECTION – II

Unit 6: **(4)**

Power station: General arrangements of a power station, power house, sub-structure and super structure, under ground power station – necessity principal, types, development and economics.

Unit 7: **(5)**

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

Unit 8: **(5)**

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

Unit 9: **(4)**

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

Unit 10: **(5)**

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

TERM WORK

Term Work shall consist of exercises based on theory.

Visit to Water Power Station. Visit report with the salient features and details of station

TEXT BOOKS:

i) Hydro Power Structures – R. S. Varshney (ISBN 8185240787)

ii) Water Power Engineering – M. M. Dandekar, Vikas Pub. House Pvt. Ltd.

iii)Water Power Engineering – P. K. Bhattacharya, Khanna Pub., Delhi

iv)Water Power Engineering – M. M. Deshmukh, Dhanpat Rai and Sons

v)Textbook Of Water Power Engineering- Sharma R. K. , Sharma T. K Publisher: S Chand & Company Ltd.

REFERENCE BOOKS:-

i) Water Power Development – E. Mosonvi, Vol. I & II

ii) Hydro-electric Engineering Practice – G. Brown, Vol. I, II & III

iii) Hydro – Electric Hand Book – Creager and Justin

B.E. (CIVIL) - II

4. ELECTIVE – III

4.4 Advanced Concrete Technology

Teaching Scheme	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper – 100 Marks
Practical: 2 Hrs / Week	Term Work – 50 Marks

Course objectives:

1) To understand in detail the behaviour of fresh and hardened concrete.
2) To get acquainted with recent developments in admixtures in concrete
3) To understand factors affecting the strength, workability and durability of concrete
4) To learn about ready mix concrete, concrete mix design

Course Outcomes:

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

1) Select proper admixtures to obtain concrete of desired properties
2) Adopt appropriate type of special concrete for desired results
3) Design a concrete mix of required strength and workability properties
4) Adopt appropriate method for repairs and rehabilitation of concrete structures

SECTION – I

Unit 1: **(4)**

Review of cements including blended cement, chemical and physical process of hydration. Aggregates–Coarse aggregates, Natural sand, Crushed sand.

Unit 2: **(5)**

Addition to Concrete:- Review of types covering pulverized fuel ash, ground granulated blast furnaces slag and silica fume, Rice husk Ash, manufacture, physical characteristics, effects on properties of concretes. Admixtures: - Plasticizesrs, Super plasticizers, retarder, accelerators, Curing compounds and their effects on properties of concrete.

Unit 3: **(6)**

Properties of Fresh Concrete: Workability setting, bleeding and segregation. Theory and application principles governing in concrete placing and compaction of concrete Durability & impermeability, microstructure and carbonation of concrete, fire resistance

Unit 4: **(7)**

Special Concretes: - High performance concrete, High Strength concrete, fiber reinforced concrete, Light weight concrete, High density and radiation shielding concrete, High volume fly ash concrete, Self compacting concrete, Recycled concrete.

SECTION-II

Unit 5: **(5)**

Special Processes & technology for particular types of structures: Mass concrete, Sprayed concrete, Ferro-cement concrete, pumped concrete, Roller compacted concrete, Sustainability of concrete industry.

Unit 6: **(5)**

Ready mixed Concrete: Types of plants, Concrete specification, Process adopted for central RMC plant, Distribution & transport, Code recommendations, quality control.

Unit 7: **(4)**

Mix design: Review of methods & philosophies, mix design for special purpose (High grade concrete), variability of results.

Unit 8: **(3)**

Quality concepts- Definitions, principles & standards, quality control in concrete Construction, tools for quality management.

Unit 9: **(6)**

Repair & rehabilitation: Visual inspection of concrete structure, distress in concrete, Non-destructive test, crack repair techniques, damage assessment procedure, deterioration- causes & prevention, strengthening techniques.

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TERM WORK

Experiments:

1) Tests on fresh & hardened concrete: Workablity tests, Stregth test- compression, flexure

2) Mix design for high performance concrete: Experimental

3) Non destructive testing of concrete- Rebound hammer, Ultra sonic pulse velocity test

4) Effects of additives and admixtures in concrete: Effects on workability and strength of concrete.

REFERENCES:

1) Concrete Technology by M.S. Shetty

2) High performance concrete by P.C. Aitcin

3) Concrete Technology by A.R. Santhakumar, IIT Madras

4) Concrete Technology by Neviell.

B. E. Civil (Part-II)

4. ELECTIVE – III

4.5 RELIABILITY ENGINEERING

Teaching Scheme:	**Examination Scheme:**
Lecture:- 3 Hrs/Week	Theory Paper – 100 Marks
Practical: 2Hrs/Week	Term Work – 50 Marks

Course Objectives:

1) Learning basic concepts of probability theory followed by the reliability methods and reliability analysis for various Civil Engineering Method.
2) Study of the time varying reliability analysis stochastic finite element.
3) Introduction to the reliability analysis of complex real life civil engineering structures using MATLAB and ANSYS software.

Course Outcomes:

At the end of the course student will be able to:

1) Summarize reliability engineering and its management related to structural reliability.
2) Perform reliability engineering analysis and design the structure by safety consideration using the reliability analysis method.
3) Use FEM software for solving and giving the solution for problem of Civil structures.

SECTION-I

Unit 1: **(06)**

Introduction and review of basic statistics and probability:-

Introduction to structural reliability and its role in civil engineering design. Basic Statistics (Scatter Diagram, Histogram and Frequency Polygon), Theory of Probability, Probability Distributions (Continuous & Discrete), Conditional probability, Common probability distributions. Random Variables, Random vectors and functions of random variables.

Unit 2: **(06)**

Reliability of structures and safety in Civil Engineering:-

General introduction to structural safety and reliability, Reliability Methods, Failure Surface and Definition of Reliability in Standard Normal Space (Cornell's Reliability Index). Concept of uncertainty in reliability-based analysis and design.

Unit 3: **(05)**

Structural analysis and design, load and resistance models.

Unit 4: **(05)**

Reliability analysis method: - First Order Second Moment Method (FORM) for Correlated & Non-Normal Random Variables. Graphical representation of Reliability Index in Standard Normal Space.

SECTION-II

Unit 5: **(05)**

Simulation Methods in Reliability Analysis:- Monte Carlo simulations, Technique, Importance Sampling and Adaptive Sampling.

Unit 6: **(06)**

Design specification, Load and resistance factors in design codes, Load combination, Steel design specifications based on ASD & LRFD, Design of tension members, and Design of beam elements.

Unit 7: **(06)**

System reliability concepts, System and component reliabilities series and parallel models, Connection problems and reliability, Time Varying Reliability Analysis, Load estimation based on ASCE-7 project presentation.

Unit 8: **(06)**

Introduction to Stochastic Finite Element Method.

Case Studies using software (MATLAB & ANSYS) in Batch Mode.

TERM WORK: - Total eight assignment should be submitted based on each unit with the examples.

TEXT BOOKS:

1) Statistics and Probability for Civil Engineers (Basic Statistics).
2) Structural Mechanics I & II (Theory of Structures I & II).
3) Structural Reliability Analysis and Prediction, R. E. Melchers and John, Wiley & Sons 1999.
4) Reliability of Structures, A. S. Nowak & K. R. Collins, McGraw-Hill, 2000.
5) "Reliability of Structures", Andrzej S. Nowak & Kevin R. Collins, Tata McGraw-Hill.
6) Structural Reliability Analysis & Design, Ranganathan R., Jaico Publishing House, Mumbai, India, 1999.
7) Structural Reliability: Analysis and Prediction, Melchers R E., John Wiley, Chichester, 1999.

REFERENCE BOOKS:

1) "Structural Reliability Analysis and Prediction", Robert E. Melchers and John, Wiley & Sons.
2) Probability, Random Variables and Stochastic Processes, Papoulis A., McGraw-Hill, New York, USA, 1991.
3) Probability, Statistics and Reliability for Engineers and Scientists, Ayyub B M, McCuen R H., Chapman & Hall, Florida, USA, 2000.
4) Probability Concepts in Engineering Planning and Design, Volume-II, Ang A H S & Tang W H., John Wiley, New York, 1984.
5) Methods of Structural Safety, Madsen H O, Krenk S and Lind N C., Prentice-Hall, Inc, Englewood Cliffs, USA, 1986.
6) Reliability Based Structural Design, Choi S K, Grandhi R V and Canfield R A., Springer-Verlag, London, UK, 2007.
7) Reliability Assessment Using Stochastic Finite Element Analysis, Haldar A & Mahadevan S., John-Wiely & Sons Inc., New York, USA, 2000.

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8) Reliability and Optimization of Structural Systems, Rackwitz R, Augusti G and Borri A., Chapman & Hall, London, UK, 1995.
9) Structural Reliability Using Finite Element Methods, Waarts P H., Delft Univ. Press, Netherland, 2000.

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B. E. (CIVIL) PART – II

4. ELECTIVE –III

4.6 FINITE ELEMENT METHOD

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practical: 2 Hrs / Week	Term Work: 50 Marks

Course objectives:

1. To study the strain displacement and linear constitutive relation of any element using finite element techniques
2. To understand the numerical techniques applied in FEM
3. To study isoparametric concepts
4. To analyze frame elements using FEM techniques

Course Outcomes:

Upon successful completion of the course, the students should be able to

1. Demonstrate the displacement models and load vectors
2. Compute the stiffness matrix for isoperimetric elements
3. Analyze plane stress and plane strain problems
4. Analyze one dimensional, two dimensional and 3 dimensional elements using FEM

SECTION – I

Unit 1: **(7)**

Introduction to finite element method: History, applications, Stress strain relationship, strain displacement relationship. Principle of minimum potential energy, variation principle, Rayleigh – Ritz method, Finite element procedure.

Unit 2: **(8)**

Linear Constitutive equations, Matrix displacement equations for bar element, beam element and truss element, element shapes, co-ordinate systems, shape functions, polynomial shape functions, derivations of shape functions using polynomials, consistent nodal load,

Lagrange's interpolation formulae, Shape function in Cartesian and natural co-ordinate system

Unit 3: **(7)**

Bar Element, application to bars with constant and variable cross section subjected to axial forces. Development of element stiffness matrix and nodal load vector for truss and beam

SECTION – II

Unit 4: **(7)**

Pascal's triangle, convergence requirements and compatibility conditions, plane stress and plane strain problems, Triangular elements, CST, LST elements, Rectangular elements, Effect of element aspect ratio, finite representation of infinite bodies.

Unit 5: **(8)**

Concept of iso-parametric element, relation between Cartesian and natural Coordinate system, Jacobian matrix, one and two dimensional iso-parametric elements.

Unit 6: **(8)**

Introduction to three-dimensional problem, various three-dimensional elements, Axisymmetric problems, formulation of stiffness matrix of three dimensional and axisymmetric elements.

TERM WORK

A set of tutorials / Problems based on above topics of syllabus

TEXT BOOKS:

i) Introduction to Finite Element Method by C. S. Desai & J. F. Abel.

ii) Finite Element Analysis by S. S. Bhavikatti

iii) The finite Element Method (Fourth Edition) Vol I & II by O. C. Zienkiewicz & R. L. Taylor

REFERENCE BOOKS:-

i. First Course in the Finite Element Method by Daryl L. Logan

ii. Concepts and Applications of Finite Element Analysis by R. D. Cook

iii. Introduction to Finite Element in Engineering by T. R. Chandrapatla and Belegundu.

w. e. f. Academic Year 2015-16

B.E. Civil – Part II

4. ELECTIVE – III

4.7 EXPERIMENTAL STRESS ANALYSIS

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs / Week	Theory Paper: 100 Marks
Practicals: 2 Hrs / Week	Term Work: 50 Marks

Course objectives:

1) To study the working principles of different types of strain gauges
2) To understand the model analysis
3) To know the fundamentals of photo elastic coatings
4) To study the effects of 2-D photo elasticity
5) To study the working principle of load, pressure and displacement transducers

Course Outcomes:

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

1) Identify the different types of strain gauges
2) Carry out model analysis
3) Apply the concepts of photo elastic coatings
4) Analyze the behavior of 2-D photo elasticity
5) Apply the working principles of transducers

SECTION – I

Unit 1: **(9)**

History of experimental stress analysis, method for generating, applying and measuring forces, fundamental concepts of strain measurement, load cell, proving ring, Huggen burger, Berry, Johanson, Demec optical extensometers.

Unit 2: **(9)**

Electrical resistance strain gauges, properties of grid, backing and cement, different types of wire and foil types strain rosettes, Balancing- Series, parallel.

Unit 3: **(5)**

Dimensional analysis theorem, Model analysis- Simulations, Problems.

SECTION – II

Unit 4: **(9)**

Brittle coating method, general principles, advantages and disadvantages, state of stress and laws of failure, calibration technique, applications, methods of crack detection.

Unit 5: **(14)**

Photo-elasticity – Polariscope and auxiliary instruments, stress optic law, Fringe pattern, isoclinics and stress trajectories materials properties and their values, calibration techniques, application of model results to prototype two dimensional models, compensation techniques, separation of principal stresses.

TERM WORK

The term work shall consist of a record of set of experiments and exercises based on the theoretical course of the syllabus.

TEXT BOOKS:

1. Applied Stress Analysis - Direlli
2. Experimental Stress Analysis- Dally & Riley, McGraw Hill
3. Experimental Stress Analysis- Srinath, T. McGraw Hill
4. Experimental Stress Analysis & Motion measurements- Dove & Adams

REFERENCE BOOKS:

1. Photo elasticity Vol. I – Frocht
2. Mechanical measurements- Beckwith & Buck
3. Strain Gauge Primer- Perry Lisner

B.E. (Civil) Part-II

4. ELECTIVE– III

4.8 OPTIMIZATION TECHNIQUES

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 Hrs/Week	Theory Paper: 100 Marks
Practical: 2hrs/Week	Term Work: 50 Marks

Course Objectives:

1. To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
2. To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
3. To apply the mathematical results and numerical techniques of optimization theory to Civil Engineering problems.

Course Outcomes:

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

1. Formulate and solve optimization problems and use the results in managerial decision making process.
2. Apply optimization techniques in Civil Engineering problems such as transportation, water supply, etc.
3. Make inventory calculations for resources required in Civil Engineering Projects.

SECTION I

Unit 1: **(04)**

Use of Operations Research in Civil Engineering and Managerial Decision making process. Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction. Various models; Objective function and constraints, convex and concave functions, regions and sets.

Unit 2: **(06)**

Introduction: Classical optimization techniques, Standard format of optimization problems, Types of optimization problems, formulation of optimization problems

Unit 3: **(06)**

Linear programming: Formulation of Linear optimization models, Civil engineering applications. Simplex method, Special cases in simplex method, Method of Big M, Two phase method, duality, sensitivity analysis.

Unit 4: **(06)**

Transportation problems: Modi method, shortest route problem, maximum flow problem.

SECTION II

Unit 5: **(05)**

Decision theory (certainty, uncertainty and risk), Decision tree, and Game theory.

Unit 6: **(06)**

Inventory models – deterministic models, probabilistic model, Replacement Models

Unit 7: **(08)**

Introduction to non classical optimization Techniques viz. Artificial Neural Networks, Fuzzy Logic, Genetic algorithms. Introduction to Non-Linear Programming, Dynamic Programming and Integer programming.

Unit 8: **(04)**

Simulation, applications with problem.

TERM WORK

Consists of at least two exercises on each of the above units

TEXT BOOKS:

1) Optimization, S. S. Rao, Wiley Eastern Ltd.
2) Operation Research, H. A. Taha, Mac-Millan.
3) Operation Research, Hira and Gupta, S. Chand.

w. e. f. Academic Year 2015-16

REFERENCE BOOKS:

1) Engineering Optimization, A. Ravindran, K. M. Ragsdell, G. V. Reklaitis, Wiley Publication.

2) Lecture Notes by Dr. Nageshkumar (nptel.iitk.ac.in/courses/Webcourse-contents/IISc-BANG/OPTIMIZATION METHODS/pdf)

3) Operations Research: Theory and application, J.K. Sharma, Macmillan Publishers

4) Computational Intelligence for Optimization, Authors: Ansari, Nirwan, Hou, Edwin, Springer Publications

w. e. f. Academic Year 2015-16

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4. ELECTIVE – III

4.9 DISASTER MANAGEMENT

Teaching Scheme:	**Examination Scheme:**
Lecture:- 3 Hrs/Week	Theory Paper – 100 Marks
Practical: 2Hrs/Week	Term Work – 50 Marks

Course Objectives:

1) Study of various disasters, their characteristics, causes and impacts.
2) Acquaint with the various disaster management stages to prevent or reduce losses that occur due to hazards during disaster and emergencies.
3) Provide information regarding various programmes of International, National and State and District Level Agencies for disaster management.

Course Outcomes:

By the end of the course students should be able to

1) Apply various disaster preparedness, mitigation and management techniques.
2) Apply the Geo-informatics techniques for prepare hazard zonation maps for Disaster management.
3) Apply the various schemes and programmes of International, National and State and District Level Agencies for disaster management.

SECTION-I

Unit 1: **(08)**

Environmental Hazards and Disasters:-

Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology- Landscape Approach- Ecosystem Approach- Perception approach- Human ecology & its application in geographical researches.

Unit 2: **(08)**

Types of Environmental hazards and Disasters:-

Natural disaster and Planetary Hazards

Earthquake Hazards/ disasters- Introduction, general characteristics, mechanism, causes and effects of Earthquakes, prediction, seismic zones, seismic waves, vulnerability, damage potential – magnitude and intensity, Earthquake Hazards in India- Human adjustment, perception and mitigation of earthquake.

Volcanic Hazards/Disasters:- Volcanoes Causes of volcanism, volcanic materials, hazardous effects and impacts of volcanic eruptions.

Landslide and Land Degradation:- Causes, tectonic conditions, erosion, avalanches, rock fall, damage assessment. Landslide prone area in India.

Cyclones and Tsunamis:- Structure and nature of cyclones (Tropical cyclones & Local storms) & tsunamis, characteristics, hazard donation, factors, hazard potential, impact assessment. Cyclone prone areas in India.

Floods:- General characteristics, causes, Flood hazards India, geomorphology and floods, flood forecasting, river and coastal floods, flash floods, lake outburst, risks, environmental planning, flood control and management (Human perception & mitigation).

Droughts:- Cause and Impacts of droughts- Drought hazards in India- Drought control measures.

Man-made Disaster and Extra Planetary Hazards/ Disasters

Man induced Hazards /Disasters-Physical hazards/ Disasters-Soil Erosion

Soil Erosion:- Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion, Conservation measures of Soil Erosion.

Mining:- Mining and environment, land & environment degradation and management, Mined land reclamation.

War and Chemicals disaster: - Release of toxic chemicals Hazardous wastes, reactivity, toxicity, nuclear war, biological weapons, armed conflicts, land mines etc.

Sedimentation processes: - Global Sedimentation problems, Regional Sedimentation problems. Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation.

Biodiversity Extinction and Deforestation:- Biodiversity, species at risks, loss of biodiversity, management of species diversity, deforestation its causes & adverse effects.

Biological hazards/ disasters:- Population Explosion.

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Unit 3: **(06)**

Disaster Management:- Three Stages

Pre-disaster stage (Preparedness):- Introduction to disaster preparedness, Three A's of disaster preparedness, principles of disaster preparedness, steps in disaster preparedness, Preparing hazard zonation maps, Predictability/ Forecasting & warning, preparing disaster preparedness plan. Land use zoning- Preparedness through (IEC) Information, education and Communication. Disaster resistant house construction- Population reduction in vulnerable areas- Awareness.

Emergency stages: - Planning, mitigation, preparedness, response and recovery.

Post Disaster stage (Rehabilitation):- Physical and Social Infrastructure, Social and economic rehabilitation, Repair and retrofitting, Political Administrative Aspect.

SECTION-II

Unit 4: **(05)**

Natural Disaster Reduction and Management:- Provision of Immediate relief measures to disaster affected people-Prediction of Hazards & Disasters-Measures of adjustment to natural hazards.

Unit 5: **(09)**

Disaster Mitigation:-

Disaster Mitigation through Development: Disaster Mitigation: Basic Concepts, Meteorological and Seismological observation, Structured and Non Structured Mitigation, disaster mitigation strategies, importance of Information and Communication in Disaster Mitigation, Relationship between Disaster and Development, Sustainable Development for Disaster Mitigation, Importance of various Agencies/sectors involved for disaster mitigation.

Education on disasters -Community involvement, The adjustment of Human Population to Natural hazards & disasters. Role of database in Disaster Mitigation, GIS and GPS applications.

Role of Media

Monitoring Management- programme of disaster research and mitigation of disaster of following organizations. International Council for Scientific Unions (ICSU)-Scientific

committee on problems of the Environment (SCOPE), International Geosphere Biosphere programme (IGBP) – World federation of Engineering Organizations (WFED). National Academy of Sciences-World Meteorological organizations (WMO). Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

Unit 6: **(09)**

Agencies in Disaster Management

International Agencies: United Nations and its specialized agencies like UNDP, FAO, WHO AEC (Atomic Energy Commission), United Nations Disaster Management Cell, New Delhi. International Federation of Red Cross and Red Crescent Societies (IFRC) and National Red Cross/Red Crescent Societies.

National Agencies: Disaster Management Cell (Ministry of Home Affairs, Govt. of India), National Institute of Disaster Management, Indian Red Cross Society, Planning Commission, National Civil Defense Organization, Bharat Scouts and Guides. Military and Para-Military Forces; Corporate Bodies etc.

State and District Level Agencies: Disaster Management cells at state level and District level, District Magistrate office, Role and Responsibilities of DM in prevention, preparedness, mitigation, relief and rehabilitation; local bodies and role of different functionaries-

TERM WORK

1. Practical exercise on each unit
2. Each student will be required to prepare a project work of Coastal Ecosystem, Desert Eco System and Mountain Eco System & submit it at the end of year & this will be evaluated by an internal as well as external examination

TEXT BOOKS:-

1. The Environment as Hazards, Kates, B.I& White, G.F, Oxford, New York, 1978
2. Disaster Management, R.B. Singh, Rawat Publication, New Delhi, 2000.
3. Disaster Management H.K. Gupta, Universities Press, India, 2003.
4. Space Technology for Disaster Mitigation in India (INCED), R.B. Singh, University of Tokyo, 1994.
5. Disaster Management in Hills, Dr. Satender, Concept Publishing Co., New Delhi,

2003.

6. Plan for Earthquake, Disaster, Mitigation, Disaster Management, A.S. Arya, V.K. Sharma, Action IIPA Publication New Delhi, 1994.
7. An overview on Natural and Man-made Disaster & their Reduction, R.K. Bhandani, , SIR, New Delhi.
8. Disaster Mitigation, Preparedness, Recovery and Response, P. C. Sinha, SBS Publishers and Distributors Pvt. Ltd.
9. Introduction to International Disaster Management, D. P. Coppola, Butterworth-Heinemann.
10. Disaster Management M. Sharma, Vinod K., NCDM, IIPA, New Delhi, 1994
11. Housing in Disaster prone areas, National Building Organization and U.N. Regional Centre, Mathur G.C., ESCAP, New Delhi, 1986.
12. Disaster Management, Dr. Mrinalini Pandey, Wiley Publication.

REFERENCE BOOKS:-

1. Disaster Management in India – A Status Repot, National Disaster Management Division, Ministry of Home Affairs, Govt. of India, 2004.
2. Disaster Management and Preparedness, Collins Larry R. and Scheind Thomas D. (2000)., Taylor and Francis, 2000.
3. Disaster Management, Sharma V.K., Indian Institute of Public Administration, New Delhi, 1995.
4. National Disaster Response Plan, NCDM, New Delhi, 2001.
5. Manuals on Natural Disaster management in India, M.C. Gupta, National Centre for Disaster Management, IIPA, New Delhi, 2001.
6. Management of Floods, National Disaster Management Authority, Government of India.

B.E. Civil – Part II

5 R.C.C. STRUCTURAL DESIGN AND DRAWING-II

Teaching Scheme:	**Examination Scheme:**
Drawing: 4 Hrs / Week	Term Work: 50 Marks
	Oral : 50 Marks

Course objectives:

1) To train the students to imagine and predict response of structures under loadings.
2) To carry out design of building as whole entity
3) To carry out a proper detailed drawings of the designed structure.

Course outcomes:

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

1) Use different IS codes and design the structure as per codal provision.
2) Prepare detailed drawing of R.C.C section of designed building.

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

1) Residential two storied building.
2) Any one from the following.
    a) Combined trapezoidal footing/ raft foundation.
    b) Pile foundation for structure with pile cap.
    c) Water tank (GSR/USR/ESR) by working stress method using IS 3370.

Note:

1. Computer analysis of any one frame for project No.1 shall be performed for Dead Load, Live Load & Earthquake Loads using relevant application software.
2. CAD drawing shall be prepared for at least one sheet with provision of IS : 13920.

B.E. (Civil) Part-II

6. PROJECT WORK

Teaching Scheme:

Practical - 6 hrs/week/batch

Examination Scheme:

Term Work – 100 Marks

Oral Exam. – 100 Marks

Project work at B.E. (Civil) Part-II is continuation of Project Work of B.E. (Civil) Part-I on any topic from Civil Engineering area or interdisciplinary area related to Civil Engineering. The project work should be completed at B.E. (Civil) Part-II level.