FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - CIVIL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH **Appendix - A**

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7CE01	Theory of Stuctures-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
02	7CE02	Geotechnical Engineering-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	7CE03	Structural Design-II	4	-	-	4	4	4	80	20	100	40	-	-	-	-
04	7CE04	Environmental Engineering-I	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	7CE05	Professional Elective-I	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	7CE06	Theory of Stuctures-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	7CE07	Geotechnical Engineering-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	7CE08	Structural Design-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	7CE09	Project & Seminar	-	-	2	2	4	-	-	-	-	-	-	50	50	25
		Total	18	2	8	28	27				500				200	
															GRAND TOTAL : 700	

Professional Elective-I (i) Advanced Water Treatment (ii) Advanced Geotechnical Engineering (iii) Water Power Engineering (iv) Prestressed Concrete (v) Artificial Neural Network & Fuzzy Logic (vi) Advanced Concrete Technology (vii) Environmental Pollution & Rural Sanitation (viii) Advanced Earthquake Engineernig

SEMESTER : EIGHTH

THEORY																
01	8CE01	Water Resources Engineering-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
02	8CE02	Environmental Engineering-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	8CE03	Project Planning & Management	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	8CE04	Professional Elective-II	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
05	8CE05	Water Resources Engineering-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
06	8CE06	Environmental Engineering-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	8CE07	Project & Seminar	-	-	6	6	12	-	-	-	-	-	75	75	150	75
		Total	13		10	23	27				400				250	
															GRAND TOTAL : 650	

*Professional Elective-II *(i) Advanced Design of Steel Structures (ii) Advanced Waste Water and Industrial Waste Treatment (iii) Finite Element Method (iv) Dam Engineering (v) Advanced Engineering Geology (vi) Matrix Computer Analysis of Structures (vii) Advanced Structural Analysis (viii) Rock Mechanics *(ix) Advanced Design of RCC Structures*
** PAPER 4 HOURS DURATION.*

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER SEVEN

7CE01 THEORY OF STRUCTURES

– II SECTION - A

Unit-I : **1. Moment distribution method, application to portal frames with sway. Multibay, multistoried, symmetrical frames subjected to symmetric loads only.**

Slope deflection method: Application to portal frames with side sway.

Unit-II : **1. Kani's method: Continuous beams and single bay single storey portal frames with side sway.**

Multi- bay, multi storeyed frames subjected to symmetric loads.

Unit-III : 1. Castigliano's second theorem, principle of least work, Analysis of redundant frames. (up to two degree redundancy).

Analysis of redundant trusses (up to second degree of redundancy), lack of fit, temperature effect.

SECTION - B

Unit-IV : 1. Maxwell's reciprocal theorem, Betty's theorem, Muller - Breslau's principle, Influence line diagrams for continuous beams, upto two span only.

Tension coefficient method & its applications to simple space trusses.

Unit-V : 1. Flexibility method, static redundancy, flexibility coefficients,

compatibility condition application to beams.

Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams, single bay, single storey portals.

Unit-VI : Stiffness method, kinematic redundancy, stiffness coefficients, direct stiffness approach, application to continuous beams and single - bay, single - storey portal.

BOOKS RECOMMENDED:

Junnarkar, S. B., Mechanics of Structure, Volume I and II
Jain and Arya, Theory and Analysis of Structures

Reddy. C. S., Basic Structural Analysis, Tata McGraw Hill
Wang, C. K., Elementary Analysis of Structures
Norris and Wilbur, Elementary Structural Analysis

7CE02 GEOTECHNICAL ENGINEERING

– II SECTION – A

Unit I : **Exploratory Programme : Field exploration, objectives and methods of exploration planning of exploration programme soil boring , hand augers, percussion boring, rotary wash boring, collection of sample, split spoon sampler, area ratio, disturbed and undisturbed sample, SPT test, field vane shear test, geophysical methods, electrical resistivity and soil refraction methods. Soil log bore presentation and interpretation exploration data.**

Unit II : Bearing Capacity of Shallow foundation :- Different theories: Terzaghi's skempton's, Meyerhof's, BIS method for bearing capacity determination bearing capacity of granular soils based on SPT value. concept of raft foundation and floating foundation. In situ methods of evaluation of bearing capacity, plate load test, static cone penetrometer, pressure meter test contact pressure distribution diagram below the base of footing.

Unit III : Earth pressure at rest, general & local Stages of plastic equilibrium, Rankine's and coulomb's theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhann's and culmann's simple graphical methods Ground Improvement : methods of soil stabilization use of admixture (lime, cement, flyash) in stabilization) Mechanism of reinforced soil, use of Geo synthetics material as a reinforcement, vibroflotation, sand drain installation and preloading.

SECTION – B

Unit IV: Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sandy and in clayey soil , dynamic pile formula Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, behavior of group of pile in sandy and in clayey soil, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for undereamed Pile in clay and sands

UnitV: Settlement Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous isotropic, cohesive and cohesion less soils related to single footing, combined footing, raft foundation etc, standard for requirement of settlement,

total as well as differential settlement, concept of differential settlement, factors and causes for differential settlement, service loads, proportioning of footing for uniform settlement computation of total and differential settlement of a single pile and group of piles in sandy and clayey soil.

Unit VI : 1. Well foundation : Component & their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting

Design of cantilever retaining wall and counterfort retaining Bearing capacity of well as per IS. Cofferdam purpose, various types their suitability

BOOKS RECOMMENDED :

Craig : Soil Mechanics.
Bowles J.E. : Foundation Design Analysis.
Hanson : Theoretical Soil Mechanics.
Peck and Hanson : Foundation Engineering.
Tomlinson : Foundation Engineering.
Leoner : Foundation Engineering.
Bramha : Foundation Engineering.
Prakash S. : Analysis and Design of Foundation and Retaining Structure.
Kasmalkar : Foundation Engineering.
Arora K.R. : Foundation Engineering.
Venkataramiah : Soil Mechanics and Foundation Engineering.
Rao G.V. : Engineering with Geosynthetics.

7CE03 STRUCTURAL DESIGN – II

SECTION-A

(R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I : 1. Design of interior panel of flat slab by direct design method. (Problem on square panel only)

2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II : 1. Design of combined footing.

Complete design of simple, small structures like Canopies & Parking shed.

SECTION - B
(PRESTRESSED CONCRETE)

Unit-III : 1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress

Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV : 1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.

Design of prestressed concrete circular water tanks by IS code method.

Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

Jain, A. K., Reinforced Concrete (Limit State Design)
Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
Sinham S. N., Reinforced Concrete (Limit State Design)
Edward G. Nawy "Prestressed Concrete- A fundamental Approach", Prentice Hall
Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
Dr. Shah V.L. & Karve S.R.: Limit State Design.

7CE04 ENVIRONMENTAL ENGINEERING – I SECTION - A

Unit-I : Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population, and design periods for water supply components.

Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

Intake works: Intakes, type, location, requirement & features.

Unit-II : Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works.

Unit-III : Aeration: Purpose, type of gravity, aerator & spray aerators. Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, coagulant, feeding and mixing devices. Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems of design of sedimentation tanks.

SECTION - B

Unit-IV : Filtration :- Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters modifications of filters. (Dual media, multimedia, upflow, biflow, Diatomaceous earth).

Unit V : Disinfection :- Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination forms of chlorine. Use of bleaching powder - Simple problems. Introduction to tertiary treatments like Softening, Ion Exchange, Reverse Osmosis, Defloridation, Desalination.

Unit-VI : Distribution system: - Types of supply - Continuous, and intermittent, Types of system - Gravity; Pumping and combined gravity and pumping, Layouts of distributions system, Dead end, Grid iron, Circular system and Radial system. Maintenance of distribution system. Equalising storage, Type of storage reservoirs, capacity, Types of conduits, Relative merits, selection, joints, hydraulic design. Pipe laying and

BOOKS RECOMMENDED:

Steel E. W. , Water Supply and Sewerage, Mc-Graw Hill.
Kshirsagar S. R., Water Supply Engineering, Roorkee Pub house, Roorkee.
Birde G. S. , Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, Delhi.
Punmia B. C. water Supply Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
ADVANCED WATER TREATMENT

SECTION-A

Unit - I : Requirements of water treatment facilities different unit operations and unit processes.
Coordination of unit operations. Common attributes of water affected by conventional unit operations and processes. Aeration: rate of gas absorption and desorption, objectives of aeration, gravity aerators and spray aerators, governing factors, design of aerators, removal of methane, C02,H2S taste, design and odour.

Unit-II : Objectives of flocculation, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors affecting coagulation.

Perikinetic and orthokinetic flocculation - mixing and stirring devices, flash mixing flocculators, construction and operation of flocculators, problems on design of flocculators. Pebbled bed flocculator.

Unit-III : Sedimentation: objectives, theory of sedimentation discrete settling and hindered settling, settling of floucculant suspension. Ideal settling basin and its efficiency. Design, construction and operation of sedimentation tanks.
Inlet and outlet hydraulics, sludge, removal and disposal, tube and plate settlers. Problems on design of sedimentation tanks.

SECTION-B

Unit-IV : Filtration: objectives, design, construction and operation of rapid and slow sand filters, filtering sand, grain size and size distribution, preparation of filter sand, hydraulics of filtration. Hydraulics of fluidized beds. Scour intensification, high rate, declined rate, upflow biflow, dual media, diatomaceous earth filters.

Unit-V : Disinfection : objectives, different disinfectants, chemical disinfection, theory, factors governing, and kinetics. Disinfection by Ozone. Disinfection by chlorine; free available and combined. available chlorine, break point chlorination, chemical technology and other uses of chlorine, manageable variables.

Unit-VI : Miscellaneous methods of treatment : Water softening: limesoda and zeolite process, split treatment problems on calculation of dose of lime and soda ash. Iron and Manganese Removal : Fluoridation and defluoridation. Desalination. Taste and Odour Removal.

BOOKS RECOMMENDED :

Fiar, Geyer & Okun : Water and Waste Water Engg., John Wiley & Sons.
Mark J. Hammer : Water and Waste Water Technology, John Wiley & Sons.
Steel E.W. & Ghee M.C. : Water Supply & Sewerage, McGraw Hill Co.

7CE05 PROFESSIONAL ELECTIVE – I
ADVANCED GEOTECHNICAL

ENGINEERING SECTION-A

Unit - I : Clay mineralogy : Introduction, atomic bonds, classification and nomenclature, structure of clay mineral, K lonite. Illite and Montmorillonite groups, physical properties, clay-water relations,

diffused double layer, thixotropy, base exchange capacity formation of different structure in soil deposites, electrical effects, electroosmosis, electrophoresis, stemming potential, zeta potential, clay mineral identification,DTA analysis, X ray diffraction method.

Unit II - Seepage : Flownet for anisotropic soil media, construction of flownet for hydraulic structure on non- homogenous soil, directional variation of permeability in aniosotropic medium. Numerical analysis of seepage in layered soil computation of seepage force, seepage through earthen dam resting on confined and unconfined medium entrance discharge and Transfer condition of line of seepage through earth dam.

Unit-III : Three dimensional consolidation. Equation, solution of 3dimensional consolidation equation, consolidation by vertical sand drain and its design aspect, free strain consolidation with no smear, effect of smear zone on radial consolidation. Calculation of the degree of consolidation with radial drains and solutions of problems based on this.

SECTION – B

Unit IV : Expansive soils: orgin of soil, intensification of expansive soil, swelling potential, factors affecting the swelling, different systems of classification, concept of swelling pressure and its measurements in the laboratory, special constructional measures adopted for the construction on expansive soils, special foundations adopted for the construction in expansive soils, concept of cohesive non-swelling techniques and its effect on expansive soil.

Unit V : Soil stabilization concept of mechanical stabilization, physical and chemical stabilization with organic and inorganic material like line, cement, lime, fly ash and mechanisms, various factors affecting stabilization, determination of bearing capacity of stabilized soil, laboratory and field methods of stabilization, On various properties of soil.

Unit VI : Geotextile: types, specifications, functions and various applications in the field of Geotechnical engineering. Reinforced earth, mechanism of reinforced earth, various constructional methods and its effect towards altering, the properties of soil, field situations for application of this techniques. Theory of Arching, effect of arching, design of yield strip, computation of vertical stresses.

BOOKS RECOMMENDED :

Scoth R.F. : Principles of Soil Mechanics.
Das B.M. : Advanced Soil Mechanics.
Terzaghi : Theoretical Soil Mechanics.
International Conference on Expansive Soils.
International Conference on Geotextiles.
Soil Mechanics for Road Engineers, AMSO Series.

7CE05 PROFESSIONAL ELECTIVE – I
iii) WATER POWER ENGINEERING

SECTION - A

Unit I : Introduction, sources of energy, importance of water power, estimation of water power potential, primary and secondary power, load factor, pondage and pondage factor, load curve.
Type of hydropower plants:- low and high head, run of river, valley dam, diversion canal, high head diversion, pumped storage underground, general description, layout, topographical requirements of each of above.

Unit-II : Penstocks: general classification, design criteria, economical dia, anchorages and accessories.
Water hammer :- meaning, rigid and elastic water column theory, Allievi's charts.

Unit-III : Surge tanks: Necessity, types, function, location, effect of sudden load change, Hydraulic design of simple surge tanks, stability of surge tanks.

SECTION – B

Unit-IV : Intakes: types, locations, requirements, trashrack and other components, control gates, emergency gates.

Unit-V : Hydel channel:- power canal and forebay, general principles of alignment and capacity, balancing tank.
Turbines:-types, hydraulic features, size, general description of components and layout, specific speed, choice, approximate costs.

Unit-VI : Power house:- types, general layout and approximate dimensions. Non conventional sources of energy: - tidal power, wind power, geothermal power, solar power, elementary principles and description, application of water power in drilling and blasting of rocks.

BOOKS RECOMMENDED :

Dandekar M.M. & Sharma : Water Power Engineering, Vikas Pub. House, Delhi.

Brown J.G., Blackie and Practice : Hydro Electric Engg., Vol. I, II & III, W. Sons, London.
Mosonyi E. : Water Power Development, Hungarian Academic Sciences, Budapest.
Deshmukh M.M. : Water Power Engineering.
Davin C. and Sorenson K.C. : Hand Book of Applied Hydraulics, McGraw Hill.

7CE05 PROFESSIONAL ELECTIVE – I
(iv) PRESTRESSED CONCRETE

SECTION-A

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

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

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

SECTION – B

Unit IV : Analysis and design of prestressed concrete structures such as concrete pipes, poles, sleepers, water tanks etc.

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

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

NOTE : Candidates should use the latest I.S. Codes.

BOOKS RECOMMENDED:

Guyon Y. : Prestressed Concrete, Vol. I & II, John Wiley and Sons, New York.
Krishna Raju, N. : Prestressed Concrete, Tata McGraw Hill Pub. Company, New Delhi.
Lin, T. Y. : Prestressed Concrete, Tata McGraw Hill, New Delhi.
Dayaratnam, P. : Prestressed Concrete Structures, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.

7CE05 PROFESSIONAL ELECTIVE – I
(v) ARTIFICIAL NEURAL NETWORK & FUZZY LOGIC SECTION - A

Unit I : Artificial intelligence, introduction, classification of artificial intelligence, tools of artificial intelligence, applications of A. I. in Civil Engineering.

Unit-II: Expert systems, introduction, classification, tools, applications of expert system in Civil Engineering.

SECTION – B

Unit-III : Neural network, introduction, classification, tools, applications of neural network in Civil Engineering.

Unit-IV : Fuzzy logic, introduction, classification, tools, applications of expert system in Civil Engineering.

BOOKS RECOMMENDED:

Rolston D.W. :Principles of Artificial Intelligence and Expert System, McGraw Hill International Edition, 1988.
Waterman D.A. : A Guide to Expert Systems, Addision-Wesley Pub. Co., 1985.
Koestem C.N. and Maher : Expert System in Civil Engineering, ASCE, 1986.
ASCE's Journal of Computing in Civil Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
ADVANCED CONCRETE TECHNOLOGY

SECTION-A

Unit-I: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), damp and water proofing admixtures, IS code provisions for admixtures.

Unit-II : Durability of concrete: Introduction, strength and durability relationship, volume change in concrete, significance of durability, impact of water cement ratio on durability, factors affecting durability, methods of predicting durability, IS code provisions for durability of concrete.

Unit-III : Deformation in concrete: Introduction, deformation of concrete in Indian climate, permeability, factors contributing cracks in concrete, sulphate attack, alkali aggregate reaction, corrosion of embedded steel, controlling measures.

SECTION – B

Unit-IV: Special concrete and concreting techniques: Introduction to special concrete, Lightweight, aerated, no-fines, high density, fibre reinforced, polymer, prepacked, self-compacted (self leveled), and high volume fly ash (HVFA) concrete.

Introduction to special concreting techniques, Gunite or shotcrete, ferrocement, roller compacted concrete, and ready mix concrete casting and applications.

Unit-V: Repairs and rehabilitations: Introduction, need for repairs, crack width, interaction between permeability, volume change and cracking, polymer modified mortar, bond aid for plasters, guniting aid, silicon based water repellent materials, protective and decorative coatings, injection grout for cracks, coatings to embedded reinforcement, concrete repair systems, stages of repair works.

Unit-VI: Non-destructive testing of concrete: Introduction, rebound hammer, limitations, rebound number and strength of concrete, penetration technique, pullout test, resonant frequency, pulse velocity method, corrosion analyser, rebar locators.

Students must be shown video CD, slides, transparencies and photograph of actual structures.

BOOKS RECOMMENDED:

ea, F. M.: The Chemistry of Cement and Concrete, Edward Arnold (Publishers) Ltd.

eville, A. M. : Properties of Concrete, Pitman Publishing Company.

eville, Brooks : Concrete Technology, ELBS

rchard, D. F. : Concrete Technology, Applied Science Pub Ltd.

hetty, M. S. : Concrete Technology, S. Chand

arshney, R. S. : Concrete Technology, Oxford Pub. House.

rishna Raju : Design of Concrete Mixes, McGraw Hill.

hah and Kale : Reinforced Cement Concrete Design,

ushil Kumar :Treasure of Reinforced Cement Concrete

7CE05 PROFESSIONAL ELECTIVE – I

vii) ENVIRONMENTAL POLLUTION & RURAL SANITATION

SECTION - A

Unit I : General components of environment. Nature and scope of Environmental pollution, population growth, Degradation due to human activity. Episodes of Environmental pollution.

Unit-II: Water pollution-sources of water pollution, effects on water bodies, D.O. sag curve, pollution control measures, water pollution act
Noise pollution: sources of noise pollution, human tolerance levels, levels of exposure due to various sources, preventive and curative methods.

Unit-III : Report of field visit to municipal waste water treatment plant/ Industrial Effluent treatment plant.

SECTION-B

Unit-IV: Land pollution: solids its effect on the environment, various methods of collection, treatment and disposal of solid waste, Hazardous waste and risk analysis.

Unit V : Environmental Impact assessment : Need for EIA, elements of EIA, Environmental attributes, Nature of Impact -Primary, Secondary, Tertiary, Short Term & Long terms, Local & Regional.

Unit-VI: 1) Rural Sanitation – Collection & disposal of night soil, Sanitary Latrines.
Biogas plant - Capacity & Design.

BOOKS RECOMMENDED :

Mishra P.C. : Fundamentals of Air & Water Pollution.
Mohan I. : Environmental Pollution & Management, Ashish Pub. House, New Delhi-110026
Gilbert M. Masters : Introduction to Environmental Engg. & Science.

7CE05 PROFESSIONAL ELECTIVE – I

(viii) ADVANCED EARTHQUAKE ENGINEERING

SECTION-A

Unit I : Behaviour of structures in past earthquakes : lessons learnt with regards to weak / strong aspects of structural systems. Ground motion characteristics : choice of ground motion for a major project site.

Unit II: Detailed study of IS : 1893 - 2002 : seismic analysis of buildings using codal previsions, design considerations.

Unit III: Introduction to seismic design : Considerations for bridges, dams, chimneys.

SECTION-B

Unit IV : Vulnerability of buildings : use of Vulnerability Atlas and understanding techno legal issues with regard to buildings.

Unit V : Concepts in repair, restoration and seismic strengthening: retrofitting weakness in existing buildings, aging, weathering, development of cracks, material and equipment for repairs of masonry and concrete structures, study of IS : 13935.

Unit VI : Methodologies for repairs : for walls, roofs, slabs, columns and foundations of buildings in stone, brick or reinforced concrete.

BOOKS RECOMMENDED :

Anil K. Chopra : Dynamics of Structures, Prentice Hall of India Pvt. Ltd.

James L. Stratta : Manual of Seismic Design, Pearson Education.

Jaikrishna, Chandrashekhar, Brajesh Chandra : Element of Earthquake Engineering, Sarita Pub., Meerat.

7CE06 THEORY OF STRUCTURES- II – Lab

PRACTICALS:

The laboratory work will be based on the following experiments (Any five experiments):

Influence line diagram for continuous beams.

Horizontal reaction of two hinge arch.

Forces and displacements in redundant trusses and frames.

Minimum two exercise based on theoretical course work.

Verification of Betty theorem

Verification of Maxwell Reciprocal Theorem.

Basic exposure to software for analysis.

Computer aided design of structures

Software: Anyone of the following software STAAD, SAP, NASTRAN, ANSYS, BUILD MASTER, SCADDS & STRUDS and any other reputed software (Any TWO)

Analysis and design of minimum three storied building

Cantilever or counterfort retaining wall

Analysis and design of steel structure

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE07 GEOTECHNICAL ENGINEERING- II – Lab

LIST OF EXPERIMENTS: (Any six)

To determine the shear strength by conducting Field Vane shear test.

To identify the subsoil strata by conducting soil resistivity / seismic refractivity method

To determine the bearing capacity of soil by conducting standard penetration test

To determine the soil characteristic by conducting standard penetration test

To determine the soil properties by conducting the static cone penetration test.

Computation of bearing capacity by analytical approach to verity with field test

To determine the C- characteristic with respect to soil log bore presentation and interpretation of exploration

To examine the soil characteristic with respect to soil log bore presentation and interpretation of exploration

Compulsory: Introduction to Geotechnical Software, determination of bearing capacity , earth pressure etc. using this software.

7CE08 STRUCTURAL DESIGN- II – Lab

PRACTICALS:

Candidates are required to prepare at least two designs based on theoretical course detailed workings are necessary.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE09 PROJECT & SEMINAR

Seminar based on Project shall be delivered in Seventh Semester only. 50 marks shall be given through the internal evaluation done by three member committee one of them will be guide.

Seminar shall be delivered with POWER POINT presentation.

SEMESTER : EIGHT

CE 01 **WATER RESOURCES ENGINEERING -**

II SECTION-A

Unit-I : Reservoir Planning : Investigation, selection of site, control levels, Reservoir Sedimmentation, Reservoir Capacity, Calculation of life Reservoir.

Dams : Different types and their suitability-factors governing the selection of types of dam for project

Earth Dams : Types of dams, causes of failure seepage and drainage arrangement, phreatic line, stability analysis, seepage control measures

Unit II : Gravity Dams: Types of dams forces acting, modes of failure; principles of design of straight gravity dams, Elementary and practical profile, Galleries, Earthquake and its effect on dams.

Unit-III: Diversion Head Works :- Selection of site and layout, components of diversion head works, design of weirs on permeable foundation, construction details of Kolhapur type weirs.

Spillways: Types of spillway, spillway capacity, Flood routing through spillways, types of crest gates. Energy dissipaters: meaning, objectives, location. Types hydraulic jump, jet diffusion and Bucket type,

SECTION-B

Unit-IV : Canal Irrigation: Types of canals, Parts of Canal irrigation system, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, propose and types of canal lining

Unit-V : Canal Masonry Works: Types and only design principles and description of

Regulation works: Canal fall's, Head Regulator, Cross regulator, Canal escapes and canal outlets.

Cross drainage works: Aqueduct, Syphon aqueducts, super passage, canal siphon, level crossing

Unit-VI : Well Irrigation : open wells and tube wells, types of tube walls, duty of tube well water.

Water Management : Water management and distribution, co-operative water user's organization, warabandi, conjunctive use of water. Water shed Management : Need of watershed management, importance of soil conservation measures, techniques ground water harvesting.

River Training Works : Need and types of river training works.

BOOKS RECOMMENDED :

1) Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.

Punmia : Irrigation & Water Power Engg.

Garg S.K. : Irrigation & Water Power Engg.

Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.

Varshaney R.S. : Theory of Irrigation Structures, Vol. I & II, Nemchand, Roorkee.

Birdie G.S., Das R.C. : Irrigation Engg., Dhanpatrai & Sons.

Michael A. M. : Irrigation (Theory & Practice)

8CEO2 ENVIRONMENTAL

ENGINEERING – II SECTION –A

Unit-I : Quantity of storm water, DWF, variation of sewage, flow systems of sewerage - separate combined and partially combined, layouts of sewerage system, capacity of sewers design of sewers Laying out of circular sewers-Boning rod and sight rail method, Testing & maintenance of sewers

Unit-II : Waste water characteristic, sampling of sewage, physical chemical and biological examinations, B.O.D. and C.O.D.,B.O.D. equation, problems on B.O.D Pollution due to domestic and industrial waste. Treatment of sewage - purpose of treatment, preliminary treatment, primary treatment and secondary treatment. Flow diagram for conventional sewage treatment plant. Preliminary Treatment:-Screening, Grit chamber, detritus tank. Primary Treatment:-Sedimentation of sewage

Unit-III : Biological treatment: Trickling filters, low rate & high rate tricking filters, construction details, Re- circulation Modification of trickling filters Activated sludge process - Process description, Methods of aeration, loading rates, Different modified forms of A.S.P.,MLSS & SVI,F/M.

SECTION –B

Unit-IV : Low cost waste treatments - Oxidation ponds, Aerated Lagoon, Treatment and Disposal of sludge - Digestion of sludge, sludge disposal Septic tank, working and design, Disposal of septic tank effluent Disposal of sewage on land and in stream. Effluent standards for disposal on land, into stream and into sewers. MINAS. Self purification capacity of stream

Unit-V : Characteristics of solid waste:- Physical, chemical, biological Analysis

Collection of solid waste:- Types of collection system and services, frequency of collection, methodology involved in setting up collection bins Disposal of solid wastes:- Different methods, sanitary land fill, composting, incineration

Unit-VI : Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices electrostatic precipitator & cyclones only human tolerance level Introduction to EIA and Environmental Audit.

BOOKS RECOMMENDED :

Kshirsagar S.R. : Sewerage and Sewage Treatment, Roorkee Pub House, Roorkee.
Steel E.W. Steel : Water Supply & Sewerage, McGraw Hill Book Co.
Birdie G.S. : Water Supply and Sanitary Engineering, Dhanpat Rai & Son's.
Garg S.K. : Waste Water Engineering.
Dr. Bhide A.D., Sunderson B.B. : Solid Waste Management in Developing Countries.
Rao H.V.N. : Air Pollution.
Stern, Wohlers, Boobel, Lowry : Fundamentals of Air Pollution, Academic Press, 1973.

8CE03 PROJECT PLANNING & MANAGEMENT

SECTION-A

Unit-I : Project, Project Stakeholders, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase.
Conceptual Phase - Concept of feasibility study, Budgeting, Cash Flow, Risk assessment plan.
Project planning- Steps, work break down structure, Scheduling, Project Monitoring & Controlling- Concept of Tracking, Reviewing and Rescheduling.
Planning Tools: Basic concept of Gantt Chart, Bar Chart, Mile stone chart ,their advantage , limitations and overcoming measures ,

Unit II : Networking – Activity ,Event, dummy Activity, Fulerson's numbering rule, Geometrical consideration.
Critical Path Method: Concept, technique , Critical path , Numerical on Time and Floats computation , concept of Updating Network and its numerical for computation.

Unit III: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Probability factor, crash programe , normal and crash cost, normal and crash time, cost slope, Numerical on Probability computation, crashing .

SECTION – B

Unit –IV: Concept of resource smoothening and leveling ,Cost Cuves, Numerical of it.

Introduction to MicroSoft Project Planner software .Various stages and process for Work Breakdown structure, planning, scheduling and resource allocation for project in MSP. One Compulsory assignment for planning, scheduling and resource allocation for construction project using Microsoft Project Planner.

Unit-V: Management- Feyol's Principal of Management, Functions of management, organization definition, type line, line and staff, functional organization ,quality control, ISO.
Safety management ,construction hazards in multistage building, method of prevention of accident, injury rate, injury severity rate, injury index, National safety council, its role, recommendation, Material management , Objective ,Functions, Inventory, Need for inventory, ABC,EOQ analysis.

Unit VI: Equipment Management :
Power shovel: Construction, working, Output, factors affecting, cycle time , Problem n Output.
Dragline: Construction, working, output, factor affect ting output, cycle time ,Problem on output .
Concrete mixer, Tilting and non-tilting type construction working.

BOOKS RECOMMENDED:

Peurifoy R.L. : Construction Planning, Equipment & Method.
Srinath L.S. : PERT & CPM.
Punmia & Khandelwal : PERT & CPM.
Khanna S.K. : Industrial Organization & Management.
Satyanarayan : Operations Reserach.

8CE04 PROFESSIONAL ELECTIVE – II
i) ADVANCED DESIGN OF STEEL STRUCTURES

SECTION - A

Unit-I : (a) Design of foot bridge(N-Truss or Pratt)
Analysis and design for transmission tower lines

Unit-II : (a) Design of self supporting steel chimney and its foundation.
Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

SECTION - B

Unit-III: Design of industrial buildings including gantry grider, gantry column, Design of knee braces.

Unit-IV: a) **Design of north light trusses and lattic girder.**

Design of elevated rectangular, square pressed steel tanks and staging

BOOKS RECOMMENDED:

Ramchandra, Design of Steel Structure, Volume – I and II
Arya, Ajmani, Design of Steel Structures
Duggal, Design of Steel Structures
N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.

8CE04 PROFESSIONAL ELECTIVE – II

(ii) ADVANCED WASTE WATER & INDUSTRIAL WASTE TREATMENT

SECTION - A

Unit-I : **1. Physical unit process: screening, mixing, flocculation, sedimentation, floatation.**

Design of Grit Chambers and Screens.

Chemical Unit Processes: precipitation, gas transfer, adsorption

Unit-II : Biological Unit Process: fundamentals of biological treatment.

Design of trickling filter & activated sludge process.

Unit-III: 1. **Low cost waste water treatment: design of oxidation pond and aerated lagoon**

Oxidation ditch. Design of Secondary Settling Tank.

Methods of disposal of industrial wastes. Equalization tank, Neutralization.

SECTION – B

Unit-IV : General : Effect of discharge of industrial wastewaters on streams, land and environment. Importance and scope. Problems involved in treatment. Variation in quality and quantity of industrial wastewaters. Standards & Criteria

Indian standards for discharge of treated waste water on land, into municipal sewers and natural water courses.

Sampling of Waste Water : Representative sampling. Grab and composite samples.

Unit-V : General Approaches to Planning of Industrial Wastewater Treatment and disposal. Equalization and proportioning Neutralization.

Treating different effluent streams separately. Including/ excluding domestic wastewater along wish the industrial waste. Treating industrial wastewater along with town waste.

Unit-VI : Process flow diagram, characteristics and treatment of various industrial wastes.

Industrial wastes of pulp and paper, textiles, tannery, food, canning, sugar mills, distillery, dairy, Pharmaceutical, Electroplating etc. Case study of any one industry.

BOOKS RECOMMENDED :

Matcalf and Eddy : Waste Water Treatment, Disposal and Reuse, McGraw Hill Pub. Co., New Delhi.
Rao and Datta : Waste Water Treatment, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.

8CE04 PROFESSIONAL ELECTIVE – II

(iii) FINITE ELEMENT METHOD

SECTION - A

Unit- I : Continuum structures, discretisation, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Unit-II : Interpolation, Lagrangian, Hermition shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

Unit-III : 2-D plane stress and plane strain analysis, constant strain triangle, rectangle. 3D analysis, tetrahedron & parallelepiped elements.

SECTION - B

Unit-IV : Isoparametric elements, plane stress, plane strain and solids, numerical integration.

Unit-V : Beam straight with C and C continuity, numerical integration to cater for membranes, bending and torsion combination.

Unit-VI: Programming aspects, geometry, connectivity, code numbers alternate data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, soluti6n of equations, stiffness matrix.

BOOKS RECOMMENDED:

Desai, C. S., Abel, Introduction to Finite Element Method
Cook, Concept and application of Finite Element Method
Patwardhan, N. R. Illustrated Finite Element Method
Krishnamurthi, C. S., Finite Element Analysis – Theory and Programmingn

8CE04 PROFESSIONAL ELECTIVE – II

DAM ENGINEERING

SECTION - A

Unit- I : Introduction to Dam Engineering : Different classification for dams, relative advantages and disadvantages of various dam selection or types of dam, Investigation of dam sites, Engineering surveys, geological investigation, subsurface exploration programme, economic height of dam, Construction machinary, material, money, inventory.

Unit-II : Rockfill dam : Introduction, general characteristics, materials and testing of rockfill material, foundation of rockfill dam, design, rockfill placement, examples.

Unit-III : Arch dam :- components, types, methods for design.

Buttress dam : components, types, forces acting, Buttress spacing, Master curve for economic spacing, preliminary design Solid Gravity dams : Analysis & Design of gravity dam.

SECTION –B

Unit-IV: Spillways: choice of types, crest gates, hydraulic design, comparison, approach and tail channel, J.H.C. & tail water rating curve Energy Dissipaters: types, components, design of hydraulic jump type, basins, ski-bucket type, roller bucket.

Unit- V: Head Regulators : requirements, types, foundation treatment including uplift consideration, Bank connection, energy dissipation, hydraulic design of opening and barrel, ventilation, types of gates.

Approach Channel, case study for one on rock foundation and one on permeable foundation.

Model Studies: scales design principles, materials, scale effects for model of dams spillways.

Unit-VI : Instrumentation : In earth dam and solid gravity dams, piezo meters, settlement, gauges, (surface monuments, base plate, cross arm) strain meters joint meters, thermometers, stress meters, pore pressure cells, plumb-bob Seismograph. Water level gauges (description, object, location, working, installation of each, design not expected)

Special problems: increasing height of masonry and concrete dams, strengthening, repairs and maintenance, leakage, evaporation controls. evaporation controls.

BOOKS RECOMMENDED :

Sharma H.D : Concrete Dams, Metropolitan Book Co, Delhi.

Varshney R.S. : Concrete Dam, Ox IBH, Mumbai.

Sherard et al : Earth and Rockfill Dam, John Wiley, New York.

USBR : Design of Small Dams.

USBR : Design of Large Dams.

Peurifoy R.L. : Construction, Planning and Equipments, McGraw Hill Book Co.

Satyanarayanan : Construction, Planning & Equipment, Standard Pub.

USBR : Design of Gravity Dam.

8CE04 PROFESSIONAL ELECTIVE – II

(v) ADVANCED ENGINEERING GEOLOGY

SECTION - A

Unit I : A) Geology & engineering characters of Basalts & other rock formations : study of rock formations of Maharashtra older than Deccantrap from Civil engineering point of view, field characters of basalt flows and older formations which are significant from dam foundation, tunnelling work, watershed development including percolation tanks and construction material.

Geology of dam & reservoir's : bearing capacity & water tightness of different types of rocks occruing in Maharashtra from construction of gravity dam with important case histories of different dam sites in Maharashtra whose geological problems were encountered and remedial measures were adopted. Set of geological conditions which lead to tail channel erosion with case histories of different dam sites.

Geology of tunnel alignment : geological factors responsible for overbreaks & percolation of water, various geological structures which affects the tunnelling works. Case histories of tunnels & hydro-electric projects, roads, railways & canals driven through different types of Basalts & other rocks occur in Maharashtra.

Unit II: (A) Seismological studies : factors to be to safeguard gravity dams. Detailed studies of active & dead faults. Type & design aspect of the dam to be constructed in seismic zone with cace histories.

Percolation tanks : importance of geological studies for the selection of sites for percolation tanks, geological studies of watershed development projects in Maharashtra including Raleganshindi & Vidarbha region.

Ground water studies : water bearing characters of different types of Basalts. Soil & water preservation techniques of civil engineering significance and under ground bandhara. Exploration of tubewells n alluvium and sandy – alluvium substrata for drinking water oses procedures and need thereof. Deciding acquifers for tubewell exploration & development of tubewells conducting yield tests of tubewell.

Unit III: (A) eology of soil formation : geological factors which govern the engineering characters of soils. Soil derived from different types of rocks which can be used for casing & hearting of earthen dams. Nature of river alluvium in Maharashtra. Problem water logging & its remedial measures.

Construction material : properties of different types of rocks that can be used as rubble for masonry, road metal, railway ballast, concrete aggregates etc. Problem of alkali aggregate reaction. Scaricity of sand in Deccan trap region, suitability of compact & gdaloidal basalt as a substitute of sand after crushing.

Geology of cut-off trench : geological logging and mapping of cut off trench of irrigation projects. Applicability of grouting in irrigation projects & different grouting techniques.

SECTION - B

Unit IV : (A) Drilling and logging : different methods of drilling. Precautions to be taken during drilling, preservation of cores. Recording of drilling data. Geological logging of the drill & its interpretation. Methods of water intake tests.

Aerial photo interpretation : interpretation of aerial photos from the point of view of rock types, geological structures, selection of dam sites and alignment of roads, railways & ghat interpretation of lineaments for groundwater.

Town planning : role of geology in town planning. Important case histories of the old town planning.

Unit V: Geophysical principle of electrical resistivity survey, its utility in determining the depth of overburden, foundation grade rocks, gullies & other geological structures by having case histories of dams & tunnels, significance of electrical resistivity survey in ground water studies, brief introductory ideas regarding seismic, magnetic and gravity surveys and their applications in various fields.

Unit VI: (A) Rock Mechanics : Engineering properties of rocks, general properties, strength of rocks, elasticity of rocks. Residual stresses in rock masses, classification system in rock engineering - Terzaghi's load classification, Lauffer-Pacher classification. Rock quality gnation (RQD), rock structure rating (RSR), concept of Wickham et.al (1972)

□ Ā □ Ā □ Ā

nvironmental Geology : role of geology in environmental engineering, geo-environmental : soils as resources, wind erosion, erosion by moving water, predicting & controlling erosion, soil erosion & land use decisions, problem soils. Reactivation of pre faults, earthquakes in Peninsular India, intensity & magnitude, assessment, Himalayan earthquakes, landslides - characterisation, landslide analysis, dimensions of landslide hazard, landslide potential, case histories, subsidence, response to subsidence prediction, costs of subsidence, case histories.

BOOKS RECOMMENDED :

P.W.D. Hand Book, Chapter No. 6.

Geological Survey of India - Engineering Geology Case Histories, Parts I & II.

Auden J.B. : Indian Society of Engineering Geology, Commemoration Volume.

Wahlstrom E.E. : Tunnelling in Rocks.

Wahlstrom E.E. : Dams, Dam Foundations and Reservoir Sites.

Goodman R.E. : Introduction to Rock Mechanics.

Bieniawski Z.T. : Rock Mechanics Design in Minning and Tunnelling.

Lama R.D. & Vutukuri V.S. : Hand Book of Mechanical Properties.

Gupte R.B. : AText Book of Engineernig Geology, Pune Griha Prakashan.

Miller : Principles of Remote Sensing.

Pandey S.N. : Text Book of Photo Geology.

Lundgren L. : Environmental Geology, Prentice Hall Pvt. Ltd.

Patwardhan A.M. : The Dynamic Earth System, Prentice Hall Pvt. Ltd.

8CE04 PROFESSIONAL ELECTIVE – II
MATRIX COMPUTER ANALYSIS OF STRUCTURES SECTION - A

Unit- I : Solution of simultaneous algebraic equations, Gaussian elimination method, Half-band matrices, computer programme.

Unit-II : Finite difference method, application to plate deflection problems for fixed and simply support conditions.

Unit-III : Flexibility method, static redundancy, flexibility coefficients, compatibility conditions, application to continuous beams, single-bay single story portals, pin joined plane trusses.

SECTION-B

Unit-IV: Stiffness method, kinematic redundancy, equilibrium equations, member stiffness matrix and structure stiffness matrix, assembly procedure, application to continuous beams, pin jointed plane truss, numerical examples upto three unknowns.

Unit- V : Stiffness matrix of plane frame member with axial deformation (6x6), Grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Unit-VI : Data and program organization for stiffness method, various coding systems, member-joint and joint-coordinate relations, member-displacement relations, code number approach, methods of introducing boundary conditions for restrained displacements.

BOOKS RECOMMENDED:

Gere, Weaver, Analysis of framed structures
Rubinstein, M. F., Matrix computer analysis of structures
Matrin, M. C., Introduction to matrix methods of structural analysis

8CE04 PROFESSIONAL ELECTIVE – II
vii) ADVANCED STRUCTURAL

ANALYSIS SECTION – A

Unit – I: 1. Approximate methods of analysis of multi-bay multi-storey Frames by – (a) Cantilever method, (b) Portal method & (c) Factor method.
Shear centre for thin walled beam section.

Unit – II :1. Infinite & semi-infinite beams resting on elastic foundations.
Analysis of beams circular in plan.

Unit –III: 1. Cantilever moment distribution method, application to rigid jointed plane frames.
Vierndeel girders - analysis for vertical sway cases only.

SECTION - B

Unit–IV : 1. Finite difference method, application to beam deflection problems
Minimum potential principle, Rayleigh & Rayligh-Ritz approach to continuous problems, application to simply

supported and cantilever beams using power series and trigonometric series.

Unit – V: Introduction to theory of elasticity - (treatment in Cartesian co-ordinates), state of stress at a point, stress – equilibrium equations, strain-components, stress -strain relations, generalized Hooke's law, strain plane stress and plane conditions, stress and compatibility for 2D.

Unit–VI: 1. Analysis of columns loaded laterally.
Structural response to earthquake, analysis of multistoried frames by I.S. code provisions.

BOOKS RECOMMENDED:

Norris, Wilbur, Elementary Structural Analysis
Timoshenko & Goodier, Theory of Elasticity
Jaikrishna, Chandrashekharan, Element of Earthquake Engineering, Sarita Publication, Meerut (U.P.)
Vazirani & Ratwani : Advanced Theory of Structures.
Ross C.T.F.: Advanced Stress Analysis.

8CE04 PROFESSIONAL ELECTIVE – II
viii) ROCK MECHANICS

SECTION - A

Unit I : Introduction, properties and testing. Introduction to Rock Mechanics and its field applications, identification of common rocks, physical & mechanical characteristics of rock material. Field & Laboratory testing of rocks. Classification of rock masses for engineering purpose.

Unit II: Rock excavation : Blasting - objectives, blasting materials, blasting methods, open cut blasting. control blasting operation, precautions. Drilling, braking & cutting. Machines used for rock excavation.

Unit III: Rock reinforcement & Grouting : Rock bolting – bolting methods & materials.
High capacity of rock anchors - types of rock anchors, anchor grouting, civil engineering applications. Bolted & anchor supports. Rock grouting - objectives, types of treatment, grouting material, grouting methods, quality control & monitoring of grouting.

SECTION-B

Unit IV: Rock strength & deformability : modes of rock failure, stress-strain behaviour in compression, Mohr- Coloumb failure criteria, Griffths crack theory, empirical criteria for failure, effect of size

on strength. Plane of weakness in rocks, joint orientation & roughness. Deformability of rocks - elastic & non- elastic behaviour, influence of time on rock deformation, viscous behaviour & creep.

Unit V: Rock foundation & slope stability : rock foundation – allowable bearing pressures, stress & deflection in rock under footing, failure mechanisms, subsiding & swelling rocks, base heave & remedies, foundation anchoring. Rock slopes - modes of failure, factors affecting, analysis of slopes.

Unit VI: Underground opening : types of boring machine, cutting tools, muck handling. Opening in competant rock, horizontally layered rocks & rock with inclined layers, plastic behavior around tunnels, time dependent behaviour of tunnels, underground opening in blocky rocks - Block theory. Review of design methods of tunnels
Empirical & semi-empirical methods. Support & stabilisation.

BOOKS RECOMMENDED :

Goodman R.E. : Introduction to Rock Mecanics.
Franklin J.A., Dusseault M.B. : Rock Engineering.
Franklin J.A., Dusseault M.B. : Rock Engineering Applications.
Stagg K.G., Zienkiewicz O.C. : Rock Mechanics in Engineering Practice.

8CE04 PROFESSIONAL ELECTIVE – II
ix) ADVANCED DESIGN OF R. C. C. STRUCTURES

SECTION - A

[BY LIMIT STATE METHOD]

Unit-I : 1) Design of Portal frame up to two bay two storied symmetrical frame for symmetrical loading.
Design of circular slab for uniformly distributed load only, Introduction to grid floor slab.

Unit-II : 1) Design of a footbridge and simply supported slab deck bridge for I.R.C.class A loading.
Design of RCC girder (T beam) bridge for I.R.C.class A loading.

SECTION – B

Unit-III : 1) Structural response to earth quake, Analysis of multistoried frame by seismic coefficient method.
Design of square bunkers using Rankine theory. Design of Silos.

Unit-IV: 1) Design of R.C.C. Intze tanks.
Design of staging for Intze tanks with raft foundation.

BOOKS RECOMMENDED:

Suhil Kumar, Treasure of R. C. C. Design
Jain, A. K., Reinforced Concrete (Limit State Method)
Shah, Karve, Design of R. C. C. Structures
N. Krishna Raju, Advanced R. C. C. Design
Rajgopalan, K., Storage Structures.

8CE 05 WATER RESOURCES ENGINEERING – II – Lab

TERM WORK : Five problems from the following to be worked out by the students whenever necessary scale drawing on half empirical size must be drawn : Practical examination shall consist of viva – voce.

Fixing control levels of Reservoir from given data.
Cross section, plan, L-section of Earth dam showing all components; details of drainage of downstream casing.
Design and Drawing of elementary and practical profile of gravity dam.
Design and drawing of diversion weir on permeable foundation.
Design and Drawing of ogee spillway with energy dissipaters.
Computer Aided design of unlined and lined canal.
Drawing of any Four canal structure (No design)
Field visit

8CE06 ENVIRONMENTAL ENGINEERING – II - Lab

Analysis of waste water (any four) – BOD (for domestics waste), COD (for industrial waste), Solids (Volatile), SVI, Nitrogen, Chlorides
Air sampling & Analysis of SPM.
Physical characteristic of solid waste
Sketches of sewers appurtenances – Manholes – different types storm water inlets, overflows, inverted siphons, automatic flushing tanks, ventilation in sewers.
Report of Field visit to Municipal wastewater treatment plant/Industrial Effluent treatment

8CE07 PROJECT & SEMINAR

Complete Project Report in a group of Maximum 9 students shall be submitted.

Out of 75 internal marks, 25 marks shall be given through the internal viva by three member committee one of them will be guide.

****