Faculty of Engineering & Technology
Structure of Final Year (Civil Engineering) w. e. f. Academic Year 2019-20

Semester I

Subject Code	Subject	Contact Hrs/ Week			Credit	Examination				
		Th	Pr	Total		Th	CT	TW	Pr/ Oral	Total
CED 401	Environmental Engineering	4	-	4	4	80	20	-		100
CED 402	Water Resources Engineering	4	-	4	4	80	20	-		100
CED 403	Design of Structures III	4	-	4	4	80	20	-		100
CED 404	Foundation Engineering	4	-	4	4	80	20	-		100
CED 441 to 444	Elective II	4	-	4	4	80	20	-		100
CED 421	Lab 1: Environmental Engineering	-	2	2	1	-	-	25	25	50
CED 422	Lab 2: Water Recourses Engineering	-	2	2	1	-	-	25	25	50
CED 422	Lab 3: Elective II	-	2	2	1	-	-	25	--	25
CED 423	Lab 4: SDD II	-	4	4	2	-	-	50	50	100
CED 424	Lab 5: Seminar	-	2	2	1	-	-	50	-	50
CED 425	Lab 6: Project I	-	2	2	1	-	-	25	-	25
		20	12	32	27	400	100	200	100	800

Semester II

Subject Code	Subject	Contact Hrs/ Week			Credit	Examination				
		Th	Pr	Total		Th	CT	TW	Pr/ Oral	Total
CED 451	Structural Mechanics	4	-	4	4	80	20	-		100
CED 452	Construction Management	4	-	4	4	80	20	-		100
CED 453	Transportation Engineering	4	-	4	4	80	20	-		100
CED 491 to 495	Elective III	4	-	4	4	80	20	-		100
CED 421	Lab 7: Construction Management	-	2	2	1	-	-	25	25	50
CED 422	Lab 8: Elective III	-	2	2	1	-	-	25	-	25
CED 423	Lab 9: Environment Impact Assessment	-	2	2	1	-	-	25	-	25
CED 424	Lab 10: Project II	-	6	6	6	-	-	100	100	200
		16	12	28	25	320	80	175	125	700

Elective II:

1. Prestressed Concrete
2. Plumbing Engineering
3. Ground Water Engineering
4. Open Elective

Elective III:

1. Advanced Structure
2. Pavement Design
3. Structural Dynamics & Earthquake Engineering
4. Industrial Waste Treatment
5. Surface and Ground Water Hydrology

SEMESTER I

CED 401: Environmental Engineering

Teaching Schemes **Examination Scheme**

Theory: 04 Hrs / Week **Theory: 80 Marks**

Class Test: 20 Marks

Section-A

Unit I: Water Supply Engineering (6 Hrs)

Water Demand per capita demand and variations in demand, Factors affecting demand, design period, population forecasting, **Sources of Water** Surface and subsurface sources, **Water Quality** impurities in water, water quality parameters, standards for potable water.

Unit II: Water Treatment Units (8 Hrs)

Intake Structures River intake, Reservoir intake, canal intake, Lake Intake, **Water treatment Theory and Design** screens, grit removal, aeration, plain and secondary sedimentation, filtration, disinfection, tertiary treatment, water softening, **Distribution System.**

Unit III: Waste Water Collection System (4 Hrs)

Definitions, General considerations, Combined and separate sewers, Computation of sewage/wastewater; Design of Storm and Sanitary sewer systems, Sewer materials, Sewer Appurtenances, Sewage pumping, Sewer Construction and maintenance.

Section-B

Unit IV: Characteristics of wastewater and waste water treatment-I (8 Hrs)

Sampling, Physical, Chemical and Biological characteristics, Microbiology of Sewage, Interpretation of results, Effluent standards for disposal of wastewater on land, into Surface water, and for Irrigation, **Sewage treatment units** preliminary, primary and secondary treatment.

Unit V: Waste water Treatment -II (8 Hrs)

Biological Sewage treatment and Sludge disposal activated sludge process, trickling filter, oxidation pond and aerated lagoons. Advance waste water treatments, Sludge digester, UASBR and disposal, **Design of treatment unit's** activated sludge process, trickling filter, oxidation pond.

Unit VI (6 Hrs)

Solid Waste Management Introduction; legislative trends and impacts; sources, types, composition and properties of municipal solid wastes; sources, types and properties of hazardous wastes found in municipal solid waste; engineering principles of solid waste generation, collection, separation, storage, transport, processing and transformation both at the

source and off-site; disposal of solid wastes and residual matter (landfills, landfill leachates and landfill gases); separation, transformation and recycling of waste materials, restoration and rehabilitation of landfills; and solid waste management and planning issues.

Recommended Books

1. Water Supply Engineering, S. K. Garg, Khanna Publishers.
2. Water Supply and Sanitary Engineering, G.S. Birde & J.S. Birde, Dhanpat Rai Publishing Company.
3. Elements of Environmental Engineering, Duggal K.N., S. Chand & Company.
4. Water Supply Engineering, B.C. Punmia & Ashok Jain & Arun Jain, Laxmi Publications.
5. Wastewater Engineering, B.C. Punmia & Ashok Jain & Arun Jain, Laxmi Publications.
6. Wastewater engineering: treatment, disposal, and Reuse: Metcalf, L., Eddy, H.P., McGraw-Hill, Inc.
7. Environmental Engineering: Peavy, Rowe- McGraw Hill, Inc. New Delhi
8. Water and Wastewater Technology: Mark J Hammer, Mark J Hammer Jr., PHI Pvt. Ltd.
9. Water Supply and Sewerage: Terence J McGhee, McGraw-Hill, Inc. New Delhi
10. Integrated solid waste management: engineering principles and management issues: Tchobanoglous, Theisen H & Vigil S.

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 402: Water Resources Engineering – II

Teaching Schemes **Examination Scheme**
Theory: 04 Hrs / Week **Theory: 80 Marks**
Class Test: 20 Marks

SECTION-A

Unit-I: Reservoir Planning (4 Hrs)

Reservoir types, investigation of site and selection, storage capacity estimation by mass curves, fixing various control levels. Height of dams and economics.

Unit-II: Gravity & Earthen dams (12 Hrs)

a) Dams in general: Classification, site selection, choice of types and instrumentation in gravity dams.

b) Gravity dams: Forces acting, modes of failure, stability analysis, design of low and high gravity dams, galleries, joints, keys and water seals. Control of cracking in concrete dams.

c) Earthen dams: Types, components and their functions, causes of failure, design criteria, stability analysis, seepage and its control through earth dams and its foundation, drainage of earthen dams, Maintenance of earthen dams.

Unit-III: Arch and Buttress dams

Types and suitability, forces acting and design methods of arch dams. Buttress dam and types of buttress dam.

SECTION-B

Unit-IV (06 Hrs)

a) Spillways: Types and suitability under different conditions, construction features, design criteria, energy dissipation and I.S. recommendations, spillway gates.

b) Canals: Classification, factors influencing alignment cross sections, design of canal in non-alluvial soils, Kennedy's and Lacey's silt theories.

Unit-V: Canal masonry works: (8 Hrs)

Cross Drainage works: purpose, types, suitability, components and hydraulic design and design of transitions.

Canal Falls: Necessity, location, types and design, regulating works, energy dissipation, roughening devices.

Head and cross regulators: Construction features and hydraulic designs. Modules: Functions, requirements, types and hydraulic design.

Unit-VI: Design weir head works (4 Hrs)

Introduction, site selection, components, weir barrage, design criteria for weirs and barrages, Bligh's and Khosla's theory. Weir head regulators, under sluices, divide walls, functions of components and design criteria. Failure of weirs.

CED403: Design of Structures – III

Teaching Schemes **Examination Scheme**
Theory: 04 Hrs / Week **Theory: 80 Marks**
Class Test: 20 Marks

SECTION-A

Unit I: Design of combined footings (7 Hrs)

Rectangular footing, Trapezoidal footing.

Unit II: Design of Flat Slab (6 Hrs)

Introduction – component of flat slab construction, IS code recommendation, Direct design method and Equivalent frame method

Unit III (8 Hrs)

Design of Cantilever and Counter fort retaining wall

SECTION-B

Unit IV (7 Hrs)

a) Design of Water Tank Resting on Ground: Circular and rectangular tanks (I.S. Code Method). **Introduction of supporting tower/staging for elevated tanks:** Solid shaft, Columns and braced frame, Recommendations regarding design of staging.

b) Design of under Ground Water Tank: Circular and rectangular tanks (I.S. Code Method)

Unit V (6 Hrs)

Introduction to Prestressed concrete: Principles of prestressing, Basic concepts, comparison between Prestressed concrete and Reinforced Concrete, Need of high-strength concrete and Steel for Prestressed concrete construction, Classification of prestressed concrete member, Systems of prestressing.

Unit VI (6 Hrs)

a) Design of Circular slabs: Fully restrained, partially restrained and simply supported along edges.

b) Formwork: Introduction, loads on formwork, Indian standards on formwork, design of shuttering for Columns, beams and slab floor.

Reference Books:

1. R.C.C. Design (Reinforced concrete structures) by Dr. B. C. Punmia, Ashok Jain and Arunkumar Jain
2. Illustrated reinforced concrete Design by Dr. S. R. Karve and Dr. V. L. Shah
3. Reinforced Concrete Design by Unnikrishnan Pillai, DevdasMenon
4. Design of Reinforced concrete structures by M. L. Gambhir
5. Prestressed Concrete by N. Krishna Raju

6. Deign of Prestressed Concrete by T.Y. Lin.

7. Formwork for Concrete Structures by Kumar Neeraj Jha (McGraw Hill Education)

8. Strength of Material by Dr. Sadhu Singh, (Khanna Publications)

Refer IS: 456-2000, IS: 3370 and IS: 1343-1980

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1, 2, 3) and Section B questions on remaining three units (4, 5, 6). Question paper should cover the entire syllabus.

For 80 marks Paper (4hrs duration):

1. Minimum six questions
2. Three questions in each section
3. Two questions from each section are asked to solve.

CED404: Foundation Engineering

Teaching Schemes **Examination Scheme**
Theory: 04 Hrs / Week **Theory: 80 Marks**
Class Test: 20 Marks

SECTION-A

Unit -I: Site Investigation (6 Hrs)

Need to investigate, Investigation methodologies- drilling technologies, Pits-trenches and shafts In-situ and lab testing, sampling techniques, site investigation report writing.

Unit -II: Bearing Capacity of Soil and Settlement Analysis (10 Hrs)

Failure mechanism in shallow and deep foundation, Terzaghi's theory and generalized bearing capacity equation, Meyeroff ' theory, Prantl's theory Hansens bearing capacity of soil, Vesic modification shape factors, depth factors, inclination factors, ground slope factors and base tilt factors. Use of the equations for strip, square and rectangular footings. Determination of the bearing capacity from filed tests Plate load test, Standard Penetration Test (SPT), Factors affecting bearing capacity, Effect of water table and eccentricity of loading on bearing capacity, Relative Density Apparatus

Settlement Analysis: Causes and control of settlement, stress distribution, Immediate and Consolidation settlement, Differential settlement Tolerable settlement

Unit -III: Shallow Foundation (4 Hrs)

Design consideration, construction of different types of footing on sand and clay, Proportioning of footings, combined footing design and Cantilever footing. **Raft Foundation:** Design consideration and construction of different types of raft on sand and clay.

SECTION-B

Unit -IV: Pile Foundation (10 Hrs)

Its types, use and function, timber piles, precast piles, in-situ piles. Methods of pile driving, hammer, effect of pile driving on ground, selection of pile type, determination of length of pile, pile foundation design, determination of bearing capacity, point bearing, friction bearing, negative skin friction, Pile capacity by static and dynamic formulae, limitations, group action, number and spacing of piles, under reamed piles and its design, numerical.

Unit -V: Well and Caissons (6 Hrs)

Types of wells, its component parts, choice of particular type, Design load, scour depth, sinking and frictional resistance for well tilting, methods of correction of wells. Caissons – open box, drilled, pneumatic. Caisson safety problems, caisson disease, working, uses, Salient construction features.

Foundations in Difficult soils: Characteristics of BC soil, Foundation problems and techniques on B.C. soil, Dewatering of foundation: for tower and tank construction.

Unit -VI: Cofferdams (4 Hrs)

Sheet piles, sheet pile walling, types, analysis and design of sheet pile wall, Types of cofferdams, uses, construction of single wall, double wall and cellular cofferdam Design of braced cofferdam, cellular cofferdam, Design of circular and diaphragm type cofferdam, Pumping and sealing of bottom of cofferdam

Recommended Books:

1. Foundation Engineering, B.J. Kasmalkar
2. Gulhati, S.K. and Datta, M. (2005), Geotechnical Engineering, Tata McGraw-Hill,
3. Soil Mechanics and Foundation engineering, Dr. K.R. Arora.
4. Soil Mechanics and Foundation Engineering, B.C. Punmia
5. Varghese.P.C.(2006), Foundation Engineering, Prentice-Hall of India Private Limited.

Reference Books:

1. Venkataramaiah, C. (2005), Geotechnical Engineering (3rd Edn), New Age International (P) Ltd., New Delhi
2. Das, B.M. “Principles of Foundation Engineering (Fifth edition), Thomson Books
3. Teng, W. C. “Foundation design”.
4. Donald.P.Coduto (2005), Geotechnical Engineering Principles & Practices, Prentice-Hall of India.
5. Das, BM (2009): Geotechnical engineering – Cengage learning, New Delhi.
6. Iqbal H Khan (2007): Geotechnical Engineering – Prentice Hall, Delhi.
7. Gopal Ranjan, Rao ASR (2000): Basic and applied soil mechanics – New age publication, Delhi.
8. Bowles J.E. Foundation analysis and design, McGraw Hill, 1994

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1, 2, 3) and Section B questions on remaining three units (4, 5, 6). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 441-A: Elective-II Prestressed Concrete

Teaching Schemes **Examination Scheme**

Theory: 04 Hrs / Week **Theory: 80 Marks**

Class Test: 20 Marks

SECTION A

Unit I **(6 Hrs)**

Prestressed concrete structures, introduction, basic concepts of prestressing, various materials needed for prestressing and it's properties, methods and systems of prestressing (Pre, post tensioning, Hoyer's system, Freyssinet system, Magnel blaton system etc.).

Losses in prestressing (Theory and numerical)

Unit II **(8 Hrs)**

Analysis of prestressed concrete sections – rectangular, symmetrical and unsymmetrical flanged sections

Concepts of different cable profiles, pressure line, thrust line, kern point and it's importance

Unit III **(6 Hrs)**

Need of anchor blocks for prestressed concrete section. Concept and design of anchor block by Guyon's, Magnel's and Indian Standard Code method.

SECTION B

Unit IV **(9 Hrs)**

Analysis for flexural and shear strength of prestressed concrete section. Patterns of failures of the section in flexure and shear. Design of prestressed concrete section.

Design of prestressed concrete section

Unit V **(6 Hrs)**

Analysis of Composite prestressed concrete section

Design of one way and two way slab

Unit VI **(5 Hrs)**

Concept of circular prestressing. Types of prestressed concrete pipes. Design of cylindrical and Non cylindrical prestressed concrete pipes

Design of prestressed concrete pipes.

References:

1. N. Krishnaraju, Prestressed Concrete, Tata Mc Graw-Hill Publishing Company.
2. T. Y. Lin & Nedbhurns, Design of Prestressed Concrete Structures, John Wiley & Sons
3. S.Ramamruthm, Pretsressed Concrete, Dhanpat Rai and Sons.

4. Sinha and Roy, Fundamentals of Prestressed Concrete, S. Chand Ltd.
5. N. Rajagopalan, Prestressed Concrete, Narosa Publishing House.
6. James R. Libby, Modern Prestressed Concrete, CBS Publishers & Distributors Pvt. Ltd.
7. IS 1343: 2012, Indian Standard Code of Practice for Prestressed Concrete.
8. IS 784: 2001, Indian Standard Code for Circular Prestressing in prestressed concrete pipes.

Note: The charts and tables required shall be provided in the examination in the question paper itself.

Pattern of question paper

The question paper will comprise of two sections A & B. The questions in Section A shall be set from unit no. I, II and III. Section B shall be set from unit no IV, V and VI. It shall be seen that entire syllabus shall be covered in the question paper. The weightage of the theory paper shall be 80 marks.

Each section shall contain five questions and three questions out of it need to be solved by the students.

CED 441-B: Elective-II: Plumbing Engineering

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION A

Unit I: Introduction to codes and standards **(05 Hrs)**

Approvals, AHJ, alternative materials, minimum standards, workmanship, prohibited fittings and practices, water conservation, protection of pipes and structures, role of Plumbing Practitioners.

Hydraulics in Plumbing

Introduction, Pressure, Flow of water, Flow in Pipes, Local municipal laws relating to plumbing and basic information on fire static water requirements.

Unit II: Plumbing Fixtures and Fixture Fittings **(07 Hrs)**

Plumbing fixtures, water conserving fixtures, water closets, bidets, urinals, flushing devices, lavatories, bath/shower, kitchen sinks, water coolers, drinking fountain, clothes washer, overflows, strainers, prohibited fixtures, installation standards, strainers, floor drains, floor slopes, location of valves, hot water temperature, and table of minimum plumbing facilities.

Unit III **(08 Hrs)**

Traps and Interceptors

Traps required, trap arms, trap seals, venting to traps, trap primers, prohibited traps, building traps, clarifiers, grease interceptors, sizing, oil and sand interceptors.

Indirect Waste

Air-gap, food establishments, sink traps, dish washers, drinking fountains, waste receptors, sterile equipment, appliances, condensers, point of discharge, venting. Introduction to pipe sizing.

Vents

Vent requirement, trap seal protection, materials, vent connections, flood rim level, termination, vent stacks, water curtain and hydraulic jump, horizontal and vertical wet venting, combination waste and vent system, cleanouts, venting of interceptors. Introduction to vent sizing, sizing of combination vents etc.

Unit IV **(07 Hrs)**

Sanitary Drainage

Preamble, pipe materials and jointing methods, special joints, fixture connections (drainage), hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below invert level, suds relief, testing, building sewers, testing, sumps and pumps, public sewers, sewage disposal. Introduce DFU, Design of combined sewer.

Storm Drainage

Storm drain required, prohibited connections, subsoil drains, sub-drains, gutters/channels/scuppers, window areaway drains, roof drains, strainers, leaders, conductors and connections, siphonic drains, underground drains, materials, traps required, prohibited installations, testing. Introduction to sizing of channels, rainwater down takes,

Unit V **(07 Hrs)**

Water Supply

Preamble, sources of water, potable and non-potable water, reclaimed water, water storage, treatment, hot and cold water distribution system, backflow prevention, air gap, cross connection control, pipe materials and jointing methods, pressure controls, unions, thermal expansion, types of valves, installation and testing, Design a water supply system for residential building.

Solar Hot Water

Introduction to solar water systems. System components, panels, hot water tanks, electrical backup, safety measures, auto controls, hot water supply and return systems, various insulating materials, control valves.

Unit VI **(06 Hrs)**

Building Sewers

Drainage fixture unit, change in direction of flow , drainage plan of residential building, Pine grading, Pipes and fitting suitable for building sewers, RCC, PVC, Stoneware etc, Sizing, Testing, Types of traps, gully chambers and manholes, materials, venting. Sumps, Pumps, Sewage disposal, Septic tanks.

Plumbing in High rise Buildings

Definition of high rise, Multiple storage tanks, Break pressure tank, water supply, Pressure Reducing valves, Building drainage system, Rainwater system, Sizing, Testing, Introduction to centralized hot water supply, System types, Principle of design.

Reference Books

1. Uniform Plumbing Code- India (UPC-I), 2018

2. Illustrated Training Manual (ITM), 2018

3. Plumbing Practices by Syed Azizul Haq

4. Plumbing Design And Practice by H. G. Deolalikar, Publisher: Mac-graw Hill

Examination Scheme:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1, 2,3) and Section B questions on remaining three units (4, 5, 6). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Solve any Three Question from each section

CED 441-C: Elective-II: Ground Water Engineering

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION-A

UNIT I **4 Hrs)**

Introduction Ground water hydrology and potential in India, Ground water exploration and investigation methods. Water bearing properties of soil and rocks, site selection, Infiltration mechanism and water budget equations. Water Storage and Rock Functions: Porosity, void ratio, water retention properties, specific yield, Permeability, Permeameters, Constant and variable head analysis and equations.

UNIT II **(8 Hrs)**

Geological zones of saturation, aeration zones, soil water saturation zone, Aquifers, Storage coefficient, water table fluctuation. Ground Water flow: Laminar and turbulent flows, Reynold's number, Darcy's laws and applications. Three dimensional flow, flow net analysis, Storage Equations, boundary conditions, Steady flow states, Radial flow of wells, Dupuit's equations and applications, draw down curves and cone of depression.

UNIT III **(8 Hrs)**

Aquifer Properties Aquifer tests, confined aquifers, discharge analysis (Theims and Jacob's methods), unconfined aquifers and flow properties. Well Hydraulics Types of well and constructions, infiltration galleries, tube well design and dimensions, maintenance of wells, performance tests.

SECTION-B

UNIT IV **(4 Hrs)**

Ground Water Exploration Geological and hydrologic methods, Electrical resistivity method, Seismic methods, Magnetic Methods, Gravity Methods, Ratio Metric Methods, Tracer techniques. Modeling: Physical and mathematical models, Finite element method and applications.

UNIT V **(8 Hrs)**

Saline Water Intrusion. Zone of diffusion and interface parameters, Zeolite identification, Prevention and control of saline water intrusion. Artificial Recharge: Artificial Recharge & methods, waste water recharge, detention dams, water shed management techniques, Rain water harvesting.

UNIT VI **(8 Hrs)**

Pumps and allied machinery: Discharge rates and demands. Flow charts, heads and losses, power requirements. Types suitability, Installation and maintenance, power calculations, Flow measurements and metering, Distribution Network. Water Quality, Pollutions and Legislation Potable water Quality, Sources of pollutions and pollutants, hard water and effects, water salinity logging, water test parameters, leaching; and soil reclamation, pollution control norms, boards, action plans and legislations.

Recommended Books:

1.Ground Water Engineering (Assessment, Development & Management)K.R. Karanth

2. Ground Water, H. M. Raghunath

3. Ground Water Hydrology, D. K. Todd

4. Ground Water and Seepage, M. E. Harr

5. Seepage, Drainage and Flow Nets, H. R. Cedergren

6. Engineering Fluid Mechanics, C. Jaegar

CED 421-LAB 1: Environmental Engineering

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**
Oral: 25 Marks

The oral/practical examination shall consist of viva-voice based on the practical work done during the course, the record of experiments submitted by candidate and the syllabus of the subject. The assessment will be based on performing an experiment and the record of experiments submitted by the candidate.

Part - I (Any 8 of the following shall be performed)

1. Determination of turbidity for a given samples of water.
2. Determination of solids in a given sample of water: Total solids, Suspended solids and Dissolved solids.
3. Determination of pH for a given samples of water.
4. Determination of Hardness for a given samples of water.
5. Determination of Residual Chlorine and Chlorine Demand for a given samples of water.
6. Determination of Dissolved Oxygen in a given samples of wastewater.
7. Determination of Biochemical Oxygen Demand for a given samples of wastewater.
8. Determination of Chemical Oxygen Demand for a given samples of wastewater.
9. Determination of Oil & Grease for a given samples of wastewater.
10. Determination of Sludge Volume Index (SVI) for given samples of wastewater.

Part - II

Visit to Water Treatment Plant and Wastewater Treatment Plant. Visit report of both treatment plant is compulsory.

CED 422-LAB 2: Water Resources Engineering – II

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**
Oral: 25 Marks

Practical work consist of performances from all four groups [A, B, C & D] listed below and detailed reporting in the form of journals.

A. Any **three** assignments from following.

1. Exercise on flood routing by any one method.
2. Stability analysis of gravity dam by analytical and graphical method.
3. Design of high dam by any one method.
4. Slip circle analysis for upstream/ downstream slope of earthen dam.

Analytical method of locating pheratic line and trial sketching of flow nets for homogeneous sections.

B. Any **three** assignments from following.

1. Design of Ogee spillway. Upstream and downstream profile.
2. Designing a canal by silt theories.
3. Design of a cross drainage works. (any one)
4. Design of diversion weirs and their components.
5. Design of Energy dissipaters. (any one type)

C. Visit to **Major Dams and Canal Structures/Systems** and submission of Working Principle and Technical Specifications.

D. Out of 10 assignments any one should be verified with programming Language.

CED 423 - LAB 3: Elective II: Prestressed Concrete

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work

1. The term work shall consist of minimum six assignments based on the content of the syllabus. At least one assignment shall be given on each unit.
2. A site visit shall be planned to any of the ongoing site in the area or manufacturing unit of PSC components.
3. The assessment of the term work shall be based on continuous assessment of the student throughout the semester.

CED 423 - LAB 3: Elective II: Plumbing Engineering

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work

Each student will be required to submit assignments on each of the topics mentioned in the syllabus. The assessment of term work shall be done on following criteria.

1. Continuous assessment on each unit.
2. Oral examination conducted internally on the syllabus and the term work mentioned above.

CED 423 - LAB 3: Elective II: Ground Water Engineering

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work

1. Exercise on Ground water quality parameters, pollution sources and remedial measures.
2. Exercise on bore well drilling method (working, sketch, Parts, Drilling, stages, precautions, flow measurements and billing)
3. Exercise on pumps, capacity, selections cost analysis, installation and maintenance.
4. Exercise on ground water pollution control norms, pollutions boards and legislations.
5. Exercise as a case study on water shed management scheme.
6. Design exercise of bore well.

The assessment of the term work will be based on continuous assessment of the student throughout the semester

CED423: Lab- 4: Structural Design and Drawing- II

Teaching Schemes **Examination Scheme**

Laboratory: 04 Hrs / Week **Term Work: 50 Marks**

Oral: 50 Marks

Term Work:

Design of any one of the Structures mentioned below by LSM. Design program of various elements shall also be done in the excel sheet. Scheduling of structural elements *e.g.* Slabs, beams, columns and footings shall be done manually. Drawing and of the structural elements shall be submitted on at least two full imperial size sheets.

Prepare program on excel sheet.

Types of building: (Any One)

1. Residential Building (G+2)
2. Multi-storied Public Building

Contents of sheets:

1. Centre line plan of column showing orientation of Column
2. Schedule of Column.
3. Layout of plinth beam, floor beam and slab along with the schedule of each component.

Structural note:

1. Layout of footing along with its scheduling.
2. Stair case sectional details.
3. Sunk slab sectional details.
4. Details of Column reduction if any.
5. Cantilever Beam / Chajja detailed section.

References:

1. G+3 illustrated R.C.C. By Shah and Karwe 8th / 9th Edition.
2. Reinforced Concrete Design by N .Krishna Raju.
3. Limit state design of reinforced concrete by B. C. Punmia
4. Limit State Design of Reinforced Concrete By Varghese P C
5. Limit State Theory & Design of Reinforced Concrete (I.S. 456 - 2000) by Jai Tarang
6. Reinforced Concrete: Limit State Design 7th Edition By A K Jain
7. Reinforced Concrete: Handbook for Building Design (Limit State and Working Stress Methods of Design) By Krishnamurthy
8. IS–456 (2000), IS–875 Part-I, II, III, IV, V, SP–16, SP–32

Practical examination

The practical examination shall consist of viva–voce based on the exercises conducted as apart of term work submitted by the candidate. The assessment will be based on the performance of the candidate.

CED424: Lab-5: Seminar

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 50 Marks**

The student individually shall study some special topic beyond the scope of syllabus under the subjects of Civil Engineering branch from current literature, (not more than last 5 years) by referring the current technical journal or reference books, under the guidance of a teacher.

The student shall prepare his/her report together with design computation, sketches, drawings etc. If any, and deliver a talk on the topic for other students of his/her call in the presence of his guide and internal examiner. The student is permitted to use audio visual aids or any other such teaching aids.

Term work and term Work Examination:-

The report, written in technical reporting manner and presentation of the talk on the subject and will be treated as term work under this subject and will be assessed by two internal examiners appointed by the principal of the institution: one of whom will be his guide and the other internal teacher of the concerned branch.

CHAPTER 1 Introduction:

This consists of introduction of the subject, area etc. –problem statement and description, need, objectives; it's relevance to the field-shortcomings-scope of the seminar-outline of the seminar.

CHAPTER 2 Literature Review:

It shall include theoretical support, details regarding work done by various persons, methods established, any new approach. It should preferably highlight the development in the field of research chronologically as reflected from books, journals.

CHAPTER 3 Methodology:

CHAPTER 4 Conclusions

CHAPTER 5 References (Maximum 50)

Printed 2 sided on white paper having 80GSM.

Format Std (refer Dr. BAMU Ph.D. Style Manual on official website).

CED425: Lab-6: Project-I

Teaching Schemes **Examination Scheme**
Laboratory: 02 Hrs / Week **Term Work: 25 Marks**

Term work:

It consists of a preliminary report related to the project work to be completed under project-II. The students are required to submit the outline of project along with review of literature and relevant data, while selecting the topic the emphasis should be given to field application and trends in the construction industry. The group of 2 to 5 students will work on one topic. The same group will continue the project work on the same topic of Project-I in Second term of Project-II. Students shall complete work of collection of data,

1. Authentication of topic.
2. Authentication of experimental work of project to be done in Project II shall be completed.
3. Manually analysis and completion of design to be compared in the IInd Semester.
4. Inter Disciplinary projects shall be appreciated.

The extract or copies of the literature, wherever available, may enclose in the report.

The term work will be assessed by two internal examiners appointed by the Principal at the presentation talk on the preliminary report.

The term work assessment is based on the following: Continuous assessment, Report submitted and Presentation Talk.

SEMESTER II

CED 451: Structural Mechanics

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

Section A

Unit I **(06 Hrs)**

Theory of elasticity, strain displacement relation, strain compatibility equations, stress equilibrium equations under static and dynamic conditions. Hooke's law, plane strain and plane stress conditions and their stress compatibility equations, Principal planes and principal stress in 3-D elasticity.

Unit II **(08 Hrs)**

Laterally loaded plates with small deflection theory, governing differential Equation according to Kirchhoff's thin plate theory, Cylindrical bending of thin rectangular plates. Navier's solution of rectangular plate subjected to single sinusoidal load and UDL.

Unit III **(06 Hrs)**

Introduction to Flexibility matrix method, flexibility coefficient, application to continuous beam and single bay single storey portal frames.

Section B

Unit IV **(06 Hrs)**

Stiffness Matrix method: stiffness coefficient, application to continuous beam and single bay single storey portal frames.

Unit V **(08 Hrs)**

Finite Element Method: Stepwise Procedure, Applications of FEA in Civil Engineering, Different Approaches used in FEM, Shape functions for 1-D and 2-D Elements, Analysis of Springs in series and parallel, Analysis of Truss, Beams and Frames (maximum three unknowns) using FEA.

Unit VI **(06 Hrs)**

Membrane theory of thin cylindrical shells, spherical and conical shells.

References:

1. Theory of Elasticity: Timoshenko and J N Goodier
2. Theory of Elasticity: Dr. Sadhu Singh
3. Theory of Plates and Shells: Timoshenko S P and Krieger S W
4. Design and Construction of Concrete Shell Roofs: G S Ramaswamy

5. Analysis of Framed Structures: J M Gere and W. Weaver Jr.
6. Structural Analysis: G. S. Pandit and S. P. Gupta
7. Advanced Theory of Structures: N. C. Sinha and P. K. Gayen
8. Theory of Structures-II: H M Somayya
9. Finite Element Method, Desai, Eldho and Shah

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED452: Construction Management

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION A

Unit I **(05 Hrs)**

Introduction:-Construction Management , project goals, project manager's job, responsibilities and rights, total quality management,

Construction Management Phases: - Project identification, project preparation, project appraisal, project approval, project planning, project initiation, project implementation, project monitoring and control, project evaluation.

Unit II **(05 Hrs)**

Construction Equipment:- Types of construction equipment (hydraulic excavator, power shovel, dragline, clamshell, backhoe, concreting, tunnel boring machine),criteria for selection of construction equipment on different sites.

Construction Project Planning &Scheduling: -Work break down structure(W.B.S.), Organizational Breakdown Structure(O.B.S) ,concept of management information system, bar chart its merits & demerits, milestone chart its merits & demerits.

Unit III **(10 Hrs)**

Construction Project Network Techniques: -Introduction to C.P.M & PERT, network presentation, time estimates, Cost Optimization, resources scheduling, updating.

SECTION- B

Unit IV **(07 Hrs)**

Construction Project Finance:- Phases of capital budgeting, fixed capital, working capital, concept of cost of project, concept of means of finance, investment criteria & methods, numerical on net present value, benefit cost ratio, internal rate of return.

Unit V **(07 Hrs)**

Construction Project Safety & Human Resources:- Safety in construction projects, types of tools used for safety, importance of human resources in construction organization, job evaluation & its methods, motivation, wage structure.

Organizational communication: - Types of organizational Communication (internal and external; oral, written and electronic; upward, downward and horizontal; grapevine), effective

organizational communication, barriers and remedial measures of effective communication, (Red colour topic should be eliminated)

Safety in construction operations, Disaster Management, types: Natural Disasters & Manmade disasters, legal aspects, rescue operations. Casualty management, risk management.

Unit VI **(06 Hrs)**

Material Management: - Importance in construction projects, ABC Analysis, Inventory Management, Economic Order Quantity (E.O.Q.), numerical on E.O.Q.

Application of MS Project and Primavera in Construction Management

Recommended Books

1. Construction Project Management Planning, Scheduling and Controlling: K. K.Chitkara; Tata McGraw – Hill Education
2. Construction Planning and Management: U. K. Shrivastava; GalgotiaPublications
3. Project planning and control with PERT and CPM: Dr. B. C. Punmia &K. K. Khandelwal; Laxmi Publications.
4. Construction Project Management: Kumar Neeraj Jha; Pearson Education
5. Fundamentals of Construction Planning & Management: M. R. Sharma S.K. Kataria&Sons
6. Construction Planning, Equipment and Methods: Clifford J. Schexnayder, Robert Peurifoy,AviadShapira; Tata McGraw – Hill Education
7. Fundamentals of PERT/CPM & Project Management: S.K. Bhattcharjee; KhannaPublishers
8. Safety Management: S.K. Bhattcharjee; KhannaPublishers
9. Modern Construction Management: Frank Harris, Ronald McCaffer, Francis Edum-Fotwe;WILEY
10. Construction Engineering and Management: S.Seetharaman; Umesh Publications
11. Industrial Engineering& Management O.P.Khanna; Dhanpat RaiPublications
12. Industrial Engineering & Management Dr. B Kumar; KhannaPublishers
13. Construction Engineering & Management (of Projects) S C Sharma; KhannaPublishers

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 453: Transportation Engineering

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION-A

UNIT I **(8 Hrs)**

Railway Planning: Significance of Road, Rail, Air and Water transports – Coordination of all modes to achieve sustainability – Elements of permanent way – Rails, Sleepers, Ballast, rail fixtures and fastenings, – Track Stress, coning of wheels, creep in rails, defects in rails – Route alignment surveys, conventional and modern methods- – Soil suitability analysis – Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and Crossings.

UNIT II **(8 Hrs)**

Railway Construction and Maintenance: Earthwork – Stabilization of track on poor soil, Calculation of Materials required for track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance – Railway stations and yards and passenger amenities- Urban rail – Infrastructure for Metro, Mono and underground railways.

UNIT III **(4 Hrs)**

Harbour and Tunnel Engineering: Definition of Basic Terms: Planning and Design of Harbours: Requirements, Classification, Location.

SECTION-B

UNIT IV **(4 Hrs)**

Harbour and Tunnel Engineering: Design Principles – Harbour Layout and Terminal Facilities, Coastal Structures, Inland Water Transport – Wave action on Coastal Structures and Coastal Protection Works.

Tunneling: Introduction, size and shape of the tunnel, tunneling methods in soils, tunnel lining, tunnel drainage and ventilation.

UNIT V **(8 Hrs)**

Airport Planning: Air transport characteristics, airport classification, air port planning: objectives, components, layout characteristics, socio-economic characteristics of the catchment area, criteria for airport site selection and ICAO stipulations, typical airport layouts, Parking and circulation area

UNIT VI **(8 Hrs)**

Airport Design: Runway Design: Orientation, Wind Rose Diagram, Runway length, Problems on basic and Actual Length, Geometric design of runways, Configuration and Pavement Design Principles, Elements of Taxiway Design, Airport Zones, Passenger Facilities and Services, Runway and Taxiway Markings and lighting.

TEXTBOOKS:

1. Saxena Subhash C and Satyapal Arora, "A Course in Railway Engineering", Dhanpat Rai and Sons, Delhi, 2003
2. Satish Chandra and Agarwal M.M, "Railway Engineering", 2nd Edition, Oxford University Press, New Delhi, 2013.
3. Khanna S K, Arora M G and Jain S S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
4. Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai and Sons, New Delhi, 2013

REFERENCES:

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.
4. Oza.H.P. and Oza.G.H., "A course in Docks & Harbour Engineering". Charotar Publishing Co., 2013
5. Mundrey J.S. "A course in Railway Track Engineering". Tata McGraw Hill, 2007.
6. Srinivasan R. Harbour, "Dock and Tunnel Engineering", 26th Edition 2013

E - RESOURCES

1) www.nptel.iitm.ac.in/courses/iitkanpur

2) www.cdeep.iitb.ac.in/nptel

CED 491: Elective – III: Advanced Structures

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION-A

Unit I: Design of Raft foundation **(6 Hrs)**

Unit II: Pile foundation, group piles, pile cap design. **(5 Hrs)**

Unit III: **(9 Hrs)**

Beams curved in plan - Analysis of simply supported semi circular rectangular beam subjected to udl, cantilever quarter circle beam, Analysis and design of Continuous circular beam.

SECTION –B

Unit IV: Introduction to Deck slab and bridge girder. **(6 Hrs)**

Unit V: **(8 Hrs)**

Folded Plates - Analysis and design Procedure, Transmission Towers - Introduction and load calculation

Unit VI: Design and detailing of Deep Beams as per IS 456:2000 **(6 Hrs)**

Recommended Books

1) Reinforced Concrete – Sinha and Roy
2) Design of RCC shells – G. S. Ramaswamy
3) Theory & design of concrete shells – B.K.Chatterjee
4) RCC design – B.C.PunmiaandA.K.Jain
5) Advanced structures – Krishna and Raju
6) Design of Reinforced concrete Structures – Krishna and Raju
7) Concrete structures – Vazirani and Ratwani
8) Advance R.C.C. Design – S.S. Bhavikatti

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 492: Elective – II: Pavement Design

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION-A

Unit I: Basic Design Parameters (MECHANISTIC and Modified AASHTO) (5 Hrs)

Development of Design Procedures General, Design Period, Structural Design Traffic, Mixed-Traffic Axle, Heavily Loaded Vehicles and High Volume Loadings, Truck Routes, Roadbed Soils, Structural Design, Limitations and Requirements, General Adherence to Specifications, Structural Design Traffic, Terminal Service Level.

Unit II: Structural Design of Flexible Pavements (10 Hrs)

Mechanistic, Limitations, Minimum Material Quality, Asphalt Binder Selection, Application of Design Method, Design Period Equivalency Factors, Traffic Factor, Improved Subgrade Thickness Design Process for Full-Depth HMA, Use of Limiting Strain Criterion Design Cross-Section, Designating Structural Design Information on Plans, Shoulder Type/Design, Design Example, Typical Sections

Modified AASHTO

Application of Design Method, Design Period, Equivalency Factors, Traffic Factors Structural Number, Structural Number Equation, Trial Designs, Minimum Thickness and Material Requirements , Surface Friction Aggregate, Designating Structural Design Information on Plans

Unit II: Structural Design of Rigid Pavements (15 Hrs)

Mechanistic, Limitations, Application of Design Method, Edge Support Conditions ,Joint Spacing Limitations, Design Period ,Equivalency Factors, Traffic Factor, Improved sub-grade and subbase Type and Thickness, Designating Structural Information on Plans Thickness Design Procedure Shoulder Type/Design, Design Example, Typical Sections, Joint Placement, Surface Finish.

Modified AASHTO

Application of Design Method, Design Period ,Equivalency Factors, Traffic Factors Pavement Type and Thickness ,Subbase Type and Thickness ,Minimum Structural Design Requirements ,Designating Structural Information on Plans, Joints and Concrete Lug End Anchorages ,Design Example, Typical Sections, Surface Finish.

SECTION –B

Unit IV: Structural Design of Composite Pavement (15 Hrs)

Application of Design Method, Design Period, Equivalency Factors, Traffic Factors Composite Pavement Structural Number, Thickness Design Equations Minimum Design Requirements, Designating Structural Design Information on Plans, Design Example

Unit V: Pavement Selection Analysis (10 Hrs)

Introduction, Selection Basis, Life-Cycle Activities, Cost Analysis, Selection Process

Unit VI: Pavement Design Submittals (05 Hrs)

Submittal Requirement, Submittal Content, Shelf-Life of Approved Pavement Designs

Recommended Books

1. Principles of Pavement Design, 2nd Edition-E. J. Yoder, M. W. Witczak,

2.The Design and Performance of Road Pavements-David Croney, McGraw Hill Professional, 1997 - Technology and Engineering

3. Concrete Pavement Design, Construction, and Performance, Second Edition-Norbert J. Delatte, May 22, 2014 by CRC Press.

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 493: Elective – III: Structural Dynamics and Earthquake Engineering

Teaching Schemes
Theory: 04 Hrs / Week

Examination Scheme
Theory: 80 Marks
Class Test: 20 Marks

SECTION –A

Unit I: Introduction to Earthquakes (05 Hrs)

Causes of earthquakes, Basic terminology, Magnitude, Intensity, Peak ground motion parameters, Elastic rebound theory , earthquake waves and their damage potential, plates tectonic, Past earthquakes and lessons learnt.

Unit II: Introduction to Theory of Vibrations (07 Hrs)

Free, Forced, Damped, Undamped Vibrations for Single Degree of Freedom System and numerical based on it, Strong Motion Vibration Records, Ground Motions-Effect of Ground Conditions.

Unit III: Response Spectrum Theory (08 Hrs)

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

SECTION –B

Unit IV: Earthquake Resistant Design (06 Hrs)

Lateral force analysis of buildings and numerical on it, floor diaphragm action, moment resisting frames, shear walls, Concepts of seismic design, lateral strength, stiffness, ductility, and structural configuration. Design spectrum. Base isolation.

Unit V: Design Codes (09 Hrs)

Provisions of IS: 1893 for buildings, Seismic design of masonry structures-provisions of IS: 4326, Seismic design and detailing of RC buildings- provisions of IS: 13920, Calculation of base shear according to IS Method.

Unit VI: Soil Response to Earthquakes (05 Hrs)

Liquefaction, landslides, seismic slope stability analysis, soil improvement for remediation of seismic hazards.

Recommended Books

1. Structural Dynamics: Mario Paz, CBS Publishers, Delhi.

2. Elementary Earthquake Engineering: Jai Krishna & Chander Shekran, South Asian Publishers, Delhi.

3. Geotechnical Earthquake Engineering: Steven L. Kramer, Low Price Edition, Pearson Education

4. Earthquake Resistant Design of Structures, Pankaj Aggarwal & Manish Srikhande, Prentice Hall of India

5. IS: 1893-2016, *Indian Standard Criteria for Earthquake Resistant Design of Structures*, Part I, General Provisions, BIS, New Delhi

6. IS: 13920:2016, *Indian Standard ductile detailing of reinforced concrete structures subjected to seismic forces - code of practice,* BIS, New Delhi

7. IS: 4326: 2013, *Indian Standard earthquake resistant design and construction of buildings - code of practice,* BIS, New Delhi

Web Materials:

1. http://www.cdeep.iitk.ac.in/nptel

2. http://www.nptel.iitm.ac.in

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 494-Elective – III: Industrial Waste Treatment

Teaching Schemes **Examination Scheme**

Theory: 04 Hrs / Week **Theory: 80 Marks**

Class Test: 20 Marks

SECTION-A

UNIT I **(8 Hrs)**

Stream Pollution: Physical, Chemical and Biological Pollutants: Natural System of stream purification; Streeter and Phelps DO – model; Oxygen sag curve; Whipple Ecological model; Problems on DO – Model. Effects of industrial effluents on sewers and treatment plants

Water pollution Control Acts: Need and Importance; Central and State Pollution Control, Boards, Functions and Responsibilities. Maharashtra Pollution Control Act; ISI effluent standards for disposal of Industrial wastes

UNIT II **(4 Hrs)**

Pre and Primary Treatment: Industrial Waste: Volume reduction & strength reduction of Industrial waste; Bye product recovery; Equalization & Neutralization. Importance; Necessity; Suitability

UNIT III **(8 Hrs)**

Advanced Waste Water Treatment Methods: Chemical Precipitation, Air stripping, Electro dialysis, Ion – Exchange, Reverse Osmosis, Nitrification and Denitrification, Radio Active wastes; Treatment and Disposal methods. Environmental impacts of radioactive wastes

SECTION –B

UNIT IV **(8 Hrs)**

Detailed study of the following Industries W.R.T. manufacturing process:

Characterization of waste: Suitability of treatment unit.

i. Sugar Industry. ii.Paper and pulp Industry. iii.Tannery Industry. iv. Dairy Industry.

v. Pharmaceutical Industry. vi.Cotton Textile Industry. vii.Breweries Industry. viii.Electro Plating Industry. ix. Distillery.

UNIT V **(4 Hrs)**

Design of Biological Treatment unit: Based on Kinetics. i) Activated sludge process.

ii) Oxidation pond iii) High rate Anaerobic filters. iv) Up flow Anaerobic sludge blankets reactors.

UNIT VI **(8 Hrs)**

Operation & Maintenance Problems

Common Effluent Treatment Plants (CETPs): Location, Need, Design, Operation & Maintenance Problems and Economical aspects.

EIA: Introduction to EIA, Importance; utility of EIA, Scope of EIA, EIS; Zoning of Industries; Economics of ECO – Development. Environmental inventory, Environmental Audit. Energy audit of Industries

Recommended Books

1. Industrial waste treatment and practice – N.L. Nemarov.
2. Industrial treatment processes and control – Eckenfieldor.
3. Wastewater engineering: treatment, disposal, and Reuse: Metcalf, L.,Eddy,
4. Environmental Engineering: Peavy, Rowe- McGraw Hill, Inc. New Delhi
5. Waste water Engineering – M.N. Rao and A.K. Dutta.
6. Pollution Control in Process Industries-S.P.Mahajan,Tata McGraw Hill Publication.
7. Water and Wastewater Technology: Mark J Hammer, Mark J Hammer Jr., PHI Pvt. Ltd.
8. Manual of Industrial waste Treatment – NEERI, Nagpur.

Suggested Readings

1. Sewage Disposal and Air Pollution Engineering: S.K.Garg, Khanna Publications
2. Waste Water Engineering: B.C.Punmia and Jain – Arihant Publications.
3. Water Supply and Sanitary Engineering: G.S.Birdie and J.S.Birdie, Dhanpat Rai and Sons
4. Environmental Engineering: Davis – Mc Graw Hill Publications

E - Resources:

1) http://nptel.iitm.ac.in/courses-contents/IIT Kanpur and IIT Madras.

2) http://cpcb.nic .in

3) http://moef.nic .in

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6). Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Three questions from each section are asked to solve.

CED 495 - Elective – III: Surface and Ground Water Hydrology

Teaching Schemes **Examination Scheme**

Theory: 04 Hrs / Week **Theory: 80 Marks**

Class Test: 20 Marks

UNIT-I: Components of Hydrologic Cycle & Fundamental Concepts:

Hydrologic Cycle, Precipitation, Rain Gauge Net Work, Thesen Polygon and Checks of Rainfall Data, Double Mass Curve, Evaporation, Transpiration, Methods of Estimation of Evapotranspiration.

Groundwater Origin, Types, Importance, Occurrence, Reservoirs and Movement Renewable and non- renewable, groundwater resources. Types of Aquifers, Vertical Distribution of Soil Water below the Ground, Porosity, Permeability, Specific Yield, Hydraulic Conductivity and Storage Coefficient, their Practical Significance, Darcy are Law and its Validity, Ground Water Flow Contours and their Applications.

UNIT-II: Deccan Trap and Occurrence of Groundwater:

Origin of deccan traps, Basalts and its types, types of basaltic flows, Geohydrological characters of basaltic flows, intrusion in deccan traps, their types, effects of intrusion in occurrence of groundwater, weathering of basaltic flows and its effects of groundwater potential, effect of geomorphology on occurrence of groundwater in deccan basaltic area, spring and artesian condition in deccan basaltic flows.

UNIT-III: Ground Water Hydraulics:

Derivation of Basic Differential Equation and its Solutions, Steady and Unsteady Radial Flow of Ground Water towards a Well in Confined and Unconfined Aquifers, Analysis of Pumping Test Data, Theis type Curve Method, Open Well Hydraulics, and Recuperation Test. Geohydrology of igneous sedimentary and metamorphic rocks. Preparation of litholog in horizontal flows, Drainage & its types

UNIT-IV: Groundwater Exploration:

Electrical Methods, Expression for Apparent Resistivity in Four Electrode Arrangements viz. – Werner, Schlumberger Arrays, Field Surveys, Interpretation Techniques in Sounding and Profiling for Ground Water Investigation, Seismic (Refraction Method) –Field Procedure and Interpretation Techniques.

UNIT-V: Artificial Recharge of Water:

Water Balancing of village and watershed level, Perennial Yield, Concept and role of artificial recharge in horizontal flows, study of artificial recharge condition and selection of site for rain water harvesting in Urban and rural areas, Various types of artificial recharge techniques, Conjunctive use of surface and groundwater, groundwater supply of drinking water, irrigation

and industry, reuse and recycle of water, Management of coastal aquifers – Ghyben Herzberg relation, upcoming of Saline Water, Methods of control of salt-water intrusion.

UNIT-VI: Ground Water Pollution and Watershed Management:

Ground Water Quality, Ground Water Pollution, well inventory survey for geohydrological studies, Elements and Source of Pollution, their Effects and Remedial Measures, Principles of Digital Modelling of Aquifers.

Preparation of thematic maps of watershed using remote sensing techniques, Objectives of Planning Watershed Projects by considering Village, Watershed & Aquifer, Guidelines for Project Preparation, Watershed Delineation.

TEXT BOOKS:

1. Hydrogeology by Davis and Dewiest
2. Davies, S.N and De Wiest, R.J.M (1966): - Hydrogeology
3. Freeze, R.A. and Cherry, J.A. (1971): -Groundwater
4. Fetter, C.W. (1990): -Applied Hydrology
5. Raghunath, N.M. (1982): -Groundwater
6. Karanth, K.R. (1987): - Groundwater assessment, Development and Management
7. Alley, W.M. (1983): -Regional groundwater quality
8. Subramaniam, V. (2000):-Water
9. 1.Todd, D.K. (1980): -Groundwater Hydrology
10. Water Resources & Landuse Planning: A system approach by P. Laconte & Y.V

CED 421: Lab-VI: Construction Management

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**
Oral: 25 Marks

Term Work:

The term work shall consist of a record of assignments on the syllabus:

1. Power point presentation on civil Engineering structure by the group of 3-4 students in practical hours. (minimum 15slides)
2. Students should visiting group of 3-4 students and study the nearby site under construction, collect the details of site like estimated project duration ,actual time required for completion of project, Prepare Work breakdown structure, problems faced in controlling stage etc. give power point presentation in practical hours. (minimum 15 slides)
3. Power point presentation on any one construction equipment by individual student in practical hours. (minimum 6slides)
4. Assignment on bar chart and milestone chart for a construction project.
5. Network representation, assigning duration to various activities by considering available resources, computation of duration of project, cost optimization, resources scheduling.
6. Numerical on net present value, benefit cost ratio, internal rate of return.
7. Assignment on EOQ, ABC Analysis.
8. Assignment on Application of MS Project and Primavera in Construction Management.

   Note: Students should submit the power point presentation slides in the form of handouts (3 slides on one page) as assignment.

   SOFTWARE: - MICROSOFT PROJECT MANAGEMENT-2007 OR LATEST VERSION.

Practical examination

The oral/practical examination shall consist of viva-voce based on the assignments given during the course, the record of assignments submitted by the candidate and the syllabus of the subject.

CED 422 (A): Lab-VII: Elective – III: Advanced Structures

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work: Term work shall consist of record of set of six exercises and minimum two drawings on the syllabus. Term Work Examination: The assessment of the term work shall be done on the Continuous assessment.

CED 422 (B): Lab-VII: Elective – III: Pavement Design

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work: Term work shall consist of record of set of six exercises and minimum two drawings on the syllabus. Term Work Examination: The assessment of the term work shall be done on the Continuous assessment.

CED 422 (C) Lab VII: Elective – III: Structural Dynamics and Earthquake Engineering

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**

Each student will be required to submit assignments (minimum three questions) on each unit mentioned in the syllabus. The assessment of term work shall be done on the basis of the following:

1. Continuous Assessment
2. Oral examination conducted internally on the syllabus and the term work mentioned above

CED 422 (D): Lab-VII: Elective – III: Advanced Structures

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work: Term work shall consist of record of set of six exercises and minimum two drawings on the syllabus. Term Work Examination: The assessment of the term work shall be done on the Continuous assessment.

CED 422 (E): Lab-VII: Elective – III: Surface and Ground Water Hydrology

Teaching Schemes **Examination Scheme**
Theory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work: Term work shall consist of record of set of six exercises and minimum two drawings on the syllabus. Term Work Examination: The assessment of the term work shall be done on the Continuous assessment.

CED 422 (E): Lab-VIII: Environment Impact Assessment

Teaching Schemes **Examination Scheme**

Theory: 02 Hrs / Week **Term Work: 25 Marks**

Term Work: Term work shall consist of record of set of six exercises on the syllabus as below. Term Work Examination and the assessment of the term work shall be done on the Continuous assessment.

1. Introduction to EIA
2. Policies, rules and regulations
3. EIA Procedure
4. EIA Parameters
5. Environmental management plan for different development projects
6. Case studies

Project-II

Teaching Schemes **Examination Scheme**
Theory: 06 Hrs / Week **Term Work: 100 Marks**
Oral: 100 Marks

This is an extension of the work already done by the student in first term in Project-I. The student shall complete the work of analysis of the collected data if any, design and drawing. Proceed further of the work done in Project-I.

Students shall submit a report of the work carried out in respect of the project assigned including analysis designs and drawings.

Basic outlines of Project: Format Std (refer Dr. BAMU Ph.D. Style Manual on official website).

Broad outlines

Cover page in the specified format

Certificate in the specified format Contents

List of Symbols, List of Abbreviations (if any)

List of Tables, List of Figures

Abstract/ExecutiveSummary

Chapters as follows:

1. Introduction: Introduction, Necessity/Objective, Aim and Scope, Organization etc.
2. Literature Survey/Overview
3. System Development/Observations
4. Performance Analysis/Analysis
5. Conclusion: Conclusion and Scope for future work etc.
6. References Annexure Acknowledgements

(Title of Chapter 2 to 4 can be changed according to the topic if required)

Practical Examination:

The examinations will be conducted by a panel of Guide and External Examiner. It consists of Presentation Talk/Oral/Demonstration etc.