

**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**Structure of BE (Civil) [ w.e.f. 2014-2015]**  
**Semester-I**

Subject Code	Subject	Contact hrs/Week			Examination				
		Th.	Pr.	Total	Th.	CT	TW	Pr. / Oral	Total
CED401	Environmental Engineering - II	4	-	4	80	20	-	-	100
CED402	Water Resources Engineering - II	4	-	4	80	20	-	-	100
CED403	Design of Structures - III	4	-	4	80	20	-	-	100
CED404	Foundation Engineering	4	-	4	80	20	-	-	100
CED441 TO CED446	Elective - I	4	-	4	80	20	-	-	100
CED421	Lab I: Environmental Engineering - II	-	2	2	-	-	25	25	50
CED422	Lab II: Water Resources Engineering - II	-	2	2	-	-	25	25	50
CED423	Lab III: Elective-I	-	2	2	-	-	25	-	25
CED424	Lab IV: Structural Design and Drawing - II	-	4	4	-	-	50	50	100
CED425	Lab V: Project - I	-	2	2	-	-	25	-	25
<b>TOTAL</b>		<b>20</b>	<b>12</b>	<b>32</b>	<b>400</b>	<b>100</b>	<b>150</b>	<b>100</b>	<b>750</b>

**Semester-II**

Subject Code	Subject	Contact Hrs/Week			Examination Scheme				
		Th.	Pr.	Total	Th.	CT	TW	Pr. / Oral	Total
CED451	Structural Mechanics	4	-	4	80	20	-	-	100
CED452	Construction Management	4	-	4	80	20	-	-	100
CED453	Professional Practice	4	-	4	80	20	-	-	100
CED491 TO CED496	Elective - II	4	-	4	80	20	-	-	100
CED471	Lab VI: Construction Management	-	2	2	-	-	25	25	50
CED472	Lab VII: Professional Practice	-	4	4	-	-	50	25	75
CED473	Lab VIII: Elective - II	-	2	2	-	-	25	-	25
CED474	Lab IX: Seminar	-	2	2	-	-	50	-	50
CED475	Lab X: Project - II	-	4	4	-	-	50	100	150
<b>TOTAL</b>		<b>16</b>	<b>14</b>	<b>30</b>	<b>320</b>	<b>80</b>	<b>200</b>	<b>150</b>	<b>750</b>

Abbreviations: Th. = Theory, Pr. = Practical, CT = Class Test, TW = Term Work

## CED401: Environmental Engineering - II

### Teaching Schemes

Theory: 04 Hrs / Week

### Examination Schemes

Theory: 80 Marks;

Class Test: 20 Marks

### SECTION-A

#### Unit- I: Wastewater Collection Systems

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. (4)

#### Unit- II: Characteristics of Waste water

Sampling, Physical, Chemical and Biological characteristics, Microbiology of Sewage, Interpretation of results, Environmental significance of the test results, Effluent standards for disposal of wastewater on land, into Surface water, and for Irrigation. (6)

#### Unit-III: Wastewater Treatment Systems

Unit operations and Unit Processes, Classification of Treatment Systems, Objectives, working principles, Design Criteria and Detail design aspects of Preliminary Treatment and Primary Treatment units. (10)

### SECTION-B

#### Unit-IV: Biological Treatment Systems

a) Purpose of Secondary treatment, Fundamentals of biological treatment systems, Design of Suspended growth biological treatment processes, like ASP, various modified ASPs; Design of Attached growth processes like Trickling Filters, RBCs, Fluidized bed systems .and combined treatment processes; Design of Anaerobic suspended and attached growth biological treatment processes like, Sludge digesters, UASBR. Design of Stabilization ponds, Aerated Lagoons

#### b) Advanced Wastewater Treatment Systems

Purpose of Advanced Wastewater Treatment, Suspended Solids Removal, Nitrogen Removal, Phosphorous removal, Dissolved Solids Removal, Wastewater Reclamation. (10)

#### Unit-V: Financial Considerations

Cost Estimates, Cost Comparisons, Selection of Mechanical Equipments, Optimization of Process Selection, Financing of wastewater systems. Performance Evaluation of Treatment Plants, Energy Conservation. (2)

## **Unit-VI: Solid Waste Management Systems**

The evolution of solid waste management; 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, including biological conversion technologies; closure, restoration and rehabilitation of landfills; and solid waste management and planning issues. (8)

### **Recommended Books**

1. Wastewater engineering: treatment, disposal, and Reuse: Metcalf, L., Eddy, H.P., Tchobanoglous, Georg
2. McGraw-Hill, Inc, New Delhi
3. Environmental Engineering: Peavy, Rowe- McGraw Hill, Inc. New Delhi
4. Water and Wastewater Technology: Mark J Hammer, Mark J Hammer Jr., PHI Pvt. Ltd. New Delhi
5. Water Supply and Sewerage: Terence J McGhee, McGraw-Hill, Inc. New Delhi Integrated solid waste management: engineering principles and management issues: Tchobanoglous, Theisen, H.; Vigil, S.

### **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
5. Solid waste Management: P.Aarne, Vesilind, William, A. Worrell
6. Elements of Environmental Engineering, K.N.Duggal, S. Chand and Co. Ltd.

### **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.

## CED402: Water Resources Engineering - II

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

**Unit-I: Reservoir Planning:** Reservoir types, investigation of site and selection, storage capacity estimation by mass curves, fixing various control levels. Height of dams and economics (4)

#### Unit-II:

- 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. (12)

**Unit-III: Arch and Buttress dams:** Types and suitability, forces acting and design methods of arch dams. Buttress dam and types of buttress dam. (4)

### SECTION-B

#### Unit-IV:

- 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. (8)

**Unit-V: Canal masonry works:** 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. (6)

**Unit-VI: Design weir head works, dam outlets and intakes:** 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. Dam outlets and intakes: Types and construction features, design principles. (6)

### **Recommended Books**

1. Irrigation and Water Power Engg: Dr.B.C.Punmia and Pande, B.B.Lal
2. Hydrology and Water Resources Engineering: Santoshkumar Garg
3. Design of irrigation structures: S.K.Sharma
4. Water Resources Engineering: Wurbs R.A. and James W.P
5. Irrigation Water Resources and Water Power Engineering: Dr. P.N. Modi
6. Applied Hydrology : Ven Te Chow
7. Open Channel Hydraulics: S. Ranga Raju

### **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.

## CED403: Design of Structures - III

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

**Unit I: Design of combined footings:** Rectangular footing, Trapezoidal footing. (6)

**Unit II: Design of Flat Slab:** Introduction – component of flat slab construction, IS code recommendation, Direct design method and Equivalent frame method (6)

**Unit III: Design of Cantilever and Counterfort retaining wall** (6)

### SECTION-B

#### Unit IV:

a) **Design of Water Tank Resting on Ground,** Elevated circular and rectangular tanks with flat bottom and top Including Staging (I.S. Code Method) (6)

b) Design of under Ground Water Tank (3)

#### Unit V:

**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. (6)

#### Unit VI:

a) **Design of Circular slabs:** Fully restrained, partially restrained and simply supported along edges. (3)

b) **Formwork :** Introduction, loads on formwork, Indian standards on formwork , design of shuttering for Columns, beams and slab floor. (4)

**Reference Books:**

1. Reinforced concrete structures by Dr. B. C. Punmia, Ashok Jain and Arun kumar jain
2. Illustrated reinforced concrete Design by Dr. S. R. Karve and Dr. V. L. Shah
3. Reinforced Concrete Design by Unnikrishnan Pillai, Devdas Menon
4. Prestressed Concrete by N. Krishna Raju
5. Prestressed Concrete by T.Y. Lin.
6. Formwork for Concrete Structures by Kumar Neeraj jha ( Mc Graw Hill Education)
7. Building Construction 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:**

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

## CED404: Foundation Engineering

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

**Unit -I: Site Investigation:** need to investigate, Investigation methodologies- drilling technologies, Pits-trenches and shafts, Geophysical and remote sensing. In-situ and lab testing, sampling techniques, site investigation report writing. (6)

**Unit -II: Analytical techniques:** Failure mechanism in shallow and deep foundation, Terzaghi's theory and generalized bearing capacity equations, 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 by using N-values using qc values , Plate load test, Standard Penetration test ( SPT), Factors affecting bearing capacity, Effect of water table and eccentricity of loading on bearing capacity.

**Settlement analysis:** Causes and control of settlement, stress distribution, Immediate and consolidation settlement, Differential settlement, Numerical (8)

**Unit -III: Shallow foundation:** 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. (6)

### SECTION-B

**Unit -IV: Pile Foundation:** 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. (8)

**Unit -V: Well and Caissons:** 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 soil (B.C.), Foundation problems on B.C. soil, Foundation techniques on B.C. soil, Dewatering of foundation: for tower and tank construction (7)



**Unit -VI: Cofferdams:** 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 (5)

#### **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

#### **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".

#### **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.

## CED441: Elective-I: Prestressed Concrete

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

#### Unit- I

(6)

- a) Prestressed concrete structures, introduction, basic concepts, requirement of various materials and need of high strength concrete, steel for it, systems of prestressing i.e. pre and post tensioning etc., various methods of prestressing (Hoyer's method, Freyssinet method, Magnel Bloten method)
- b) Losses in Prestressing

#### Unit - II

(8)

- a) Analysis of prestressed concrete beams - rectangular, symmetrical and unsymmetrical flanged sections
- b) Concept of cable profiles, kern point, pressure line and thrust line etc.

#### Unit - III

(6)

Design of anchor blocks by Magnel's, Guyon's method and Indian Standard method

### SECTION-B

#### Unit - IV

(10)

- a) Flexural strength of prestressed concrete section, shear strength of prestressed concrete section
- b) Design of prestressed concrete beams

#### Unit - V

(6)

- a) Analysis of composite section
- b) Design of one way and two way slab

#### Unit - VI

(4)

- a) Concept of circular prestressing, design of non-cylindrical pipes
- b) Design of prestressed concrete poles

Note: IS: 1343 is allowed in the theory examination

### **Recommended Books**

- 1) Prestressed concrete by N.Krishna Raju
- 2) Design of prestressed structures by T.Y.Lin
- 3) Prestressed Concrete by S. Ramamrutham
- 4) I.S. 784 for reference for circular prestressing

### **Pattern of Question Paper:**

**The charts for design of anchor blocks shall be made available in the 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.

## CED442: Elective-I: Town Planning

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

#### Unit-I: Meaning and Scope of the Subject

(3)

Ancient art and Science, Conditions in Rural and urban areas, Social Contact, Correct land use and balanced growth of cities, Aims and objectives, principles and necessity of town planning, Fundamental of town and country planning.

#### Unit-II: Evolution of planning concepts

(8)

Evolution from pre-historic days to Renaissance period, Corresponding developments in India, Industrial revolution, problems of urbanisation, influences affecting physical planning-defence feudal middle class, princely influence, planning for production-welfare of industrial workers, cast-status pay based in planning in India, revival of feudal style, need for organic planning .

#### Unit-III: Legal aspect of town and country planning

(9)

First Sanitary and public health act of G.B 1840, Land Acquisition act 1894 town planning and housing act 1909, garden city concept, town planning act 1932, Barlow Scott and Uthwatt Commissions, Dudley report, town and country planning act 1947and1959, distribution of industries act 1945, Bombay T.P act 1915and1954 etc.

Building Byelaws: objects of byelaws, functions of local authority, floor space index, set back, light plane off street parking, fire protection bye laws for residential areas, cinemas, multiplex, town halls, gasoline filling stations etc., Building regulations.

### SECTION-B

#### Unit-IV: Elements of city planning

(6)

Elements of city plan: Distribution of land, aesthetics of town planning-creative, preventive and destructive measures.

Surveys: physical survey, social survey, economic survey, regional, national and civic or socioeconomic survey, methods of data collection and preparation of maps, drawings and reports. Zoning: Classification and Zoning powers.

**Unit-V: Components of development**

(7)

Communication and traffic control, roads- function, Classification, roads and road systems.

Traffic management: traffic surveys, traffic congestion, rapid transit, traffic control.

Road junctions: classification, parking facilities, traffic control devices, traffic signs, markings, signals and street lighting. Parks and play grounds: recreational facilities- features and types, parks-open spaces, land scope architecture, Public building and town centres: importance, types and their developments. Industries: classification, selection of sites, planning industrial estate, industrial waste, treatment and disposal of waste, regional cities and corridor communities.

**Unit-VI:**

**(a) Housing**

(4)

Need, layout of residential unit, neighbourhood unit planning, types of layouts, classification of housing, housing problems in India, agencies for housing schemes,

Slums: meaning, causes, effects, precautions to be taken against formation, slum clearance, urban renewal and re-planning of the existing towns, necessity of re-planning, data collection, urban explosion, advantage of urban renewal.

**(b) Miscellaneous topics**

(3)

Master plan, necessity, objects, data, stages of plan, features, and implementation.

Village planning: necessity, social grouping, principal of village planning, preparation and execution of plan, rural housing problems in India. Concept of Smart City and its Planning

**Recommended Books**

- |  |                     |
|--|---------------------|
| 1) Town and country planning and housing | -Modak and Ambdekar |
| 2) Town and country planning             | - N.K. Gandhi       |
| 3) Fundamentals of Town planning         | -G.K. Hiraskar      |
| 4) Town planning                         | - Rangwala          |

**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.

## **CED443: Elective-I: Computer Applications in Civil Engineering**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

### **SECTION-A**

**Unit I:** Finite Difference Method (Introduction, Development of Finite Difference Equations and Operators, Applications of Finite Difference Method in the analysis of columns, beams, plates, for static flexure and buckling) (8)

**Unit II:** Finite Element Method (Introduction, Stepwise Procedure, Different Approaches used in FEM, Shape functions for 1-D and 2-D Elements) (6)

**Unit III:** Finite Element Method (Analysis of Pin Jointed Frames, Beams, Rigid Jointed Frames, Plane Stress and Plane Strain Problems using FEM) (6)

### **SECTION-B**

**Unit IV:** Introduction to SCILAB, Analysis of Beams, Plates and Columns using Finite Difference Method and SCILAB. Analysis of Pin Jointed Frames, Beams, Rigid Jointed Frames using FEM and SCILAB. (8)

**Unit V:** Introduction to structural dynamics, SDOF systems, Damped and Un-damped systems, Equations of Motion for Free and Forced Vibrations for SDOF system, Earthquake Response of Linear Systems, Numerical on SDOF systems. (6)

**Unit VI:** Dynamic analysis of SDOF and MDOF systems using SCILAB. (6)

## **Recommended Books**

1. "Rudiments of Finite Element Method", Manicka Selvam.
2. "Finite Element Method", Desai, Eldho T I and Shah
3. "Dynamics of Structures" A. K. Chopra.

### **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.

## CED444: Elective-I: Plumbing Engineering

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

#### Unit I: Introduction to codes and standards

Approvals, AHJ(Authority Having Jurisdiction) , alternative materials, minimum standards, sewers required, industrial wastes, workmanship, prohibited fittings and practices, water conservation, protection of pipes and structures, waterproofing, rat proofing, hangers and supports, trenching, types of joints.

#### Architectural and Structural Coordination

Local municipal laws relating to plumbing and basic information on fire static water requirements. Spaces required for various sanitary facilities, plumbing shafts, water tanks and pump rooms, centralized hot water systems, coordination with the architects. Structural parameters such as sunken toilets, location of columns and beams, post-tension slabs, importance of ledge walls. (05)

#### Unit II: Plumbing Fixtures and Fixture Fittings

Definitions of Plumbing Terminologies. Plumbing fixtures, water conserving fixtures, water closets, bidets, urinals, flushing devices, lavatories, bath/shower, kitchen sinks, water coolers, drinking fountain, clothes washer, mop sink, overflows, strainers, prohibited fixtures, installation standards, strainers, floor drains, floor slopes, location of valves, hot water temperature, and table of minimum plumbing facilities. (07)

#### Unit III: Traps and Interceptors

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

#### Indirect Waste

Air-gap, food establishments, sink traps, dish washers, drinking fountains, waste receptors, sterile equipment, appliances, condensers, chemical wastes, 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. (08)

## SECTION-B

### **Unit IV: 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, sizing of horizontal and vertical pipes.

### **Storm Drainage**

Storm drain required, prohibited connections, subsoil drains, sub-drains, gutters/channels/scuppers, window areaway drains, roof drains, strainers, leaders, conductors and connections, symphonic drains, underground drains, materials, traps required, prohibited installations, testing. Introduction to sizing of channels, rainwater down takes, underground drains. Introduction to rain water harvesting. (07)

### **Unit V: Water Supply in High Rise Buildings**

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, disinfection, protection of underground pipes, color codes and arrow marking. Introduce WSFU, sizing calculations.

### **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, introduction to other methods of hot water generation. (07)

### **Unit VI: Building Sewers**

Drainage fixture unit, change in direction of flow, Hydraulic jump, Sudsing stack, Cleanouts, Pipe grading, Pipes and fitting suitable for building sewers, RCC, PVC, Nu-Drain, Stoneware etc, Sizing, Testing, Types of traps, gully chambers and manholes, materials, venting. Sumps, Pumps, Sewage disposal and Septic tanks.

## **Plumbing in High rise Buildings**

Defination of high rise, Multiple storage tanks, Plumbing shafts, Break pressure tank, water supply, Hydro-pneumatic system, Pressure Reducing valves, Building drainage system, Rainwater system, Sizing, Testing, Case study. Introduction to centralized hot water supply, System types, Principle of design, Pressure conditions, Insulation, Return Circulation, Sizing, Testing. (06)

### **Recommended Books**

1. Uniform Plumbing Code- India (UPC-I), 2008
2. □ Illustrated Training Manual (ITM), 2008.

### **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.

## **CED445: Elective-I: GROUND WATER ENGINEERING**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

## **SECTION-A**

### **UNIT I : Introduction**

Ground water extent and potential in India ,Ground water exploitation method and investigations , hydrology, water bearing properties of rocks, site selection and pacing of well, infiltration mechanism and curves , water balance budget and 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 : Geological Zones of Saturation**

Aeration zones, soil water belt'saturation zone, Aquifers, Storage coefficient, water Table fluctuation, Springs.

### **Ground Water Flow**

Specific weight, compressibility, head distribution, laminar and turbulent flows, Reynold's number, Darcy's laws and application, 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: Aquifer Properties**

Aquifer tests, Test Measurements, confined aquifers, discharge analysis (Theis 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, specific capacity, Revitalization of well and maintenance.

## **SECTION-B**

### **UNIT-IV: 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: Saline Water Intrusion**

Saline water Intrusion, Salinity influx in estuaries , Zone of diffusion and interface parameters, saline zoetic 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: Pumps and Allied Machinery**

Discharge rates, demands. flow charts, heads and losses, power requirements. pumps, 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.Todal
4. Ground Water and Seepage : M.E.Harr
5. Seepage, Drainage and Flow Nets : H. R. Cedergrén
6. Engineering Fluid Mechanics : C. Jaegar

### **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.

## **CED446: Elective-I: OPEN ELECTIVE**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

## **CED421: Lab-I: Environmental Engineering-II**

### **Teaching Scheme**

Practical: 2 Hrs / week

### **Examination Scheme**

Term Work: 25 Marks

Pr. / Oral: 25 Marks

### **Term Work :**

The term work shall be completed as per the details given in Part-I and Part -II

#### **Part-I**

Characterization of domestic wastewater samples collected from urban area and rural area (minimum 2 samples from each area) as per the details of UNIT II of the syllabus

1. Total solids, Total suspended solids, Total dissolved solids, Total fixed solids and volatile solids
2. Dissolved Oxygen (DO).
2. Biochemical Oxygen Demand (BOD).
3. Chemical Oxygen Demand (COD)
4. Sludge Volume Index (SVI)
6. Determination of phosphates by spectrophotometer
7. Determination of oil and grease

#### **Part-II**

Design of effluent treatment plant; based on characterization of waste water done as per Part-I, with an emphasis to Interpretation of Results. Visit to one of the domestic Effluent Treatment Plant (ETP) and submission of detailed report on the working Principles and Technical Specifications of treatment units of the ETP visited.

### **Practical examination**

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

## **CED422: Lab-II: Water Resources Engineering - II**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

Pr. / Oral: 25 Marks

### **Term work:**

Visit to Major Dam and Canal Systems and submission of Working Principle and Technical Specifications.

Term work shall be based on the syllabus and following assignments (any six, out of which any one should be verified with programming Language)

1. Exercise on flood routing by any one method
2. Multiple step design of high dam
3. Slip circle analysis for upstream/ downstream slope of earthen dam
4. Analytical method of locating pheratic line and trial sketching of flow nets for homogeneous sections.
5. Design of Ogee spillway. Upstream and downstream profile
6. Design of Energy dissipaters with respect to recommendations.(any one type)
7. Design of diversion weirs, components.
8. Designing a canal by silt theories
9. Design of a cross drainage works. (any one)
10. Design of drainage arrangement for an earthen dam. (any one)

### **Practical examination**

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

## **CED423(A): Lab-III: Elective – I: Prestressed Concrete**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

It shall consist of at least six assignments based on each of the unit mentioned in the syllabus.

Visit to any Prestressed Construction site / Plant

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

## **CED423(B): Lab-III: Elective – I: Town Planning**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

- 1) Drawing showing bye-pass road, outer and inner ring roads, road systems, road junctions and street lighting
- 2) Planning of a township with all amenities For 30,000 Population by using AutoCAD

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



## **CED423(C): Lab-III: Elective - I: Computer Applications in Civil Engineering**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **TERM WORK:**

Term work shall consist minimum eight assignments for analysis of structures with methods included in syllabus by manual as well as SCILAB programming.

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

## **CED423 (D): Lab-III: Elective - I: Plumbing Engineering**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

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.

## **CED423(E): Lab-III: Elective - I: GROUND WATER ENGINEERING**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

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. At least ten sketches of basic figures of the course.

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

## **CED423(F): Lab-III: Elective - I: OPEN ELECTIVE**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

## **CED424: Lab-IV: Structural Design and Drawing - II**

### **Teaching Scheme**

Practical: 04 Hrs / Week

### **Examination Scheme**

Term Work: 50 Marks

Pr. / Oral: 50 Marks

### **Term Work:**

Design of any one of the Structures mentioned below and reinforcement detailing of Slabs, beams, columns and footings should be drawn on full size drawing sheet.

1. Residential Building (G +2)
2. Multistoried Public Building

Drawing of the structures shall be submitted on at least two full imperial size sheets.

### **References:**

1. IS - 456 (2000)
2. IS - 875
3. SP - 16
4. SP - 32

### **Practical examination**

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

## CED425: Lab-V: Project - I

### Teaching Scheme

Practical: 02 Hrs / Week

### Examination Scheme

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.

The preliminary report shall consist of minimum 25 pages. 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.

## CED451: Structural Mechanics

### Teaching Schemes

Theory: 04 Hrs / Week

### Examination Schemes

Theory: 80 Marks

Class Test: 20 Marks

### SECTION- A

**Unit I:** 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. (9)

**Unit II:** 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. (6)

**Unit III:** Bending analysis of circular plates: Governing differential equation and general solution. Circular plate subjected to point load and UDL. Plate with a circular hole at the center. (6)

### SECTION- B

**Unit IV:** Membrane theory of thin cylindrical shells, Spherical and conical domes/shells. (6)

**Unit V:** Introduction to Flexibility matrix method, Finite Element Method: Stepwise Procedure, Different Approaches used in FEM, Shape functions for 1-D and 2-D Elements. (7)

**Unit VI:** Stiffness Matrix method: stiffness coefficient, application to continuous beam and single bay single storey portal frames. (6)

### Recommended Books

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. Structural Dynamics: Mario Paz
10. Dynamics of Structures: A K Chopra
11. Finite Element Method: Desai, Edho 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 Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

#### Course Outcomes:

1. Student is prepared to assume an entry level professional constructor's role as a member of a multi-disciplinary team in the construction industry.
2. Student has the fundamental education that will lead to a leadership role in the construction industry.
3. Student possesses the fundamental knowledge and skills needed to manage the principal resources of the construction industry to include human, material, equipment, and financial resources.
4. Student will understand the technology to obtain organize & distribute information.
5. Student will be able to demonstrate responsibility for safety planning & productivity in construction management settings.

#### Unit-I

(05)

**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)

**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)

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

## SECTION- B

### Unit-IV

(07)

**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)

**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,.

### Unit-VI

(06)

**Material Management: -** Importance in construction projects, ABC Analysis, Inventory Management, Economic Order Quantity (E.O.Q.), numericals 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; Galgotia Publications
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, Aviad Shapira; Tata McGraw - Hill Education
7. Fundamentals of PERT/CPM & Project Management: S.K. Bhattcharjee; Khanna Publishers
8. Safety Management: S.K. Bhattcharjee; Khanna Publishers
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 Rai Publications
12. Industrial Engineering & Management Dr. B Kumar; Khanna Publishers
13. Construction Engineering & Management (of Projects) S C Sharma; Khanna Publishers

**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.

## CED453: Professional Practice

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

#### Unit-I

- a) **INTRODUCTION:** Professional practice as career ; modes of measurements of civil engineering works ; Details and formats in English & PWD methods of measurements; Methods of taking - out quantities; Introduction to **IS 1200** (Rev) & details; Units of measurements; Least counts (errors & accuracy margins) Prime cost: Provisional sum ; Provisional quantities. (4)
- b) **APPROXIMATE ESTIMATES:** Meaning; Necessity; General principles; Methods of preparing approximate estimates for buildings, roads, bridges, water supply schemes, drainage schemes, retaining walls etc. (3)

#### Unit -II: DETAILED ESTIMATES

Rules of measurements; Error margins & degrees of accuracy ; Uses of estimates; Essentials of an estimator; Requirements of an estimator, Estimates of building, slab, culverts, septic tank, band -stand , RCC well, steel-truss roof, earthen dam, plumbing works, RCC elements , canals, roads, bridges, earth- works. (7)

#### Unit -III

- a) **SPECIFICATIONS:** Meaning; Uses & objectives; Types; Detailed Specifications; Provisions & classification; Principles of writing specifications, Drafting detailed specifications - samples (Civil Engg. works) (4)
- b) **RATE ANALYSIS:** Purpose; Factors affecting rate analysis; Task work; Schedules of rates; Catalogues; D.S.R.; AISSR; Labour wages; Thumb rules for reinforcement; Traditional ratios of concrete; Volumereduction theories; Leads and lifts; Batching; Rate analysis- samples (Civil Engg. works). (5)

## SECTION-B

### Unit -IV: CONTRACTS

Meaning; objects; Various conditions and categories; Contract documents; Labour laws & patent rights, Agencies involved in construction industry ; Role of engineer in organizations ; Role of architect ; Essentials of valid contracts ; Termination & breach of contracts ; Arbitration ; Damages ,Responsibilities of owner & contractor ; Forms & types of contracts(lump sum ,unit price ,cost plus,piece work,); contract for supply of materials & transport of materials ; Labour contracts ; Negotiated contracts ; demolition contracts. (7)

### Unit -V

- a) **TENDERS:** Meaning; Categories; Tender notice; Notification in press and media; N.B.C.; Corrigendum; Preparation & submission of tenders, Tenders form & information; E.M.D. & S.D. objectives; Revocation of tenders; Unbalanced tenders; Opening of tenders; Scrutiny of tenders; Acceptance of tenders. (A mockup exercise of preparation,submission,opening of tender document is suggested.) (4)
- b) **VALUATION:**Meaning; Purpose; Cost, price and value; Values forms and terms; salvage value,scrap value, book value, market value, prospective value, factors affecting value of property, Property forms; Property holdings; Leases; Depreciation; Methods of cost depreciation; Incomes and outgoings; Sinking fund and parameters; Year`s purchase; Capitalized value; methods of valuation of buildings. (4)

### Unit -VI

- a) **GOVT PROCEDURE FOR WORK EXECUTION:** Work classification; Administrative approval & technical sanction; Bills; Measurement books; N.M.R.; Accounts of works, stores, plants; M.A.S. account; Daily diary; Daily work. (4)
- b) **PROPERTIES & ESTATES:** Meaning; Mortgages; Amortization; Deals of property; Registration; Sale deed; Formation of cooperative housing societies; Building bye-laws and Municipal norms; N.A. concept; Loans; Repayments; E.M.I.; Apartment acts; Mathematics of finance; Banking finance terms; New construction works and documents; Real estates. (4)

### **Recommended Books**

1. Estimation and Costing – S. C.Rangawala
2. Estimation and Costing (Civil Engineering) – B. N. Dutta
3. Civil Engineering Contracts and Estimates – B. S. Patil
4. Estimation, Costing and Valuation – N. Chakraborty.

### **HANDBOOK**

1. Practical Information for quantity surveyors, property valuers, Architects, Engineers & builders: By. P.T. Joglekar, Published by: Pune Vidyarthi Griha Prakashan, Pune.

### **CODES**

1. I.S.1200 (Part 01 to 25): Methods of Measurement of building & Civil Engineering works.
2. D.S.R: District Schedule of Rates.

**e-RESOURCES:** [nptel.iitm.ac.in](http://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.

## **CED491: Elective - II: Advanced Structures**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

### **SECTION-A**

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

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

**Unit III:** 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 (9)

### **SECTION -B**

**Unit IV:** Analysis of Deck slab and bridge girder (6)

**UnitV:** Folded Plates - Analysis and design Procedure, Transmission Towers - Introduction and load calculation (8)

**Unit VI:** Design and detailing of Deep Beams as per IS 456:2000, Comparison with design by British code and American code. (6)

### **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.Punmia and A.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.

## **CED492: Elective - II: Pavement Design**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

### **SECTION-A**

#### **Unit I: Basic Design Parameters (MECHANISTIC and Modified AASHTO)**

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. (5)

#### **Unit II: Structural Design of Rigid Pavements**

Mechanistic,

Limitations, Application of Design Method, Edge Support Conditions ,Joint Spacing Limitations,Design Period ,Equivalency Factors, Traffic Factor, Improved subgrade and subbase Typeand 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. (15)

#### **Unit III: Structural Design of Flexible Pavements**

Mechanistic,,Limitations,Minimum Material Quality, Asphalt Binder Selection, Application of Design Method, Design Period Equivalency Factors, Traffic Factor, Improved SubgradeThickness 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 (10)

### **SECTION -B**

#### **Unit IV: Structural Design of Composite Pavements.**

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 (15)

#### **Unit V: Pavement Selection Analysis**

Introduction, Selection Basis, Life-Cycle Activities , Cost Analysis , Selection Process (10)

#### **Unit VI: Pavement Design Submittals**

Submittal Requirement, Submittal Content, Shelf-Life of Approved Pavement Designs (5)

### **Recommended Books**

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



## CED493: Elective - II: Earthquake Engineering

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### Objectives:

- 1) To develop logical understanding of the subject
- 2) To develop mathematical skill so that students are able to apply mathematical methods & Principal's in solving problems Earthquake Engineering
- 3) To develop basic skills for earthquake resistant designs

### SECTION -A

#### Unit I: Introduction to Earthquakes

(07)

Causes of earthquakes, Basic terminology, Magnitude, Intensity, Peak ground motion parameters, Past earthquakes and lessons learnt.

#### Unit II: Introduction to theory of vibrations

(07)

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

(06)

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

(07)

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

(07)

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

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. IS: 1893-2002, *Indian Standard Criteria for Earthquake Resistant Design of Structures*, Part I, General Provisions, BIS, New Delhi
5. IS: 13920:1993, *Indian Standard ductile detailing of reinforced concrete structures subjected to seismic forces - code of practice*, BIS, New Delhi
6. IS: 4326: 1993, *Indian Standard earthquake resistant design and construction of buildings - code of practice*, BIS, New Delhi
7. Earthquake Resistant Design of Structures, Pankaj Aggarwal & Manish Srikhande, Prentice Hall of India.

### **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.

## CED494: Elective – II: Industrial Waste Treatment

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

### SECTION-A

**Unit-I:** 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.

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:** Industrial Waste: Volume reduction and strength reduction of Industrial waste; Bye product recovery; Equalization and Neutralization. Importance; Necessity; Suitability.

**Unit-III:** 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.

### SECTION -B

**Unit-IV:** 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:** 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:** Advanced waste water treatment systems.

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.

### **Recommended Books**

1. Industrial waste treatment and practice - N.L. Nemerov.
2. Industrial treatment processes and control - Eckenfelder.
3. Waste water treatment; disposal and reuse - Metcalf and Eddy.
4. Environmental Engineering - Peavy , Howard and Technoglous.
5. Waste water Engineering - M.N. Rao and A.K. Dutta.
6. Manual of Industrial waste Treatment - NEERI, Nagpur.

### **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.

## **CED495: Elective – II: GEOGRAPHIC INFORMATION SYSTEMS**

### **Teaching Scheme**

Theory: 04 Hrs / Week

### **Examination Scheme**

Theory: 80 Marks

Class Test: 20 Marks

### **SECTION-A**

#### **Unit I: Geographic Information Systems**

Introduction, GIS definitions and terminology, need of a GIS, Components of GIS, categories, fundamental operations in GIS, theoretical framework of GIS

#### **Unit II: Representing Geography**

Introduction, digital representation, objective of representation, the fundamental problem, discrete objects and continuous fields, raster's and vectors, the paper map, generalization

#### **Unit III: Coordinate systems, datum's and map projections**

Coordinate systems: Cartesian, polar, cylindrical: datum's: different kinds of datum's, global and local datum, datum transformations, map projections: need of projection, types of projections, suitability of a projection for an area, projection transformations.

#### **Unit IV: Data collection and maintaining databases**

Spatial and non-spatial data, primary and secondary geographic data and their captures, obtaining data from external sources, capturing attribute data. Database management systems, concept of SQL, spatial queries, geographic database types and functions. Spatial analysis

#### **Unit V: Cartography and Geovisualization**

Maps and cartography, principles of map design, symbology, scale, Map series, applications of cartography; Geovisualization: uses, users and media, geovisualization and spatial query, geovisualization and transformation, immersive interaction and PPGIS, Consolidation.

#### **Unit VI: GIS Software and applications**

Evolution and architecture of GIS software, software vendors, types of GIS software systems, Water resources applications, land use / land cover, flood and drought impact assessment and monitoring, watershed management, environmental monitoring applications, natural hazard and disaster management, urban planning in natural resources management

## References:

1. Kumar, S., Basics of Remote Sensing and GIS, Laxmi Publications.
2. Longley, P.A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., 2011, Geographic Information Systems and Science, New York, John Wiley & Sons.
3. Demers, M. N., 2009, Fundamentals of Geographical Information Systems, John Wiley and Sons.
4. Bernhardson, T., 1999, Geographic Information Systems: An Introduction, New York: John Wiley & Sons.
5. Bonham-Carter, G.F., 1994, Geographic Information Systems for Geoscientists: Modelling with GIS, New York, Pergamon.
6. Burrough, P.A. and McDonnell, R.A., 1998, Principles of Geographical Information Systems, Oxford University Press
7. Clarke, K.C., 2003, Getting Started with Geographic Information Systems (4th Edition), Prentice Hall
8. Chrisman, N.R., 2002. Exploring Geographic Information Systems, New York: John Wiley & Sons.
9. ESRI, Understanding GIS: The Arc/Info Method
10. Longley, P.A., Goodchild, M.F., Maguire, D., and Rhind, D.W., 1999, Geographical Information Systems, 2 Volume Set., New York: John Wiley & Sons.
11. Maguire, D.J., Goodchild, M.F., and Rhind, D.W., 1991, Geographical Information Systems: Principles and Applications (volume 1 and 2). New York: Longman Scientific & Technical. (Available online at [www.wiley.com/gis](http://www.wiley.com/gis)).
12. Ormsby, T. et al., 2001, Getting to know ArcGIS desktop: basics of ArcView, ArcEditor, and ArcInfo, Redlands, Calif.:ESRI 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.

## CED496: Elective – II: OPEN ELECTIVE

### Teaching Scheme

Theory: 04 Hrs / Week

### Examination Scheme

Theory: 80 Marks

Class Test: 20 Marks

## CED471: Lab-VI: Construction Management

### Teaching Scheme

Practical: 2 Hrs / week

### Examination Scheme

Term Work: 25 Marks

Pr. / 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 15 slides)
2. Students should visit in 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 6 slides)
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.

## **CED472: Lab-VII: Professional Practice**

### **Teaching Scheme**

Practical: 04 Hrs / Week

### **Examination Scheme**

Term Work: 50 Marks

Pr. / Oral: 25 Marks

### **Term Work:**

1. Procedural report for new construction work and documents.
2. Detailed specifications (Six samples)
3. Rate analysis (Ten samples)
4. Detailed estimate : Road work with cross slope/Railway track.
5. Detailed estimate : Steel truss roof.
6. Detailed estimate : G+1 Building manual and using estimating and costing software.
7. Valuation report of residential building.
8. Preparation of draft tender notice & collecting minimum three tender notice of civil engineering works.

### **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.

## **CED473(A): Lab-VIII: Elective - II: Advanced Structures**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

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 following criteria:

- 1) Continuous assessment
- 2) Oral examination conducted internally on the syllabus and term work mentioned.



## **CED473(B): Lab-VIII: Elective - II: Pavement Design**

### **Teaching Scheme**

Practical: 02 Hrs / Week  
Assignments based on

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

Assignments based on

1. Structural design of flexible pavements by mechanistic
2. Structural design of flexible pavements by modified AASHTO
3. Structural design of rigid pavements by mechanistic
4. Structural design of rigid pavements by modified AASHTO
5. Structural design of composite pavements.

The assessment of term work shall be done on the basis of Continuous Assessment

## **CED473(C): Lab-VIII: Elective - II: Earthquake Engineering**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

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

## **CED473(D): Lab-VIII: Elective – II: Industrial Waste Treatment**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

Characterization of waste water of any two industries mentioned in the syllabus, Interpretation of Results; Design of suitable treatment system; based on characterization of waste water. Visit to minimum of three industries, mentioned in the syllabus. Submission of detailed report on manufacturing process; existing treatment facilities.

The assessment of the term work shall be done on the following criteria's.

1. Continuous assessment
2. Performing the experiments in the laboratory.
3. Oral examination conducted internally on the syllabus and term work mentioned.

## **CED473(E): Lab-VIII: Elective – II: GEOGRAPHIC INFORMATION SYSTEMS**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

### **Term Work:**

1. Practices on Open Source Software Quantum GIS or Professional Software ArcGIS
2. Creation of spatial layers
3. Spatial Analysis

The assessment of the term work shall be done on the following criteria's.

1. Continuous assessment
2. Performing the experiments in the laboratory.
3. Oral examination conducted internally on the syllabus and term work mentioned.

## **CED473(F): Lab-VIII: Elective - II: OPEN ELECTIVE**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

Term Work: 25 Marks

## **CED474: Lab-IX: Seminar**

### **Teaching Scheme**

Practical: 02 Hrs / Week

### **Examination Scheme**

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, 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: 1-10 (Pages)**

(This consists of introduction of the subject, area etc.- problem statement and description- need-objectives- its relevance to the field-shortcomings-scope of the seminar- outline of the seminar. )

### **CHAPTER 2 LITERATURE REVIEW: 11-25 (Pages)**

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 Refreneces 1-5 (Pages)**

## CED475: Lab-X: Project - II

### Teaching Scheme

Practical: 04 Hrs / Week

### Examination Scheme

Term Work: 50 Marks

Pr. / 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.

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:

#### *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 / Executive Summary

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