Swami Ramanand Teerth Marathwada University, Nanded
SCHEME AND DETAIL SYLLABUS OF B.E. CIVIL
Teaching and Evaluation Scheme for
Final Year Program in Civil Engineering
Effective from 2017-18

Semester VII

Course Code	Name of Subject	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CE401	Environmental Engineering - II	04		02	03	01	04
CE402	Design of structure-III	04		02	04	02	06
CE403	Water Resources Engineering -II	04		02	03	01	04
CE404	Professional Ethics	04 Audit		02			
CE405	Elective -II	04		02	04	02	06
CE 406	Seminar			02		01	01
CE 407	Field Training			02		01	01
	Total	20		14	14	08	22

Semester VIII

Course Code	Name of Subject	Teaching Scheme			Credit Structure		
		L	T	P	T	P	Total
CE408	Professional Practice	04		02	03	01	04
CE409	Foundation Engineering	04		02	04	01	05
CE410	Project Planning & Management	04		02	03	01	04
CE411	Elective -III	04		02	04	01	05
CE412	Project			04		04	04
	Total	16		12	14	08	22

Elective-II

CE405 a) Structural Dynamics
CE405 b) Advance Steel Structure .
CE405 c) Ground Water Engineering.
CE405 d) Air Pollution and Control
CE405 e) Town and Country Planning.
CE405 f) Construction Management and. Equipments

Elective-III

CE411 a) Seismic design of structures
CE411 b) Hydropower Engineering.
CE411 c) Advanced RCC Structure.
CE411 d) Industrial Waste water Treatment.
CE411 e) Construction Project Economics.
CE411 f) Advance Soil Engineering.

Evaluation Scheme			
Theory Credit Course		Practical	
MSE	ESE	MSE	ESE
20	80	30	70
Minimum for passing in theory and practical 40% each MSE: Mid Semester Exam ESE: End Semester Exam			

Total Credit of BE Civil : 44

BOS Members (Ad Hoc) : Civil Engineering **Dean Engineering**

CE 401 Environmental Engineering –II

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Objectives:

1. To make students understand Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water.
2. To make students understand industrial waste water quantity and quality for achieving better sanitation in society.

Unit I

Introduction: (6 hrs)

Sewage, sewerage, sullage, sewerage systems, sewers- materials and shapes, laying, connecting and testing of sewers**,** sewer design, manholes, street inlets, automatic flushing devices, traps, inspection chambers.

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Unit II (6Hrs)

Quality of waste water:

Physical, chemical and biological aspects. DO, COD, BOD

Sewage treatment: Introduction to sewage treatment, preliminary, primary, secondary and tertiary treatment, process and flow diagram for sewage treatment, theory and design of grit chamber and primary sedimentation tank

Unit III (6Hrs)

Principles of biological treatments, important microorganisms in waste water treatment

Activated sludge process- mechanism, sludge age, sludge volume index, efficiency, aeration, methods of aeration Trickling filter: Biological principle, different T.F media & their characteristics, design of trickling filter single stage & two stage filters, recirculation, ventilation, operational problems,

Unit IV (6Hrs)

Low cost treatment methods: Oxidation pond- Bacteria algae symbiosis, design of oxidation pond, advantages & disadvantages of oxidation ponds.

Aerated lagoons: principle, aeration method, advantages & disadvantages of aerated lagoons, design of aerated lagoon.

Unit V: **(8hrs)**

Septic tank- design, anaerobic digester: Principle of anaerobic digestion, stages of digestion, bio gas production its characteristics & application, factors governing anaerobic digestion,. Dewatering of sludge by gravity thickener, sludge drying bed, decanters. Methods of sludge treatment and disposal, advantages & disadvantages. Up-flow naerobic Sludge Blanket (UASB) reactor– principle, advantages & disadvantages

Unit VI **(4Hrs)**

Sources of waste water generation from manufacturing process, characteristics of effluent, different methods of treatment & disposal of effluent
(Numericals only on sewer design, trickling filter,ASP, oxidation pond, septic tank)

Outcomes of course:

1. Students understood Sewage quantity and quality for better treatment so as to reduce scarcity by recycling waste water
2. Students understood industrial waste water quantity and quality for achieving better sanitation in society.

TEXT BOOKS

1. Water Supply by Garg S.K. Khanna Publishers.

2. Environmental Engineering by Peavey, H.S.Rowe D.R. and Tchobanoglous Mc Graw Hill Book Company.

3. Waste water Engineering, P. N. Modi.

4. Hammer M.J. Water and Waste water Technology, Prentice-Hall of India Private Limited.

5. Water Supply & Sanitary Engineering, G. S. Birdie, Dhanpat Rai & Sons, New Delhi

6. Manual on sewerage and sewage Treatment-Government of India Publication.

CE 401 Environmental Engineering –II
(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term Work
A. Brief report on Sewer materials, choice of materials, testing of sewer pipes, sewer appurtenances **OR** Design of septic tank

B. Experiments
The term work shall consist of a journal giving details of at least 6 out of 8 of the following experiments conducted in Environmental Engineering laboratory.

1. Solids -Total solids, dissolved and suspended solids,
2. Solids-volatile and fixed solids
3. Determination of alkali metals by flame photometer.
4. Dissolved oxygen.
5. Bio-Chemical Oxygen Demand.
6. Chemical Oxygen Demand.
7. Determination of Phosphates by spectrophotometer/calorimeter
8. Determination of Nitrates by spectrophotometer/calorimeter
9. Visit to domestic / Industrial wastewater treatment plant & its detailed reports.

CE 402 Design of Structure – III

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objective:
To get the knowledge of analysis of prestressed concrete members, computation of losses, design of combined footing, flat slab, retaining wall, & water tank.

Unit – I
Introduction to prestressed concrete, basic concepts, comparison between prestrssed concrete & reinforced concrete, Need of high strength concrete and steel, Different methods& systems of prestressing, Stages of loading, Analysis of beams for flexure under working loads for rectangular and flanged sections.

Unit – II
Losses of prestress- Loss due to elastic shortening of concrete, shrinkage of concrete, creep of concrete, friction, anchorage slip and relaxation of stress in steel, computation of losses.

Unit – III
Design of flat slab: - Introduction, components of flat slab construction, IS code recommendations, Design of flat slab using direct design method.

Unit – IV
Design of combine footing: - Rectangular & Trapezoidal footing,
Design of strap footing.

Unit- V
Earth retaining structures: - Introduction, functions and types of retaining walls, Analysis and design of RCC cantilever type retaining wall for various types of backfill conditions.

Unit – VI
Liquid retaining structures: - Introduction, types, functions, codal provisions, methods of analysis & design of circular, square and rectangular water tanks resting on ground.

Course outcome:

On the successful completion of course the students will be able to understand the difference between prestressed construction and RCC construction. Also able to design the flat slab, combined footings, earth retaining structures and liquid retaining structures.

Reference books:

1. "Prestressed concrete" - N. Krishna Raju
2. "Design of prestressed concrete structure" – T.Y. Lin
3. Prestressed concrete design – S. Ramamrutham
4. Design of R.C. Structures – S. Ramamrutham
5. Limit state of design – Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain
6. RCC Designs – Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain
7. Fundamentals of RCC – N.C. Sinha & S.K. Roy
8. Limit state of theory & Design of RCC – Dr S.R. Karve and V.L. Shah
9. Limit state of design – Dr. Ram Chandra

IS 875, 3370, 1343, 456 (2000), SP 34, SP 16.

Design of Structure – III (Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term work

1) Analysis and design of G+2 RCC Structure of residential building of minimum 120 sq.m area. Analyze any one frame manually and other frames by using software like staad pro, Etabs, SAP etc. Use AutoCAD for drawing and detailing of reinforcement.

2) Design any one from the following
   i) Retaining wall
   ii) Rectangular or Trapezoidal combined footing

CE 403 Water Resources Engineering – II

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Objectives:

1. To make Students understand all type of dams and reservoirs.
2. To make Students understand Spillways, Gates & Energy dissipators.
3. To make student understand various canal structures, river training works etc.

UNIT-I:

Planning of reservoirs: Types, investigations, selection of site, fixing various control levels, find capacity of reservoir, reservoir sedimentation, useful life of reservoir. Various factors such as physical, economical, environmental & ecology aspects for planning a water resources project. Collection of data & selection of project plan. (06 Hrs)

UNIT-II

Dams: Types, selection of site and choice of dam

Gravity Dam: Introduction, Forces acting, elementary and practical profile of gravity dam. Modes of failure and stability analysis, principal stress and shear stress acting, limiting height of gravity dam. Joints, keys, water seals and galleries. Grouting, dam instrumentation and dam outlets. Arch dam and Buttress dam:- Introduction, types, forces acting and comparison.

(08 Hrs)

UNIT- III

Embankment dam: Introduction, types, elements of an E.D., basic design considerations and design consideration in seismic zone, piping & its prevention, control of seepage, drainage arrangement in E.D, causes of failure, location of pheratic line, seepage and its estimation, maintenance of E.D., stability of U/S and D/S slopes under various situations, c/s of an E.D. for a particular type of foundation condition and availability of material. Introduction to Rock fill dam. (06 Hrs)

UNIT-IV

Spillway:- Types, Necessity, suitability and components, design of ogee and siphon spillway

Spillway Gates:- Types and suitability

Energy Dissipators:- various methods, JHC & TWC curves & its significance, Indian standard stilling basins & buckets. (08 Hrs)

UNIT-V

Canal Head Works:- Types, purpose & components of diversion head works. Weir and Barrages:- Comparison, type of weir, causes of failure and its remedies Design of Weirs:- By Bligh's and Khosla's theory, limitations of Bligh's theory.

Canals:- Types, canal alignment, cross sections, Balancing depth and economic section. Canal lining – types and its necessity. Design of canals by Kennedy's and Lacey's theory and their merits and demerits. Design of canal in Non – Alluvial soil. (06 Hrs)

UNIT-VI

Canal Structures: Cross drainage works and canal regulatory works-aqueduct, super passage, level crossing, cross and head regulators, their purpose and hydraulic design, canal fall, canal escape and canal outlet and its purposes.

River Training Works: Types and objective. Application of remote sensing in water resources projects. Augmentation and conservation of water resources. (06 Hrs)

Course out come:

1. Students understood all type of dams and reservoirs.
2. Students understood Spillways, Gates & Energy dissipators.
3. students understood various canal structures, river training works etc.

TEXT BOOKS

1. Dr. P.N. Modi:- Irrigation, Water Resources and Water Power Engineering
2. S.K. Garg:- Irrigation and Water Power Engineering.
3. Michael A.M. Irrigation Theory and Practice.

REFERENCE BOOKS

1. Dr. Arora KR :- Irrigation Engineering.
2. Dr. Punmia B.C. :- Irrigation and water Power Engineering.
3. Engineering for dam Vol-1,2 and 3. Justin, Creager and Hinds
4. Design of Small dam:- U.S.B.R., Oxford and IBH publication.
5. Design of Canal:- Circular of government of Maharashtra (8^{th} Feb. 1995)
6. Varshney R.S. Theory of Irrigation Structures Vol-1 & 2
7. K.B. Khushilani :- Irrigation Engineering.
8. GL Asawa:- Irrigation Engineering.

CE 403 Water Resources Engineering – II

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

Term work consists of at least 08 assignments from the following:

1. Find capacity of reservoir by mass curve method.
2. Fix various control levels for an earthen dam.
3. Stability analysis of gravity dam.
4. Theoretical and practical profile of gravity dam
5. Design of Arch dam by Thin cylinder theory
6. Location of phreatic Line, drawing flow net and estimation of seepage, for an earthen dam.
7. Design of ogee spillway by W.E.S method
8. Design and showing energy dissipation arrangements for a spillway.
9. Design of canal by Kennedy's and Lacey's theory
10. Design of C.D. Works
11. Design of weir by Bligh's creep theory
12. Report after visit to a dam/ C.D. Works/canal structures.

CE-404 Professional Ethics

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks MSE: 20 marks	Audit Course

Introduction

Civil Engineering is the oldest engineering profession comprising of a variety of sub disciplines such as structural engineering, geotechnical, water resources, environmental engineering, construction, transportation etc. Undergraduate programmes are designed with different theoretical approaches on the application of basic sciences to solve different societal problems by engineering knowledge. However, there is a need to make the students aware about how the Civil Engineering industry operates and how theories taught in different courses are applied in practice. The students can learn from the experience gained from different workplaces such civil engineering consultancies, contracting companies, construction sites etc. The course aims to provide insight of the different practices followed by the industry such use of different contracts in civil engineering practice, local by-laws, duties and responsibilities of the Engineers, site records and diaries, Health and Safety practices on site, etc.

Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

Course Objectives:

1. To provide basic overview of functioning of different civil engineering related industries / firms.
2. To provide awareness on application of different drawings, contract documents in civil engineering.
3. To provide insight of code of ethics, duties and responsibilities as a Civil Engineer.

Course Contents

1. **Social responsibility to uphold values of the society**
    a. Public Safety
    b. Compliance with social order
    c. Impartiality and fairness
    d. Environmental protection and sustainable development

2. **Responcibility to maintain high standards of professional quality**
    a. Development of Technical and managerial skills
    b. Undertake assignment where professionally competent
    c. Performance Responsibility
    d. Proper verification of documents and production processes

3. **Obligations to maintain high standards of personal behavior in a responsible manner**
    a. Honesty and Integrity in professional dealing
    b. Compensation for services rendered
    c. Professional opinion
    d. Professional relationship with the employer
    e. Information communication with the employer
    f. Mutual obligation and trust
    g. Self Promotion
    h. Employer's Business Secrets
    i. Personal Conflicts

4. Discuss on issues such as sustainability, eco-friendly techniques, use of locally available materials etc. directly related to techno economic development of society.

References:

1. code of ethics for professional engineers, IoE, New Delhi,
2. Ethics Manual, ethics for engineers, ASCE, (https://www.asce.org/pdf/ethics_manual.pdf)
3. National Institute for Engineering Ethics (NIEE)
4. Professional ethics, National Society of Professional Engineers (NSPE).

Professional Ethics

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Guidelines for assessment
Presentation
Visit report
Group discussion

CE 405 a) STUCTURAL DYNAMICS

(ELECTIVE-II)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objectives:

1: Students will explore 'Dynamic Equilibrium'

2: Student will be introduced to Single and Multi Degree of Freedom System for Dynamic System

3: Students will be introduced to Modal Analysis

4: Students will be introduced to earthquake engineering

UNIT-I :

Introduction to structural dynamic, definition of basic problem in dynamics, static V/s dynamic c loads, different types of dynamic loads (6)

UNIT-II :

Single degree freedom system, free vibrations, damped free vibrations, critical damping, and response, dynamic load factor Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral. Response to general dynamic loading, Numerical schemes such as constant, linear acceleration (8)

UNIT-III :

Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of modes, numerical schemes to find mode shapes and frequencies. (6)

UNIT-IV :

Multi degree freedom systems, response to dynamic loading, Formulations of equations of motion, normal coordinates mode superposition method, modal matrix(6)

.

UNIT-V :

Distributed systems, free vibrations of uniform beams, differential equation and Solution, boundary conditions, finite element, Ritz approach, free vibrations of simply supported plate. (Transverse vibrations) (7)

UNIT-VI :

Engineering Seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale, Tsunami. Seismic zoning maps of India and comparison study. (7)

Course Outcomes:

1: Students are now explored to Dynamic Equilibrium

2: Student are now introduced to Single and Multi Degree of Freedom System for Dynamic System

3: Students are now introduced to Modal Analysis

4: Students are now introduced to earthquake engineering

TEXTBOOKS :

1. Dynamics of Structures, R.W. Clough and J. Penzian, 2nd edition, McGraw-Hill Inc, 1993.
2. Introduction to Structural Dynamics, J.M. Biggs ,McGraw-Hill Book Co.1964

REFERENCE BOOKS :

1. Vibration Problems in Engineering, W. Weaver, Jr., S. P. Timoshenko and D. H. Young. Chichester, 5th edition, John Wiley & Sons Limited,1990,
2. Structural Dynamics: Theory and Computation, Mario Paz, 2nd Edition, CBS Publishers, 1987.

CE 405 a) STUCTURAL DYNAMICS

(ELECTIVE-II)

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Minimum four analytical numerical should be done amongst the list given below:

1. Finding out the stiffness of the system in parallel and series
2. Dynamics of single degree of freedom system for free and forced vibration
3. Problems based on Modal Analysis
4. Force Transmissibility
5. Dynamics of a four storied building frame with and without an open ground floor
6. Dynamics f one-span and two-span beams.

A Report based on above shall be submitted by each student.

Practical Examination;

Practical examination shall consist of oral examination based on Report.

CE 405 b) Advance Steel Structures
(Elective-II)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objectives :

1. This course will develop a broader understanding of the behavior of steel structures as systems, in opposition to individual elements only.
2. This course will develop a deeper understanding of structural steelwork design based on limit state principles.
3. After learning, students can design industrial building, multistory buildings, towers, bridges, etc based on limit state concepts based on IS 800:2007

Unit I. Moment Connection **[08 Hours]**

[1] Simple, Semi-rigid and Rigid Connections.
[2] Connection Configurations
[3] Angle Cleat Connections
[4] End-plate Connections
[5] Semi-rigid Connections
[6] Moment-rotation Characteristics

Unit II. Industrial Buildings **[08 Hours]**

[1] Structural Configurations
[2] Functional and Serviceability Requirements
[3] Industrial Floors
[4] Roof Systems
[5] Plastic Analysis and Design of Portal Frames
[6] Crane Gantry Girders
[7] Design for Wind Actions

Unit III. Multi-storied Buildings **[06 Hours]**

[1] Structural Configurations
[2] Steel-Concrete Composite Floor Systems
[3] Loading
[4] Analysis for Gravity Loads
[5] Lateral Load Resisting Systems
[6] Analysis for Lateral Loads
[7] Dual Systems
[8] Advanced Structural Forms

Unit IV. BRIDGES **[06 Hours]**

[1] Classification and Types of bridges
[2] Load and Load Combination for highway Bridges
[3] Load and Load Combination for Railway Bridges
[4] Wind and Earthquake Effects
[5] Design of a Typical Truss Bridge
[6] Bearings and Supporting Elements

Unit V. TANKS **[06 Hours]**

[1] Introduction- Types of Tanks
[2] Load and Load Combination
[3] Design Aspects of Cylindrical Tanks
[4] Design Aspects of Rectangular Tanks
[5] Wind and Earthquake effects
[6] Staging Design

Unit VI. TOWERS **[06 Hours]**

[1] Classification of Types of Towers
[2] Loads and Load Combinations
[3] Wind Effects on Towers
[4] Methods of Analysis
[5] Design Approaches
[6] Economy and Optimisation

Learning Outcome :

At the end of the course, students will be able to apply the recommendations in IS800:2007 to design steel structures economically and safely. They will be able to design moment connections, portal frames and multi-Storey rigid frames, Bridges, Water Tank and tower. They will be able to do both elastic and plastic design of steel structures.

References:

1. IS 800-2007 General Construction in steel-code of practice
2. N. Subramaniam, “Design of Steel Structures”, Oxford University press
3. Nethercot, D.A. and Gardner L, “Limit States Design of Structural Steelwork", 4th edition, E&FN Spon, London and New York, 2001.
4. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., “Design of Steel Structures”, 3rd edition, McGraw-Hill Publications, 1992
5. Duggal, Design of Steel Structures, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.

CE 405 b) Advance Steel Structures
(Elective-II)
(LABORATORY)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Objective

1. The students can design industrial structures and its various components.
2. The students can design the steel structures manually as well as using a computer program

Group [A] Basic skills

1. Drawings for moment connections as per IS (manual and using CAD package)
2. Understanding basic analysis and design process using computer program

Group [B] Implementation with a computer program/software package like STAAD, OSDAG, ETAB, SAP, etc and detailing must be done using any CAD package.

Analysis, Design and detailing of

1. Single portal frame.
2. Industrial building (gravity and wind load).
3. Highway bridge (Multi span)
4. Railway bridge
5. Liquid storage tanks and its staging system.
6. Communication towers / Transmission towers

Group [C] Visits (Minimum one)

A real or virtual visit may be arranged to places where steel structures from above syllabus were used on site.

Term work shall be based on all the above content.
Computer programs should content input, program and output prints with flowchart of method implemented in programming.

CE 405 c) GROUND WATER ENGINEERING

ELECTIVE-II

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objective :

Quality water demand has been becoming a major human life factor across the world. Water quantity and quality are depleting at alarming rate compelling the experts to adopt corrective measures. Ground water harnessing shall be accomplished without disturbing environmental balance.The proposed syllabus enables the students to study the subject to promote the desired goals.

UNIT- I :

1. **Introduction :**

Ground water extent and potential in India ; Ground water exploitation methods and investigations ;

Hydrology ; Water bearing properties of rocks ; Site selection and spacing of wells ; Infiltration mechanism and curves ; Water balance budget and equations. **(4Hrs.)**

2. **Water Storage and Rock Functions** :

Porosity ; Void's ratio ; Water retention properties ; Specific yield ; Permeability and Permea meters ;

Constant and variable head analysis and equations. **(4Hrs.)**

UNIT-II :

3. **Geological Zones of Saturation:**

Aeration zones; Soil water belt ; Saturation zone ; Aquifers ; Storage coefficient ; Water table fluctuations ; Springs. **(3Hrs.)**

4. **Ground Water Flow :**

Specific weight; Compressibility; Head distribution ; 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. **(4Hrs.)**

UNIT-III :

5. **Aquifer Properties :**

Aquifer tests; Test Measurements; Confined aquifers; Discharge analysis (Theis's and Jacob's

methods); Unconfined aquifers and flow properties. **(3Hrs.)**

6. **Well Hydraulics :**

Types of wells and constructions; Infiltration galleries ; Tube well design and dimensions;

Maintenance of wells; Performance tests; Specific capacity ; Revitalization of wells. **(4Hrs.)**

UNIT-IV :

7. **Ground Water Exploration :**

Geological and hydrological methods; Electrical resistivity method ; Seismic method; Magnetic

Method; Gravity Method ; Radio Metric Method ; Tracer techniques. **(4Hrs.)**

8. **Modeling** :

Physical and mathematical models ; Dimensional analysis ; Dimensionless numbers ; Reyleigh's method ; Buckingham π- theorem.
(3Hrs.)

UNIT-V :

9. **Saline Water Intrusion :**

Sea water salinity ; Saline water Intrusion; Salinity influx in estuaries; Zone of diffusion and interface parameters; Prevention and control of saline water intrusion; Desalination of sea water. **(3Hrs.)**

10. **Artificial Recharge :**

Artificial Recharge & methods; Waste water recharge; Detention dams; Water shed management techniques ; Rain water harvesting ; Residential rain water harvesting. **(4Hrs.)**

UNIT-VI :

11. **Pumps and Allied Machineries :**

Discharge rates; Demands; Flow charts; Heads and losses; Power requirements and calculations; Pumps, types and their suitability; Installation and maintenance;, Flow measurements and metering;

Brief description of distribution network.
(4Hrs.)

12. **Water Quality, Pollutions and Legislations :**

Potable water Quality ;Sources of pollutions and pollutants; Hard water and effects; Water salinity and

logging; Water test parameters; Leaching and soil reclamation; Pollution control norms; Boards and agencies; Action plans and legislations; Case study of Namami Ganga action plan.
(4Hrs.)

Course Outcome :

It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of Ground Water Engineering with confidence and success.

REFERENCE 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. Cedergren

6. Engineering Fluid Mechanics : C. Creaegar

CE 405 c) GROUND WATER ENGINEERING

ELECTIVE-II

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 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

Practical Examination : It shall be in the form of **Oral Examination** based on term work

CE405 d) Air Pollution and control
(Elective -II)

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course objectives

This course covers the sources, characteristics and effects of air pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

Course outcomes

1. The students completing the course will have an understanding of the nature and characteristics of air pollutants, and basic concepts of air quality management.
2. Ability to identify, formulate and solve air pollution problems.
3. Ability to design stacks and particulate air pollution control devices to meet applicable standards.

Unit I: Introduction
(04)

The structure of the atmosphere, definitions and scope of air pollution, scales of air pollution

Unit II: Sources and effects of air pollutants
(08)

Classification of air pollutants, particulates and gaseous pollutants, sources of air pollution, source inventory, effects of air pollution on human beings, vegetation, animals, property, aesthetic value, air pollution episodes. Global effects of air pollution- global warming, ozone layer depletion, acid rain and heat island effect.

Unit III: Meteorology and air pollution
(08)

Different meteorological factors and their effects, Lapse rate and stability of atmosphere, an inversion phenomenon. Precipitation and its relation to scavenging pollutant in air, wind pattern, direction, velocity and fluctuations. Models of diffusions and dispersion, plume behavior, stack height design, maximum height, numericals

Unit IV: Chemistry air pollution
(06)

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

Unit V: Air pollution control
(08)

Concepts of control, principles and design of control measures, particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation. Selection criteria for equipment, gaseous pollutant control by adsorption, absorption, condensation, combustion. Pollution control for specific major industries.

Unit VI: Air quality management
(06)

Air quality standards, air quality monitoring, preventive measures, air pollution control efforts, zoning, town planning regulation of new industries, legislation and enforcement, environmental impact asessment and air quality.

Textbooks

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N, Air Pollution Control, Tata McGraw Hill, New Delhi, 1996.

References

1. W. L. Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New York, 1997

2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.

3. Peavy S.W., Rowe D.R., and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.

4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi Mahajan, S.P., "Pollution Control in Process Industries", Tata McGraw-Hill, New Delhi, 1991

CE405 d) Air Pollution and control (Elective -II) (Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term Work

1. At least 6 assignments/ problems on air pollution
2. Sampling and analysis of ambient air Or

   Sampling and analysis of automobile exhaust.
3. Demonstration of stack gas monitoring

405 e) TOWN AND COUNTRY PLANNING

(Elective-II)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

1: **Evaluation of Town planning**:
1.1 Necessity and scope of Town Planning, Brief history, Greek and Roman Towns, Planning in ancient India - Indus Valley Civilization, Vedic Period, Buddhist Period, Medieval Period, Mogul Period, British Period, , post independence problems in India. (8 Hrs.)

1.2 : Town Planners in Modern Era such as Sir Patrick Geddes, Sir Ebenezer Howard, Clarence perry & Lewis Mumford, Le Corbusier, Present Status of Town Planning in India, New towns and cities in India. (Administrative, Tourism Potential Areas, Industrial, Railway Town, Religious Activities, Project Based Areas etc.) (8 Hrs.)

2: **Fundamentals of planning:** Town Forms Layout: Circular towns, star shaped Towns, Linear Towns, Radial and Grid Iron Patterns ,. surveys and Data collection for regional and town plans, sources and methods of gathering information, land Use survey population base and projection services and amenities, Layout of Residential Units, Neighborhood Unit Planning, Radburn Plan, Growth Pattern of Towns, Concentric Satellite, Ribbon Development, Scattered growth module, Zoning (6 Hrs.)

3. Urban Transport:
Traffic Engineering – Traffic study, Improvement of traffic facilities, road Intersections and its optimum use. Congestion and parking Traffic Control Devices, refuge Islands, Rapid Transit Systems. standards of housing, Traffic circulation, Tree planting and Land Spacing, Schools, parks and open spaces, medical, factors limiting expansion of towns. (8 Hrs.)

4: Introduction to Planning Legislation : Introduction to M.R.T.P. Act of 1966, Land Acquisition Act of 1894, Maharashtra Slum Redevelopment Act, Urban Arts Commission Act, Maharashtra Tree Act, Urban Ceiling Act, M.I.D.C. Act, Mhada Act. Introduction of Town planning scheme- Procedure and regulations of layout of TP Scheme Development Control Rules for A, B, C Class Towns, and Municipal Corporations. Development Control Rules of Local Municipal Corporations. Development Plan and Regional Plan (6 Hrs.)

5. **Urban Renewal, Redevelopment and Rural Development :**
Problems of slums and improvement, urban explosion and Its problems dilapidated localities, Traffic problems, optimum city population, Ecological and Sociological aspect town planning. Integrated Rural Development Approach, various schemes for rural development (6 Hrs.)

6.: Professional Bodies and Building Byelaws:

Introduction about Professional Bodies in planning profession such as T.C.P.O. and I.T.P.I. etc. Various Planning authorities like D.D.A., CIDCO, MMRDA, and PCNTDA etc. Introduction to Local and Self Government in urban as well as rural areas, introduction to 73rd and 74th amendment to the constitution. Introduction of minimum plot areas, road width open space, Byelaws of Municipal Corporation applicable to residential and commercial buildings. Centralization and Decentralization concepts (6 Hrs.)

Text Books

Town and Country Planning By M.K.Gandhi
Hiraskar G.K., "Town and country Planning"
Rangawala S.C., "Town Planning", Charotar Publications, Anand
Sundaram K.V., "Urban and Regional Planning in India", Vikash Publishing House Pvt. Ltd.
MRTP Act 1966
Land Acquisition Act - 1894
Misra S.N., "Rural Development Planning-Design and Method", Satvahan Publications, N. Delhi
Town Planning – Law, Administration and Professional Practice – G. R. Diwan
Reference Books

REFRENCE BOOKS :

1) The Urban Pattern: City Planning and Design,By Gallion Arthur B., Eisner S., (CBS Pub. and
Distributors, Delhi, 1984.)
2) The Text Book of Town Planning, By Bandopadhyay Abir, (Books and Allied (P) Ltd, Kolkata,
2000).
3) Town and Country Planning & Housing,By Modak &Ambdekar(Orient Longman Ltd 1971)
4) Lewis Kuble, "Town and Country Planning"
5) Gallion, "The Urban Pattern", Eisner
6). Image of City – Kevin Lynch
7) P.W.D. Handbook of Town Planning
8. Development Plan and Regional Plan Reports
9. Tomorrow – Peaceful Path To Social Reforms – Sir Ebenezer Howard.

405 e) TOWN AND COUNTRY PLANNING

(Elective-II)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

(Any Six)

1. Subdivision of plots (including conversion of land to Non Agriculture use)
2. Study report on Town Planners and towns designed by them.
3. Neighborhood layout.
4. Redevelopment of existing slum area of the city
5. Project based on Urban Design and Landscape Design aspect in planning.
6. Case studies of various types of housing
7. Visit to any of the planning organizations, builders and promoters
8. Study of existing Town and Town Planning proposals
9. Urban renewal scheme
10. Social and environmental problems of sporadic and unplanned growth of urban and rural areas.

CE 405 f) CONSTRUCTION MANAGEMENT AND EQUIPMENT (ELECTIVE-II)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 02

Course Objectives:

- To study and understand the various types of equipment's used for earthwork, tunneling, drilling, blasting, dewatering, material handling conveyors and its applications in construction projects
- To train the students with the latest and the best in the rapidly changing fields of Construction Management & construction equipment's technology.
- To prepare the students to be industry leaders who implement the best engineering and management practices and technologies in the construction industry.
- To study and understand the various types of equipment's used for earthwork, material handling conveyors and its applications in construction projects.
- To study and understand the standard designations, sizes, and gradations of equipment, to construction engineering.
- Be able to apply knowledge and skills of construction equipment's practices and techniques.

UNIT- I:

1. Basic concept of management:

Management classification characteristic of Management Importance of Management Development of Management thought functional approach to Management Scientific Management, approach, Human relation approach.

2. Administration and Management:

Introduction Board of Directors Managing Directors Company's secretary commercial manager, Authority and Responsibility Delegations its guidelines, centralization of Authority Def. of Management Duties and responsibilities Def. of Administration duties & Responsibilities. (8 Hrs.)

UNIT- II:

3. Organization:

Duties and responsibilities of organizations principles of good organization Qualities of good organization, Types of Organization, Advantages and disadvantages line or Staff organization &Disadvantages Line staff and Financial Advantages and Disadvantages. (4 Hrs.)

UNIT- III:

4. Site Selection and Layout:

Introduction, location selection of actual site, selection of site in city, selection of site in rural area, Single storey and Multi-storey Building, Factory Layout factors affecting layout.

5. Plant Layout:

Definition of plant layout, Main objective of scientific layout, Principles of plant layout, Symptoms of bad layout, factors influencing layout. Methods of layout, stability Advantages and disadvantages. (8 Hrs.)

UNIT- IV:

6. Elements of Costing:

Introduction, calculation of Material cost calculation of direct labour cost, fixed and variable Overhead, components of cost, selling price, examples of overhead. (4 Hrs.)

7. Operation Research:

Introduction, Definition, various phase in O.R. study. Method of making decision by OR Scope, Applications of OR Method used in O.R. (4 Hrs.)

UNIT-V:

Construction Equipment's:

Introduction, Planning and selection of equipment, Mechanical Operation in construction.

Earth Moving Equipment's.- Its Advantage Disadvantages working (Dragline, Clamshell, Bulldozer, Power shovel, Back Hoe, Scraper only).

Hoisting Equipment's - Derrick and Gantry cranes

Hauling Equipment's - Introduction only (Track Trailer Wagon).

UNIT- VI:

Pile and pile driving Equipment's- operation and advantages disadvantage.

Tunnel Boring Machine - Operation - Advantages and disadvantages.

Belt conveyor.

Equipment used in Highway construction and Underwater Construction.

Special Equipments

Course Outcomes:

- On completion of this course the students will have the knowledge of construction equipment's practices and techniques to be used in the field.
- Be able to apply theoretical and practical aspects of project management techniques to achieve project goals.
- Become familiar with construction equipment and their capabilities
- Learn how to best utilize construction equipment on site work and heavy civil projects
- Properly select heavy equipment based on applications, utilization, productivity, and other factors

REFERENCE BOOKS:

1. Industrial organization and engineering economics by T.R. Banga, S.C. Sharma.
2. Industrial organization and Management by O.P. Khanna.
3. Construction Planning Equipment's and methods by Robert L. Purify.
4. Construction Equipment's and its Planning and Applications by Dr. Mahesh Verma.
5. Construction Management Practice by Dr. V. K. Raina Shroff Publishers & Dist. Pvt. Ltd.
6. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi,1988.
7. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction Planning, Equipment andMethods, McGraw Hill, Singapore, 2006.
8. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988.

CE 405 f) CONSTRUCTION MANAGEMENT AND EQUIPMENT (ELECTIVE-II)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term work: Term work will consist of

A) Site Visit & Case study

- Two site visit to major construction work and submission of Detailed reports
- Case study for Construction Project

B) Assignments

Term work shall consists of assignments based on above syllabus

Drawing of a typical Site/ Construction layout.

Drawing Plates and write suitability of different construction equipments.

Practical examination:

It consists of oral examination based on the above term-work.

CE 406 SEMINAR

MSE : 50 Marks **Credit Structure : 01**

Seminar topic is included to enable the students to apply their knowledge to understand advanced technologies, designs etc. Literature survey may help to select such topics which are invaluable to an engineer in an Information Technology industry. It will encourage students to develop their presentation skills, good communication skills and skills of collecting the correct information regarding the technical topic. The students will be able to deliver seminar with useful information. He/she should understand the technologies, designs and skills of writing technical report, to do literature survey and to attempt the queries from examiner. Report and Assessment The concerned guide will assess the term work as a continuous activity done by students to complete seminar. The students will have to deliver seminar for 20-25 minutes, during examination and explain the topic in presence of all students and department faculties. Questions and answers session will be of five minutes to each student. Examiner, concerned guide and senior faculty of the department will assess the performance during examination.

Each student should select a Seminar topic must be related to one of the following

1. Civil Engineering
2. Interdisciplinary subjects
3. Recent trends in Engineering

CE 407 FIELD TRAINING & PRESENTATION

MSE: 15 Marks **ESE: 35 Marks** **Credit Structure: 01**

The basic objective of this **Field Training Programme** is to expose the students to gain direct field/ practical experience with the actual civil engineering work processes such as Surveying , Marking out, Mixing, Quality control, Reinforcement (i.e. cutting, bending and placement), Measurements, advance construction equipment, Curing, Centering etc. It is intended that the students understand how theoretical aspects are put into actual action in the form of field activities. In this light following exercise assignments are required to be covered by engaging students at actual work sites.

1. Marking out building plan on field.
2. Centering details in multi-storey buildings
3. Reinforcement details of all RCC structural members
4. Excavation and bed concreting for different structures (e.g. Bridges, Dams, Buildings etc)
5. Road pavement work.
6. Plumbing accessories and techniques.
7. Measurements, units and rates for important raw materials.
8. Set of documents for new construction works.
9. Bank loans, processing, repayment details and running bill preparations

Report should include daily progress of the construction works along with detail photographs.

CE 408 PROFESSIONAL PRACTICE

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objective : In Civil Engineering field infrastructure creation and construction of wide range of structures is one of the primary activities. For this it is intended that a student shall be given adequate opportunity to study and imbibe various aspects of **Professional Practice** as a core subject. So this syllabus aims to provide that necessary plat form to gain the required know-how and knowledge of this subject.

UNIT-I

1. INTRODUCTION:

Professional practice as career ; Modes of measurements of civil engineering works ; Brief idea about English method; Details and formats of 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. **(4Hrs.)**

2. APPROXIMATE ESTIMATES:

Meaning; Necessity; General principles; Methods of approximate estimates for buildings, roads, bridges, water supply schemes, drainage schemes, retaining walls etc**. (3 Hrs.)**

UNIT-II

3. DETAILED ESTIMATES:

Rules of measurements; Error margins & degrees of accuracy ; Uses of estimates; Essentials of an estimator; Requirements of an estimator; Basic ideas for Estimation of works as Septic tank, band –stand , RCC ring well, steel-truss roof, earthen dam, plumbing works, RCC elements , canals, cycle – shed, roads,bridges, earth- works. **(7Hrs.)**

UNIT-III

4. SPECIFICATIONS:

Meaning; Objectives; Types; Detailed Specifications; Provisions & classification; Principles in writing specifications, Drafting detailed specifications for Work samples (Civil Engg. works)

(3 Hrs)

5. 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; Volume reduction theories; Leads and lifts; Batching; Rate analysis Work samples (Civil Engg.works).

(5 Hrs.)

UNIT-IV

6. 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 ; Responsibilities of owner & contractor ; Essentials of valid contracts ;; Forms of contracts (lump sum ,unit price ,cost plus) ; Other types of contracts as Labour contracts ,Negotiated contracts, 'demolition contracts**;** Termination & breach of contracts ; Arbitration ;Liquidated damages. **(6Hrs.)**

UNIT-V

7. TENDERS:

Meaning; Categories; Tender notice; Notification in press and media; N.B.C.; Corrigendum and addendum; Tenders form & information; E.M.D. & S.D. objectives; Preparation & submission of tenders; Opening of tenders; Scrutiny of tenders; Acceptance of tenders; Revocation of tenders; Unbalanced tenders; e-tendering; Centre line award of tenders. **(3Hrs.)**

8. VALUATION:

Meaning; Purpose; Cost, price and value; Values forms and terms; Property forms; Property holdings; Leases; Depreciation; Methods of cost depreciation; Incomes and outgoings; Sinking fund and parameters; Year`s purchase; Capitalized value; Building valuation. **(4 Hrs.)**

UNIT-VI

9. 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. **(3 Hrs.)**

10. PROPERTIES & ESTATES :

Meaning; Mortgages; Ammortization; Deals of property; Registration; Sale deed; New construction works and documents; Formation of cooperative housing societies; Building bye-laws and Municipal norms; N.A. concept; Apartment acts; Loans; Repayments; E.M.I.; NPA; Mathematics of finance; Banking finance terms; Real estates and RERA; Turn-key projects; PPP works; BOT and BOOT projects; Land acquisition and compensation; Project funding and international lenders; Housing sector development**;** Professional and technical agencies in Civil Engineering construction field **(6Hrs.)**

Course Outcome :

The above course of syllabus gives ample scope for the students to pick up diverse aspects of the subject Professional Practice. With this knowledge back up through academic sessions a student shall be able to serve in different organizations carrying out different project works and infrastructure activities. And even it is ensured that a student shall start his career as a consultant in this field .

REFERENCE 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.

CE 408 PROFESSIONAL PRACTICE

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term Work

1. Procedural report for new construction work and documents.
2. Detailed specifications (Six samples)
3. Rate analysis (Six samples)
4. Detailed estimate : Bullock cart bridge.
5. Detailed estimate : Steel truss roof.
6. Detailed estimate : Plumbing of a building.
7. Detailed estimate : G+1 Building.
8. e-Tendering assignment sample

Practical Examination : It shall be in the form of **Oral Examination** based on term work

CE 409 Foundation Engineering

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course Objective:- For safe design of structures, sound knowledge of foundation engineering is essential. The knowledge of bearing capacity, settlement analysis is required to decide safe load that a soil can take. By conducting field tests also the bearing capacity & settlements can be known. In expansive soils like B.C .soils foundation design requires use of special techniques, use of, pile foundations, piers etc, hence forth its study is essential. The structures to be constructed in Earth Quake prone areas require special consideration of effect of earth quake in their design .Coffer dam studies will help to select a type & to design it. Heavy machines require foundations, large structures like bridges; dams etc require heavy foundation like wells & caissons.

Unit-1

1.1 **Introduction**-Shallow foundation-types and applications, floating foundation.

1.2 **Bearing capacity**-Basic definitions, Rankine's minimum depth of foundation, Modes of shear failure, Terzaghi's and Meyerhof's bearing capacity analysis, IS code method of bearing capacity (IS:6403-1981), Skempton's bearing capacity equations, factors affecting bearing capacity & the methods to improve it. (8 Hrs)

Unit-2

2.1 Settlement analysis-Causes and control of settlement, Immediate settlement, Consolidation settlement, Differential settlement, Prediction of foundation settlement from plate load test, Settlement tolerance of super structures, proportioning of footings for equal settlement.

2.2 Field tests for bearing capacity calculation-Plate load test, Standard penetration test (SPT), Static cone penetration test and Dynamic cone penetration test procedures and limitations. (8Hrs)

Unit-3

Foundations on black cotton soils-Characteristics of B.C. soil, Foundation Problems in B.C soil, Swelling pressure measurement, Foundation design principles, Construction techniques in B.C. soil, Under reamed piles, Special features of foundation for towers and water tanks.(4Hrs)

Unit-4

Pile foundations-Introduction, Necessity and classification of piles, Methods of pile driving, pile driving hammers, Effects of pile driving on ground, selection of type of pile, Determination

of length (Critical depth) of pile, Design of pile foundation, Determination of load carrying capacity of pile by static and dynamic formulae, by theoretical analysis- point bearing, friction, Negative skin friction, Cyclic Pile load test, Group action of piles-Fields rule, Rigid block method, number and spacing of pile in a group, Under-reamed piles. (8Hrs)

Unit 5

Earthquake Geotechnics-Earthquake terminology, Sources of earthquake, Seismic waves, Location of earthquake, Size of earthquake, Characteristics of strong ground motion, Seismic hazards-Liquefaction and its effects, Evaluation of Liquefaction susceptibility, Liquefaction hazards mitigation, Numerical based on magnitude, intensity, energy released, estimation of cyclic stress ratio. (4Hrs)

Unit-6

6.1 Machine Foundations- Introduction, Types of machine foundation, Basic definitions, Degree of freedom of block foundation, General criteria for design of machine foundation.

6.2 Coffer dams-Definitions and types of coffer dams, uses and salient features.

Wells and caissons- Types of wells, Components of well foundation, choice of particulars type, tilting and correction methods of well. Definition of caissons-types of caissons and their uses. (8Hrs)

Course Outcome:-The study of Foundation engineering .subject develops the knowledge & confidence level of the students to select the proper type of foundation & its safe & economic design

Reference books:

1. Foundation Engineering-D. R. Phatak.

2. Foundation Engineering -B. J. Kasmalkar

3. Soil Mechanics and Foundation engineering – Dr. B. C. Punmia

4. Soil Mechanics and Foundation engineering - V. N. S. Murthy

5. Soil Mechanics and Foundation engineering - Dr. K.R.Arora

6. Foundation design and construction - Wayne C. Teng

7. Foundation design - Wayne C. Teng.

8. Soil Mechanics and Foundation engineering - Bharat Singh.

CE 409 Foundation Engineering

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term work:

Term work is based on assignments/experiments listed below.

1. To determine the bearing capacity of soil by standard penetration test(SPT)
2. To determine the soil characteristics by standard penetration test(SPT)
3. Determination of free swell index.
4. The study of Plate load test.
5. The study of cone penetration test.
6. Computation of bearing capacity by analytical approach to verify field test.
7. The study of Seismic refractory method to identify sub-soil strata.
8. Design of raft foundation for a given data.
9. A case study on bearing capacity and settlement.

Note;-Minimum 08 assignments are expected to complete the Term work.

CE 410 PROJECT PLANNING AND MANAGEMENT

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 03
	MSE: 20 marks	Practical: 01

Course Objectives:

- To study and understand the concept of planning, scheduling, cost during construction, organization and use of project information necessary for construction project.
- To understand the basic principles and functions of construction management.
- To learn scheduling techniques such as CPM and PERT.
- Able to prepare the activity logic sequence and calculation of network duration and float analysis.
- To gain the knowledge of time-cost optimization and effective utilization of resources on construction sites.
- To study the various legal aspects and provisions,arbitration, legal requirement, and Practical focus upon legal concepts applicable to the construction industry
- To study the effect of resource planning, labour management, material and equipment, time management
- Apply technical skills and knowledge in mathematics, science, construction, and technology in support of planning, analysing, and solving construction problems.
- Manage a construction project from start to completion while maintaining budget, schedule, and safety requirements.

UNIT 1: CONSTRUCTION PROJECTS

1.1 Introduction to Construction Management:

Unique features of construction industry, Concept of Management, Deification of Construction Management, Importance of Construction management, objectives and functions of construction management, Role of Construction Manager, main causes of construction project failures.Phases of a construction projects

1.2 Construction project planning:

Deification of planning, objective of planning, Principle of planning, Advantages of planning, and Stages of project planning: - Pre-tender planning & Pre-construction planning, Roles and responsibilities of various agencies associated with a Construction project, Resources required for construction.

1.3 Construction ProjectScheduling:

Uses of scheduling of the project, advantages of scheduling, classification of scheduling, work break down structure. Method of Scheduling: Bar charts & Milestone Charts.

UNIT 2: PROJECT MANAGEMENT THROUGH NETWORKS

2.1 Elements of network:

Definition of network, objectives of networks techniques, Basic terminology: Event: Tail Event, Head event, Dual role event, Successor Events, Predecessor Events, Activity, interrelationship of activities: Parallel activities, serial activities, Predecessor activities, Successor activities, Dummy activities and their uses, Types of networks: Activity on arrow & Activity on node, types of precedence relationships for activities : finish to start, start to start, finish to finish, start to finish, Basic assumption made for creating network, Rules for drawing a network, Fulkerson's Rule for numbering the events, Problems for draw the network diagram.

2.2 PERT(PROGRAMME EVOLUTION AND REVIEW TECHNIQUE):

Introduction& Salient features of PERT, determining three time estimates: (Optimistic, Pessimistic & Most lively time estimates), Frequency distribution, Mean, Variance & Standard Deviation of the distribution, Probability distribution, Expected time or Mean time, Earlier expected time (T_E), Rule for evaluating T_E for any event, Latest allowable occurrence time or Latest allowable time (T_L), Rule for evaluating T_L for any event, Combined tabular calculation for T_E & $T_{L.,}$ Forward pass & Backward pass, Slack, concept of critical path and its identification, procedure for finding probability of meeting the scheduled time of completion.

UNIT 3: CPM (CRITICAL PATH METHOD)

Introduction, Comparison between CPM & PERT, Definitions, network construction, Activity time estimates, earliest event time (T_E), Rules for calculating$T_{E,}$ Forward pass, latest event time (T_L), Rules for calculating$T_{L,}$ Backward Pass, Combined Tabular calculation for T_E & $T_{L.}$ Activity Times: Earliest start time, Earliest Finish time Latest start time and latest finish time, Float, types of floats, Supercritical, Critical & Subcritical activities, Identification of critical path. Numericals on CPM networks: computation the activity times & floats values, Locate critical paths on Networks.

UNIT 4. : PROJECT COST ANALYSIS

Introduction, Project costs: Direct cost & indirect cost, normal cost & crash time, Project times: normal time & crash time, cost slopes, direct and indirect cost-time relationships, Project time - cost relationship, variation of indirect cost with time, optimum cost and optimum duration, time grid diagram, conducting a crash programme, determining the minimum total cost of a project.

UNIT 5: MATERIALMANAGEMENT AND PERSONNEL MANAGEMENT:

5.1 Material management: Introduction, functions of material management, Importance of material management, Manager selective control techniques, A.B.C. analysis.

5.2 Personnel Management: Aim, objective or Functions of Personal Management, duties of personal officer, Employment Recruitment, Recruitment and Selection of employees, Selection process or techniques, Training- objectives, aims or needs of training, Advantages of employee training , labour Welfare Facilities (Services), need for safety engineering .

UNIT 6. INDUSTRIAL LAWS:

1. The Indian factories Act 1948.
2. Industrial Dispute Act. 1947.
3. The Payment of Wages Act. 1936.
4. Workmen's Compensation Act. 1923.
5. Minimum Wages Act. 1948. (06 hrs.)

Course Outcomes:

On successful completion of the course, student will be able to:

- The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.
- The students will be able to demonstrate their capability for preparing the project networks to work out best possible time for completing the project.
- The students will be able to understand and exercise the time- cost relationship in practices.
- The students will be able to implement the safety aspects during the execution of civil engineering project.
- The course will inculcate the managerial skills among the students which will be helpful for them in future during actual execution of projects.
- On completion of this course the students will know different legal aspect and its provisions for construction project
- The students will be able to carry out the Human resource Management efficiently.
- The students will be able to plan for Equipment's and material requirements.
- On completion of this course the students will know the various management techniques for successful completion of construction projects.

REFERENCE BOOKS:

1. Construction Project Management, Chitkara K. K., Tata McGraw Hill
2. Industrial Engineering: Organization - O.P. Khanna.
3. Project Planning & Control with PERT & CPM- Dr. B. C. Purmia.
4. Principles of Cost Management - Roy plchery,
5. Construction Management and Planning by Sengupta and Guha-Tata McGraw Hill publication.
6. Construction Planning and Management – Dr. Srivastava, U. K.
7. Handbook of Construction Management: Joy, P. K., Macmillan, India

CE 410 PROJECT PLANNING AND MANAGEMENT

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

Term work will consist of

1.Preparation of a project plan for one the following projects using working drawing

- Residential Bungalow
- Single storied building for commercial purpose
- Single span Bridge

2.Project Plan:

- From the drawing available, Prepare a plan in tabular format as indicted below
- List of activities, activities Code, description of activities, rough estimate of quantity, preceding activity, succeeding activity,Activities logic sequence tableetc.

3. Project Management Software:

Study of project management software's, Capability, Input requirements, possible outputs

- Use the free online software (like GanttProject, OpenProj) or MSP/ Primaveraand input the details from the tabulated plan details
- Submit Printout of input sheet and the output sheet in the form of network by using Project management Software's(like GanttProject, OpenProject, MSP, Primavera). (Use any one software).

2. Assignments:

Term work shall consists of assignments based on above syllabus. At least 6 (six) Assignments which will include oftheory questions, numerical problems, and networks covering the entire syllabus divided properly unit wise.

Practical / Oral Examination:

It consists of oral examination based on the above Term work (Course Contents and Assignments).

CE 411 a) SEISMIC DESIGN OF STRUCTURES
(ELECTIVE-III)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course Objectives:

1: Students will explore the stream of 'Seismology'

2: Student will be introduced Earthquake force on building structures

3: Students will be introduced Ductile Design of Structures

4: Students will be introduced to retrofitting

UNIT-I:

Engineering Seismology, Elastic rebound theory, Theory of plate tectonics and movement of Indian plate. Seismic waves. Seismic intensity, Richter scale, Tsunami. Seismic zoning maps of India and comparison study. Response spectra. Strong motion characteristics. (7Hrs.)

UNIT-II:

Earthquake effects on the structures, classification of loads, Seismic methods of analysis, seismic design methods. Seismic damages during past earthquakes and effect of irregularities and building architecture on the performance of RC structures. Mathematical modeling of multi storeyed RC buildings with modeling of floor diaphragms and soil-foundation, Winkler model. (8Hrs.)

UNIT-III:

Design of multi-story RC structure with foundation as per latest IS: 1893 by Equivalent static lateral load method and Response Spectrum Method. Introduction to Time history method. Capacity based design of soft story RC building, design of Shear Walls. Ductile detailing as per latest IS:13920. (8Hrs.)

UNIT-IV:

Seismic design of multi-storied steel structures with various bracing systems. Lateral load analysis and design of two- storied masonry buildings. p-delta analysis, Non Structural Element. (7Hrs.)

UNIT-V:

Seismic design of Elevated RC Circular Water Tanks, Ductility requirements, Types of ductility, Factors affecting ductility. IS code provisions. (8Hrs.)

UNIT-VI:

Seismic retrofitting, Sources of weakness in RC framed buildings, Classification of retrofitting techniques, Conventional and non-conventional methods, Comparative study of various methods and case studies. Introduction to base isolation systems, I. S. code provisions for retrofitting of masonry structures, failure modes of masonry structures and repairing techniques. (8Hrs.)

Course Outcomes:

1: Students are now explored to the stream of 'Seismology'

2: Students are now introduced Earthquake force on building structures

3: Students are now introduced Ductile Design of Structures

4: Students are now introduced to retrofitting

REFERENCE BOOKS:

1. P. Agarwal and M. Shrikhande, Earthquake Resistant Design of Structures, Prentice-Hall Publications.

2. IS: 1893: Indian Standard Criteria for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.

3. IS: 13935: Repair and Seismic Strengthening of Buildings Guidelines, 1993
4. IS: 4326: Earthquake Resistant Design and Construction of Buildings Code of Practice, 1993

5. IS: 13828: Improving Earthquake Resistance of Low Strength Masonry Buildings, 1993

6. IS: 13827: Improving Earthquake Resistance of Earthen Buildings, 1993

7. IS: 13920: Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Force, 1993

8. IS: 3370: Indian Standard code of practice for concrete structures for storage of liquids, Bureau of Indian Standards, New Delhi.

9. Jai Krishna, A.R. Chandrashekharan and B Chandra Elements of Earthquake Engineering, South Asian Publishers Pvt. Ltd.

10. Earthquake Tips: C.V.R. Murty , NICEE

Reference Books

11. Clough and Penzin, Dynamics of Structures, Mc-Graw Hills Publications.

12. Joshi P S et al. – Design of Reinforced Concrete Structures for Earthquake Resistance Published by Indian Society of Structural Engineers, 2001

CE 411 a) SEISMIC DESIGN OF STRUCTURES (ELECTIVE-III)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

Term work:

Term work shall consist of 10 assignments based on above syllabus.

Practical examination:

It consists of oral examination based on the above term-work.

CE 411 b) HYDROPOWER ENGINEERING

(Elective -III)

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course Objective : Power has become a mandatory driving force for the all round development of human life. Increasing environmental pollution levels causing high magnitude problems call for to embrace eco-friendly power forms. Hydropower being one such option has the potential to club multi objectives under one project. Further, project harnessing can be brought to remote and country side locations even at micro order power generation. This syllabus enables students to strive in that direction.

UNIT-I

1. Introduction :

Energy forms and sources; History of hydropower in India; Merits and demerits of hydropower system **;** Load and Load Curve ; Power ; Definitions; Equations; Units and Conversions**;** Flow and power duration curves and construction**;** Position of hydropower in power system ; Estimation of hydropower potential. **(5Hrs.)**

2. Loads on Hydro Turbines :

Load Curve; Load Factor; Capacity Factor ; Demand Factor ; Utilization Factor; Power Factor**;**

Graphical Representation of Power Forms**;** Load Duration Curve; Power Forms; Primary and

Secondary Power. **(4Hrs.)**

UNIT-II

3. Hydro Power Plants :

Detailed classification of hydropower plants and features ; Reservoir Prime levels and storage; Sub types of Hydro power plants; Pondage; Reservoir capacity and components ; Appurtenances of Hydro power plants and various types.
(7Hrs.)

UNIT-III

4. Pressure Shafts :

Meaning & classification ; Methods of support ; Exposed and buried penstocks ; Features ; Merits and demerits ; Design criteria ; Shell thickness ; Economical diameter ; Economical diameter computation methods ; Anchor blocks ; Design methods ; Forces in action on anchor Blocks ; Stability conditions ; Operating conditions ; Conduit and valves and functions; CRF and significance. **(6Hrs.)**

UNIT-IV

5. Pumped Storage Plants :

Basic principle ; Hypothetical load curve ; Historical development **;** Advantages and disadvantages ; Layout arrangements ; Two and three unit system plants ; Merits and demerits of

two and three unit plants ; Reversible pump turbines ; Operational problems ; Cavitation and equations ; Turbine settings; Plant efficiency ; Plants in India. **(4Hrs.)**

6. Surge Tanks :

Meaning; Classification; Elastic and rigid water column theories; Pressure wave and celerity; Hydraulic design of simple surge tank; Need; Minimum sectional area; Inertia constant; Intakes; Losses; Air entrainment and inlet aeration; Equations ; Period of surge oscillations. **(4Hrs)**

UNIT-V

7. Hydro Turbines :

Types; Classification; Layouts and arrangements; Specific speed , significance and equations; Draft Tubes and functions; Classification; Cavitational problem and remedy; Turbine setting;Turbine governing and methods ; Velocity triangles ; Turbine characteristics. **(4Hrs.)**

8. Tidal Power Plants :

Basic principle; Development and site locations; Operational difficulties; Components; Modes of generation; Various operational cycles ; Estimation of tidal power energy; Damage control; T.P. sites in India **(3Hrs.)**

UNIT-VI

9. Power House Planning :

P.H. structure; Components; Basic types; Location arrangements; Surface and underground power houses; Suitability and features; Power house dimensions; Layouts and types; Electro-mechanical equipments; Functional galleries. **(4Hrs.)**

10. Future of Hydro Power :

Potential sites in India; Project clearance; Environmental problems; Environment impact

assessment; Funds and gestation periods; Associated disasters; Multipurpose; projects;

Transbasin schemes; Problems and performance of H.P. Plants ; Indo-Nepal hydropower projects **(3Hrs.)**

Course Outcome :

It is desired that students after undergoing academic study sessions as cited this above shall be competent and able to work as Engineers in the field of **Hydropower Engineering** with confidence and success.

REFERENCE BOOKS

1. Water Power Engineering – M.M. Dandekar & K.N.Sharma

2. Water Power Engineering – Deshmukh

3. Hydro Power Structures – R.S.Varshney

HAND BOOKS

1. Hydro Electric Engineering Practice – J.G.Brown

2. Hydro Electric Practice – Creager & Justin

3. Water Power Development (Vol. – I, II & III) – E.Mosonyi

4. Hydro Electric Stations – I.I.Ilynykh

5. A Handbook on Hydrology – Ven Te Chow

CE 411 b) HYDROPOWER ENGINEERING

(Elective -III)

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

TERM WORK

1. Analytical solution for economical diameter of penstocks.

2. Hydraulic design of simple surge tanks.

3. Power house complex : Dimensions, components and arrangements.

4. Salient features of an existing HPP.

5. Neat sketches : At least ten basic figures of the course.

Practical Examination : It shall be in the form of **Oral Examination** based on term work

CE 411 c) Advance Reinforced Concrete Structure

(Elective -III)

Teaching Scheme:	Examination Scheme:	Credit structure:
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course Objective

To get the knowledge of analysis and design of special structural member like pile, pile cap, shear wall, deep beam, rise tread staircase and curved staircase design, reinforcement detailing and ductile detailing.

Unit – I

Design of isolated footing – Design of footing subjected to axial load and moment , Eccentric footing design.

Unit – II

Pile and Pile Cap- Introduction, Load carrying capacity of different pile, Pile cap design subjected to axial load.

Unit – III

Ductile Detailing- Ductile detailing of flexural member, longitudinal reinforcement, transverse reinforcement , special confining reinforcement, column and joint detailing, special confining reinforcement in footing , lapping details.

Unit – IV

Shear wall- Introduction, design of shear wall, reinforcement detailing.

Unit- V

Deep Beam – Design of deep beam, Check for local failure, detailing of deep beam.

Unit – VI

Rise Tread staircase design, Design of curved staircase

Course outcome

On the successful completion of course the student will be able to understand the design of special component of pile and pile cap, deep beam, shear wall, rise tread and curved staircase design. Reinforcement detailing, also student understand the importance of ductile detailing

REFERENCE BOOKS

1. Design of R.C. Structure – S. Ramamurtham
2. Reinforced concrete- Vol- I- Dr. H. J. Shah
3. Advanced reinforced concrete Design- P.C. Varghese
4. Limit state of design – Dr. B.C. Punmia, A.K. Jain
5. Comprehensive RCC Design – Punmia, Jain & Jain
6. Fundamental of RCC – N.C. Sinha & S.K. Roy
7. Limit state of theory & Design of RCC – Dr S.R. Karve and V.L. Shah
8. Limit state of design – Dr. Ramchandra

IS 456 (2000), 13920, 2911-1/2/3/4, SP 34, SP 16

CE 411 c) Advance Reinforced Concrete Structure

(Elective -III)

(Laboratory)

Teaching Scheme
Practical: 2 hrs/week

Examination Scheme
ESE: 70 marks
MSE: 30 marks

Term work

1) Analysis, design and Reinforcement detailing (any Five)
   i) Eccentric footing
   ii) Pile and pile cap design
   iii) Deep beam design
   iv) Shear wall design
   v) Rise and tread staircase design
   vi) Curved staircase design

2) Draw the sketched of different component member like beam, column, column beam joint, footing showing the detail of ductile reinforcement and special confining reinforcement

CE 411 d) INDUSTRIAL WASTE WATER TREATMENT (IWWT)

(ELECTIVE-III)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course objective

1. To understand sources of waste water in different industries.

2. To study effects of industrial waste water on environmental

3. To acquire knowledge about disposal of effluents and the standards for disposal

4. To study waste water treatment options for different industries

UNIT-I

1. Introduction (6Hrs.)

Types of industries, characteristics of Industrial wastes, effects of industrial effluents on streams, land and human health. Use of water in industry, Sources of wastewater, quality, and quantity variation in waste discharge, water budgeting

UNIT-II (7 Hrs)

Water quality monitoring of streams, Self-purification of stream, , Classification of streams.. D.O. Sag curve. Miscellaneous methods of dissolved solids removal- Ion-exchange, Electro dialysis, Reverse osmosis and Evaporation, Adsorption. Sludge disposal methods

UNIT-III (7 Hrs)

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

UNIT-IV (8 Hrs)

Effluent standards and receiving water quality standards.

Different aspects and choices of various disposal alternatives Sampling – Grab, Composite or integrated samples. Continuous monitoring – pH, Conductivity, Biomonitoring.

Detail manufacturing process in: Distillery, Sugar, Pulp and paper, Cement, Textile, Dairy, Fertilizer, Pesticides, and Pharmaceutical.

UNIT-V (8 Hrs)

Complete treatment system & disposal for industries:

Distillery, Diary, Textile, paper and pulp mill to meet P.C.B. norms. Study of common effluent treatment plant, process flow, Advantagous and disadvantageous of CETP

UNIT-VI (4 Hrs.)

Environmental Auditing Introduction, , Environmental audit solutions, . Criminal and Regulatory liabilities. Introduction to EIA. Definition of E IA and EIS, preparation of EIS, Elements of EIA

Course Outcomes:

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

1. Understand Characterize different industrial wastes

2. Suggest treatment alternative based on characteristics of industrial waste.

3. Demonstrate basic knowledge of legislation for pollution control

4. Understand manufacturing process and treatment of wastewater of different industries

REFERENCE BOOKS:

1. Nemerow N.N., (1971) – "**Liquid Waste of industry theories,** "Practices and Treatment. Addison Willey New York.

2. Azad N. S.,– "**Industrial Wastewater Management Hand Book"** McGraw Hill book Co., Newyork.

3. Ross R.D. (1968)– "**Industrial Waste Disposal"**, Reinhold Environmental Series – New York.

4. Dickinson(1974**)- Practical Waste Treatment and Disposal Applied Science publication**, London.

5. Mahajan (1984) –" **Pollution control in Process industries"**. TMH, New Delhi.

6. Eckenfelder(2000)- "**Industrial Water pollution Control"-** McGraw hill Company, New

CE 411 d) INDUSTRIAL WASTEWATER TREATMENT (IWWT)

(Elective -III)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

TERM WORK:

1) Assignments to be submitted on each topic.

2) Report to be prepared on industrial visit with respect to above syllabus

3) Report to be prepared for the survey of waste produced in the visited industries

CE 411 e) CONSTRUCTION PROJECT ECONOMICS

(ELECTIVE-III)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course Objective:

This course is intended to provide a brief background for construction project Economics for financial investments. After studying the course the students would –

- To study and understand the Project Economics & Project Finance for the construction project
- Explain the sources and mechanism of finance for construction projects
- To study and understand the various Economical analysis for Inventory control for the construction material management.
- To study and understand the various Financial Planning and Management for the construction project
- To study and understand the various Project appraisal for the construction project
- To study and understand the Life cycle costing
- Have also understood capital budgeting and working capital management parameter
- Have necessary knowledge and skills in accounting, financing for the construction project

Unit-1: Project Economics

Introduction to Project Economics - Definition, principles, Importance in construction Industry, Difference between Cost, Value, Price , Rent, simple & compound interest, profit, Annuities , Demand, demand schedule, law of demand, demand curve, elasticity of demand, supply, supply schedule, supply curve, elasticity of supply Equilibrium, Equilibrium price, Equilibrium amount, factors affecting price determination. Concept of Cost of Capital

(6 hrs.)

Unit-2: Project Finance

Means of Project Finance, Sources of finance, Long-term and short -term finance, Concepts of Debt Capital and Equity Capital. Types of Capital – Fixed and Working, FDI in Infrastructure, Time value of money, Types of budgets. (06 hrs.)

Unit-3: Economical analysis for Inventory control

What is inventory, why do we carry inventories, the disadvantage of carrying excessive stocks, objective of scientific inventory control system, steps to install a scientific inventory control system, ABC – analysis for a selective control, Economic order quantity (EOQ), lead time and safety stocks.

Introduction to Equipment Management – Fleet Management, productivity studies, Equipment down time, sizing - matching, Construction Safety norms – measures and precautions, implementation of safety programs (08 hrs.)

Unit 4: Financial Planning and Management

Long term finance planning, Stock, Borrowings, Debentures, Loan Capital, Public Deposit, Dividend Policies, Bonus Shares, Market value of shares, Reserves. Over and under capitalization, Introduction to Micro financing. Construction accounting, Chart of Accounts, Financial statements – Profit and loss, Balance sheets, Financial ratios, Working capital management. (06 hrs.)

Unit -5: Project appraisal

Types of Appraisals such as political, social, environmental, techno-legal, financial and Economical, Criteria for project selection - benefit - cost analysis, NPV, IRR, Pay-back period, Break Even analysis (Fundamental and Application Component ,Study of Project Feasibility report and Detailed Project Report (DPR), Role of Project Management Consultants – pre tender and Post tender . (08 hrs.)

Unit-6 Life cycle costing (LCC)

Definition of LCC, Importance of Life cycle costing, Economical principles used Life cycle costing, application of LCC in construction, identify feasible alternatives, Challenges to the application of LCC, Sensitivity analysis. (06 hrs.)

Course Outcomes:

- Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
- Be able to perform and evaluate payback period and capitalized cost on one or more economic alternatives.
- Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives
- On completion of this course the students will be able to know Life cycle costing, Financial Planning and Management for the construction project, Economical analysis for Inventory control

Reference Books

1. Construction Management: "Planning and finance", Cormican D. Construction press,
2. Engineering Economy', Leland T. Blank. Anthony Tarquin. McGraw Hill, 2008.
3. Foundations of Financial Management', Block Hirt, McGraw Hill, 2009.
4. Real Estate, Finance and investment', Bruggeman, Fishr, McGraw Hill, 2010.
5. "Construction Management and Accounts", Singh H. Tata McGraw Hill, New Delhi, 1988
6. Construction Project Management-Planning, Scheduling and Controlling by K. K. Chitkara, Tata McGraw Hill Publishing Company, New Delhi.
7. "Financial Management" – Indian Institute of Banking and Finance – Macmillan Publications.
8. "Principles of Corporate Finance", Brealey R.A. Tata McGraw Hill, New Delhi, 2003.
9. Engineering Economics by Pannerselvam – PHI Publications
10. Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P, "Engineering Economic Analysis",
11. Ostwald, P. F., "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle and Methods, 7th ed., Tata McGraw-Hill, New Delhi, 2010.
12. Industrial organization and engineering economics- by T.R. Banga & S.C. Sharma

CE 411 e) CONSTRUCTION PROJECT ECONOMICS

(ELECTIVE-III)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

Term work:

1. Term work shall consists of assignments based on above syllabus
2. Prepare a ABC – analysis report for a any construction project work and Economic order quantity (EOQ) report.
3. Assignments on NPV, IRR, Pay-back period, Break Even analysis problems.
4. Prepare a construction/ project financial report based on a site visit.

Practical examination:

It consists of oral examination based on the above term-work.

CE 411 f) ADVANCE SOIL ENGINEERING

(ELECTIVE-III)

Teaching Scheme:	**Examination Scheme:**	**Credit structure:**
Lectures: 4 hours per week	ESE: 80 marks	Theory: 04
	MSE: 20 marks	Practical: 01

Course objectives

To study the:

- IS code for ground improvement.
- Types of geosynthetics.
- Reinforced soil retaining walls and slopes.
- Use of geosynthetics in pavement.
- Various IS codes for deep foundation.

Unit I

Introduction: Selection of ground improvement techniques for foundation in weak soils - Guidelines. As per IS 13094: 1992

Unit II

Geosynthetics: Definition of geosynthetics. The terminology includes natural fibre materials such as coir, jute and hemp. Historical background of geosynthetics.Basic functions of geosynthetics and relevance to the environment. Different types of geosynthetics (nonwoven and woven geotextiles, geogrids, geonetsetc) and their exclusive functions and applications.

Unit III

Reinforced Soil Retaining Walls and Slopes:

Elements of a reinforced soil wall and function of each element, selection of each element, limit state approach, design principles, external and internal stability, codal provisions, FHWA and BS 8006, construction of RS walls, causes of failures, numerical example

Reinforced soil slopes, differences in design, modes of failure, example of a reinforced slope

Unit IV

Geosynthetics in Pavements:

1. Geosynthetics in unpaved roads – Giroud and Noiray approach (1981).
2. Geosynthetics in paved roads – Milligan, Houlbsy and others approach (1989-90).
3. Examples on unpaved and paved roads.
4. Reflective cracking applications.
5. Use in flexible pavements layers.

Unit V

Pile foundation:

Design of pile based on cyclic load test. Study of provision made in different IS codes related to deep foundation, various types of pile. Design of under reamed pile foundation subjected to tensile loads. Design of sand drains and stone columns. Introduction to software available for geotechnical foundation design.

Unit VI

Well foundation:

Study of various provisions made as per IRC and as per IS in respect of design of well foundation. Case studies of failure of well foundation. As per **IS: 1200 (Part 24) - 1983**

Course outcomes :

This course will enable the students to recognize the major geosynthetics applications and their significance. They develop the knowledge of problem solving, analysis and design. Students will understand various IS codes.

REFERENCE BOOKS:

1. Engineering Principles of Ground Modifications: *Manfred R. Hausmann*, Mcgraw Hill International.
2. Engineering with Geosynthetics, *Venkatappa Rao G.* and *SuryanarayanaRaju*, GVS, Tata McGraw Hill Publishing Co. Ltd.
3. Designing with Geosynthetics, *Koerner, R. M.*, Prentice Hall, NJ.
4. Designing in Geosynthetics, *Ingold*.
5. Foundation Analysis and Design- Joseph E. Bowels, TATA Mc-Graw hill
6. Design Aids in Soil Mechanics and Foundation Engineerimg-Shenbage R Kaniraj, TATA Mc-Grawhill

CE 411 f) ADVANCE SOIL ENGINEERING

(ELECTIVE-III)

(Laboratory)

Teaching Scheme	**Examination Scheme**
Practical: 2 hrs/week	ESE: 70 marks
	MSE: 30 marks

Term work will consist of :

1. Pictures/sketches of various types of geosynthetics.
2. Design of Pile foundations subjected to inclined load and tensile load.
3. Design of Sand Drains.
4. Comparative study of provisions for well Foundation as per IS, IRC and code adapted by Indian railways.
5. One site visit to any important deep foundation and submission of report on the same giving details of design and construction.
6. Any one case study of failure of foundation from the published literature.

CE 412 PROJECT WORK

Teaching Scheme	Examination Scheme	Credit Structure : 04
Practical: 2 hrs/week	ESE: 100marks MSE: 100 marks	

The topic for the Project Work may be from any Civil Engineering and Interdisciplinary Area related to Civil Engineering as mentioned below,

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

Project work will comprise of literature survey, problem formulation and analytical / experimental work.