**DEPARTMENT OF CIVIL ENGINEERING SYLLABUS**

**BACHELOR OF TECHNOLOGY**

**[2022-23]**

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**SIKKIM MANIPAL UNIVERSITY**

**FIRST YEAR B. TECH CURRICULUM 2022 (Common to all branches)**

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| Semester | GROUP A (FIRST SEMESTER)  **PHYSICS GROUP** | | | | | | GROUP B (FIRST SEMESTER  **CHEMISTRY GROUP** | | | | | |
| Sub. Code | Subject Name | L | T | P | C | Sub. Code | Subject Name | L | T | P | C |
| I | MA10101A | Engineering Mathematics–I | 3 | 1 | 0 | 4 | MA10101A | Engineering Mathematics–I | 3 | 1 | 0 | 4 |
| CE10101A | Elements of Civil Engineering | 3 | 0 | 0 | 3 | ME10102A | Element of Mechanical Engineering | 3 | 0 | 0 | 3 |
| PH10101A | Engineering Physics | 3 | 1 | 0 | 4 | CH10101A | Engineering Chemistry | 3 | 1 | 0 | 4 |
| EC10101A | Basic Electronics | 3 | 0 | 0 | 3 | EE10101A | Element of Electrical engineering | 3 | 0 | 0 | 3 |
| BA10101A | Communication Skills | 2 | 0 | 0 | 2 | CS10101A | Computer Programming in C | 3 | 1 | 0 | 4 |
| ME10101A | Engineering Graphics | 1 | 0 | 2 | 2 | CH11001A \* | Environmental Science\* | 2 | 0 | 0 | 0 |
| BP11001A \*\* | Constitution of India | 2 | 0 | 0 | 0 |  |  |  |  |  |  |
| ME10401A | Workshop Practice | 0 | 0 | 2 | 1 | CS10401A | Computer Programming Lab | 0 | 0 | 2 | 1 |
| PH10401A | Engineering Physics Lab | 0 | 0 | 2 | 1 | CH10401A | Engineering Chemistry Lab | 0 | 0 | 2 | 1 |
| GN10401A | Experiential Learning Lab-I/NCC | 0 | 0 | 2 | 1 | GN10402A | Experiential Learning Lab-II/NCC | 0 | 0 | 2 | 1 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| \*\* Optional audit course | | 17 | 2 | 8 | 21 |  | | 17 | 3 | 6 | 21 |
|  | Total Contact Hours (L + T + P) | | 27 | | | | Total Contact Hours (L + T + P) | | 26 | | | |
|  | **\*Mandatory audit course** | |  | | | | **\*Mandatory audit course** | |  | | | |
| II | GROUP A (SECOND SEMESTER) | | | | | | GROUP B (SECOND SEMESTER) | | | | | |
| MA10102A | Engineering Mathematics–II | 3 | 1 | 0 | 4 | MA10102A | Engineering Mathematics–II | 3 | 1 | 0 | 4 |
| ME10102A | Element of Mechanical Engineering | 3 | 0 | 0 | 3 | CE10101A | Elements of Civil Engineering | 3 | 0 | 0 | 3 |
| CH10101A | Engineering Chemistry | 3 | 1 | 0 | 4 | PH10101A | Engineering Physics | 3 | 1 | 0 | 4 |
| EE10101A | Element of Electrical engineering | 3 | 0 | 0 | 3 | EC10101A | Basic Electronics | 3 | 0 | 0 | 3 |
| CS10101A | Computer Programming in C | 3 | 1 | 0 | 4 | BA10101A | Communication Skills | 2 | 0 | 0 | 2 |
| CH11001A \* | Environmental Science\* | 2 | 0 | 0 | 0 | ME10101A | Engineering Graphics | 1 | 0 | 2 | 2 |
|  |  |  |  |  |  | BP11001A \*\* | Constitution of India | 2 | 0 | 0 | 0 |
| CS10401A | Computer Programming Lab | 0 | 0 | 2 | 1 | ME10401A | Workshop Practice | 0 | 0 | 2 | 1 |
| CH10401A | Engineering Chemistry Lab | 0 | 0 | 2 | 1 | PH10401A | Engineering Physics Lab | 0 | 0 | 2 | 1 |
| GN10402A | Experiential Learning Lab-II/NCC | 0 | 0 | 2 | 1 | GN10401A | Experiential Learning Lab-I/NCC | 0 | 0 | 2 | 1 |
| **\*Mandatory audit course** | | 17 | 3 | 6 | 21 | \*\* Optional audit course | | 17 | 2 | 8 | 21 |
|  | Total Contact Hours (L + T + P) | | 26 | | | | Total Contact Hours (L + T + P) | | 27 | | | |
|  |  | |  | | | |  | |  | | | |

Note: UHV–I has been introduced under Mandatory Induction Program.

**B. TECH in CVIL ENGINEERING (125 credits)**

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| **THIRD SEMESTER** | | | | | | | **FOURTH SEMESTER** | | | | | | | |
| **Year** | **Sub.**  **Code** | **Subject Name** | **L** | **T** | **P** | **C** | **Year** | **Sub.**  **Code** | **Subject** | **L** | **T** | **P** | **C** |
| **II** | MA10105A.10 | Engineering Mathematics – III | 2 | 1 | 0 | 3 | **II** | CE10107A | Numerical Methods & Statistics | 2 | 1 | 0 | 3 |
| CE10102A | Strength of Materials | 3 | 0 | 0 | 3 | CE10108A | Geotechnical Engineering - I | 3 | 0 | 0 | 3 |
| CE10103A | Fluid Mechanics & Hydraulics | 3 | 1 | 0 | 4 | CE10109A | Structural Analysis – I | 3 | 0 | 0 | 3 |
| CE10104A | Engineering Geology | 3 | 0 | 0 | 3 | CE10110A | Design of RC Structures - I | 3 | 0 | 0 | 3 |
| CE10105A | Surveying | 3 | 0 | 0 | 3 | CE10111A | Transportation Engineering | 3 | 1 | 0 | 4 |
| CE10106A | Building Materials & Concrete Tech. | 3 | 0 | 0 | 3 | CE10112A | Irrigation Engineering/ NCC | 3 | 0 | 0 | 3 |
| CE10401A | Planning & CA Drawing of Buildings | 0 | 0 | 2 | 1 | GN10101A | UHV-II | 3 | 0 | 0 | 3 |
| CE10402A | Geology Lab | 0 | 0 | 2 | 1 | CE10404A | Fluid Mechanics Lab | 0 | 0 | 2 | 1 |
| CE10403A | Surveying Lab | 0 | 0 | 2 | 1 | CE10405A | Material Testing Lab | 0 | 0 | 2 | 1 |
| CE10501A | Project Based Learning - I | 0 | 0 | 2 | 1 | CE10502A | Project Based Learning II | 0 | 0 | 2 | 1 |
|  | **Total** | **17** | **3** | **8** | **23** |  | **Total** | **20** | **2** | **6** | **25** |
| **FIFTH SEMESTER** | | | | | | | **SIXTH SEMESTER** | | | | | | | |
| **Year** | **Sub.**  **Code** | **Subject Name** | **L** | **T** | **P** | **C** | **Year** | **Sub.**  **Code** | **Subject** | **L** | **T** | **P** | **C** |
|  | GN10103A | Professional Communication &Technical Writing | 1 | 0 | 0 | 1 |  | CE10117A | Construction Planning & Management | 2 | 0 | 0 | 2 |
| **III** | CE10113A | Structural Analysis - II | 3 | 0 | 0 | 3 | **III** | CE10118A | Geotechnical Engineering II | 3 | 0 | 0 | 3 |
| CE10114A | Engineering Hydrology | 3 | 0 | 0 | 3 | CE10119A | Remote Sensing & GIS | 3 | 0 | 0 | 3 |
| CE10115A | Environmental Engineering | 3 | 0 | 0 | 3 | CE10120A | Design of Steel Structures | 3 | 0 | 0 | 3 |
| CE10116A | Design of RC Structures - II | 3 | 0 | 0 | 3 | CE10121A | Estimating, Costing & Valuation | 3 | 0 | 0 | 3 |
| CE102\*\*A | Open Elective II / MOOC / NCC | 3 | 0 | 0 | 3 | CE103\*\*A | Programme Elective I / MOOC | 3 | 0 | 0 | 3 |
| GN10102A | Behaviour Management and Leadership | 3 | 0 | 0 | 3 | CE102\*\*A | Open Elective III /MOOC / NCC | 3 | 0 | 0 | 3 |
| CE10406A | Computer Aided Structural Analysis & Design | 0 | 0 | 2 | 1 | GN11001A | Quantitative Aptitude & Logical Reasoning\*\* (T&P) | 0 | 0 | 0 | 0 |
| CE10407A | Environmental Engineering Lab | 0 | 0 | 2 | 1 | CE10408A | Geo Technical Lab | 0 | 0 | 2 | 1 |
| CE10901A | Industrial Training-I | 0 | 0 | 2 | 1 | CE1049A | Geoinformatics Lab | 0 | 0 | 2 | 1 |
| CE10503A | Project Based Learning III | 0 | 0 | 2 | 1 | CE10504A | Minor Project | 0 | 0 | 4 | 2 |
|  | **Total** | **19** | **0** | **8** | **23** |  | **Total** | **20** | **0** | **8** | **24** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **SEVENTH SEMESTER** | | | | | | | **EIGHTH SEMESTER** | | | | | | | |
| **Year** | **Sub.**  **Code** | **Subject Name** | **L** | **T** | **P** | **C** | **Year** | **Sub.**  **Code** | **Subject** | **L** | **T** | **P** | **C** |
| **IV** | CE102\*\*A | Open Elective - IV / MOOC / NCC | 3 | 0 | 0 | 3 | **IV** | CE10602A | Major Project/ Industrial Project – II | 0 | 0 | 24 | 12 |
| CE103\*\*A | Programme Elective II / MOOC | 3 | 0 | 0 | 3 |
| CE10902A | Industrial Training II | 0 | 0 | 2 | 1 |
| CE10601A | Research Project/ Industrial Project - I | 0 | 0 | 14 | 7 |
|  | **Total** | **6** | **0** | **16** | **14** |  | **Total** | **0** | **0** | **24** | **12** |

\*Industrial Trainings will be conducted during the summer vacations after IV and VI Semester and evaluated in V and VII Semester respectively.

\*\* GN11001A Quantitative Aptitude & Logical Reasoningis Optional Audit Course

**CE 10101A ELEMENTS OF CIVIL ENGINEERING**

(Common for First Year students of all branches)

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able

1. To understand the importance and basics of Civil Engineering, Architecture and Town-planning.
2. To understand the application of Building materials and analysis of Structures.
3. Students will be able to understand the fundamentals of Geotechnical Engineering and Earthquake Engineering and its effect on structures.
4. To understand the importance of Hydrology, Water resource and Environment Engineering.
5. To understand the fundamentals and importance of Surveying, Transportation Engineering and Civil Engineering Projects.

**MODULE 1**

**Introduction**

What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering; Possible scopes for a career. [02]

**History of Civil Engineering**

Early constructions and developments over time; Ancient monuments and Modern marvels; Development of various materials of construction and methods of construction. [02]

**Fundamentals of Architecture and Town Planning**

Aesthetics in Civil Engineering; Examples of great architecture; Fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities. [04]

**MODULE 2**

**Fundamentals of Building Materials**

Stones, bricks, mortars; Plain, Reinforced &Prestressed Concrete; Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing. [02]

**Structural Engineering**

Types of buildings; Tall structures; Various types of bridges; Water retaining structures; Other structural systems; Determinant and indeterminant structure. Types of Loads and Supports. Centroid and moment of Inertia.

**MODULE 3**

**Geotechnical Engineering**

Basics of soil mechanics; Basics of permeability and seepage; Basics of shear strength and compressibility; Types of foundations. [03]

**Elements of earthquake engineering**

Earthquake waves; Scale and magnitude; Seismic zones in India and world; Earthquakes in India, causes and effects; Reservoir-induced seismicity; Seismic zoning; Engineering consideration against earth quakes. [04]

**MODULE 4**

**Hydrology, Hydraulics, and Water Resources Engineering**

Hydrological cycle and Water budget equation; Hydrological factors; Basics of water supply systems; Extreme hydrological events; Rainwater harvesting. [04]

**Environmental Engineering**

Water treatment systems; Effluent treatment systems; Solid waste management.

[03]

**MODULE 5**

**Surveying & Geomatics**

Basic concepts of surveying; Contouring and levelling; Traditional surveying techniques; Total Stations; Digital Terrain Models; GPS; LIDAR. [04]

**Traffic &Transportation Engineering**

Highway development in India; Necessity for highway planning; Classification of roads; Road network patterns; Highway alignment; Factors affecting alignment; Different types of pavements; Factors influencing pavement design; Highway geometric parameters: width, camber, gradient, sight distances, super elevation, extra widening; Traffic signs, traffic signals. [04]

**Civil Engineering Projects**

Sequence of events in Civil engineering projects. Departmental bye laws. [02]

Total contact hours: **40**

**References:**

1. Ashok Kumar Jain and B.C. Punmia, Soil Mechanics and Foundations

2. K. Subramanya, Engineering Hydrology

3. M. Neville and J. J. Brooks, Concrete Technology

4. M. S. Shetty, Concrete Technology: Theory and Practice

5. Khanna and C.E.G Justo, Highway Engineering

6. B.C. Punmia, Surveying Vol. I

7. B.C. Punmia, Surveying Vol. II 8. Valdengrave Okumu , An Introduction to Civil Engineering

9. R.K. Rajput, Engineering Mechanics

**GN10401A Experimental Learning Lab (1st year)**

**List of exercises offered by Civil Engineering Department**

1. **Stability of floating object:** Determination of metacentric height of a floating body. Analogous to ship that remains stable and floats under various loading conditions.
2. **Turbines and hydroelectricity:** Process of hydroelectricity generation through turbines. AV containing the working various turbines included. Demonstration in the lab using Pelton wheel turbine and Francis turbine.
3. **Bridge building:** Constructing truss bridges and suspension bridges using popsicle sticks, floss and glue. Demonstration and working of structural models.
4. **Flow in Rivers and Channels:** Demonstration and working with miniature river/channel systems called hydraulic flumes to understand the nature of flow and measure the quantity of water flowing.
5. **Concrete and construction techniques:** Casting of concrete cubes and strength test. Types of concrete and its applications
6. **AV on Civil Engineering wonders:** Three gorges Dam, Burj Khalifa, Taipei 101, Veluwemeer Aqueduct, Palm islands etc and.

References:

1. R.K. Bansal, Fluid Mechanics and Hydraulic Machines

2. R.K. Rajput, Fluid Mechanics and Hydraulic Machines

3. John Cimbala and Yunus A Çengel, Fluid Mechanics: Fundamentals and Applications

4. M. S. Shetty, Concrete Technology: Theory and Practice 5. Murari Lal Gambhir, Concrete Technology

6. M. A. Jayaram, Design of Bridge Structures

7. N. Krishna Raju, Design of Bridges

8. Link: <https://www.youtube.com/watch?v=NmoJktAUueg>

9. Link: <https://www.youtube.com/watch?v=NJI8mOv4VW4>

10. Link: https://www.youtube.com/watch?v=WnZbySHm9Qs

**CE10102A STRENGTH OF MATERIAL**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To determine the resultants of coplanar Concurrent and Non-concurrent force system.
2. To find the SFD and BMD of determinate beams.
3. To solve the problems related to simple stresses and strains.
4. To evaluate bending stress and shear stress distribution in beams.
5. To analyse the problems related to torsion and compression members.

**Module – 1**

**Coplanar Concurrent And Non-Concurrent Force System**

Resultant of a force system, Concept of free body diagrams, Lami’s theorem. Moment of a force, couple, properties of couples, resultant of non-concurrent force system, conditions of equilibrium, Types of Supports, Types of loads, Equilibrium equations, Reaction forces.

[08]

**Module – 2**

**Shear force and Bending moment diagram**

Shear force and Bending moment, Sign convention, Relationship between load intensity, Shear force and Bending moment, Point of Contra-flexure, SFD and BMD of beams subjected to various loads.

[07]

**Module – 3**

**Simple Stresses and Strains**

Mechanical properties of materials, concept of stresses and strains, stress-strain diagrams, yield stress, ultimate stress, limit of proportionality, elastic limit, working stress , factor of safety, Hooke’s law, Young’s modulus(Modulus of elasticity), rigidity modulus, bulk modulus, Poisson’s ratio, relationship among the elastic constants, bars of varying cross sections, elongation due to self-weight; Numerical problems.

[06]

**Module – 4**

**Stresses in Beams**

Simple bending theory, derivation of pure bending equation, section modulus, moment of resistance, modulus of rupture, derivation of shear stress in beams, shear stress distribution across rectangular, triangular and circular sections, problems.

Stress at a point in a general two dimensional stress system, principal stresses, principal planes, maximum shear stress, shear plane, Mohr Circle.

[10]

**Module – 5**

**Torsion of circular Shaft and Axially loaded compression members**

Pure torsion, derivation of pure equation, transmission of power, polar modulus of section, strength and stiffness of solid and hollow shafts, Equivalent moment and equivalent torque, problems.

Classification, definition of effective length, slenderness ratio, critical load, derivation of Euler’s equation for a column hinged at both ends, Rankine-Gordon formula

[07]

Total Contact Hours – **38**

**Reference Books:**

**Name of book Author(s) Publisher(s)**

1. Strength of Materials S.S.Bhavikatti Vikas

2. Strength of Materials R.K. Rajput S. Chand

3. Strength of Materials Khurmi&Khurmi S. Chand

4. Strength of Materials S.Ramamrutham Dhanpat Rai

5. Elements of Strength of Materials Timoshenko and Young EWP

**CE10103A FLUID MECHANICS & HYDRAULICS**

**[ 3 1 0 4]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understand the significance of fluid properties and explain its effects in a flow system.
2. Describe the motion of fluid particles and use Euler’s and Bernoulli’s equations to solve fluid flow problems.
3. Determine the losses in flow through pipes and calculate hydraulic coefficients.
4. Solve non-uniform flow problems in open channels and calculate the discharge in free surface flows.
5. Design models and prototypes using similitude concept and understand the theory of boundary layer and flow separation.

**MODULE– 1**

**Properties of fluids**

Specific weight, mass density, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Classification of fluids – ideal and real fluids, Newtonian and non-Newtonian fluids, compressible and incompressible fluids. [08]

**MODULE – 2**

**Continuity, momentum and energy equations and their applications**

Introduction, methods of describing fluid motion- Lagrangian and Eulerian approach. Continuity equation in differential form in Cartesian co-ordinates, continuity equation in one dimensional flow. Euler’s equation of motion in one dimension, Bernoulli’s equation, limitation and modification of Bernoulli’s equation. Application of Bernoulli’s equation, venturi meter, orifice meter and pitot tube. [10]

**MODULE – 3**

**Flow through pipes**

Darcy-Weisbach equation for flow through pipes, friction factor, minor losses, pipes in series and parallel, equivalent length, pipe network analysis. Flow through orifices and mouth pieces. Classification of orifice and mouth pieces, Hydraulic coefficients. [10]

**MODULE – 4**

**Open Channel Hydraulics**

Introduction to free surface flow (Uniform and Non-uniform Flows), Chezy’s and Manning’s formulae, Classification of flow, Energy-depth relationships, specific energy, critical flow, hydraulic jump, uniform flow, gradually varied flow and water surface profiles. Flow through notches and weirs, Rectangular, triangular, trapezoidal notches, broad crested weir. [12]

**Module – 5**

**Hydraulic Similitude and Boundary layer flow**

Introduction to Dimensional Analysis, Model studies, similitudes, dimensionless parameters, significance of dimensionless numbers, Reynolds, Froude, Euler, Mach and Weber number, model laws, Reynolds law, Froude’s law, undistorted and distorted models, scale effect.

Boundary layer concept, drag coefficients, control of boundary layer. [10]

**Total contact hours: 50**

**Reference Books**

1. Kumar K L, **Engineering Fluid Mechanics**, Tata McGraw Hill, New Delhi
2. Shames, **Mechanics of Fluids**, McGraw Hill Book Co.
3. SOM, **Fluid Mechanics and Machines**, Tata McGraw Hill New Delhi.
4. Mohanty, **Fluid Mechanics**, Prentice Hall of India, New Delhi
5. Jain A K, **Fluid Mechanics**, Khanna Publishers, New Delhi.
6. Modi P N and Seth S M, **Hydraulic and Fluid Mechanics**, Standard Book House, New Delhi.
7. Chow, Vente, **Open Channel Hydraulic**, Tata McGraw Hill Publishing, Delhi
8. Raghunath H.M, **Fluid Mechanics and Machinery**, CBS Publishers, New Delhi
9. Subramanya K, **Theory and Applications of Fluid Mechanics**, Tata McGraw Hill
10. Streeter V L and Wiley E B, **Fluid Mechanics**, McGraw Hill Co.
11. Garde R L, **Fluid Mechanics through Problems**, New Age International.

**CE10104A ENGINEERING GEOLOGY [3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the properties of minerals and rocks, processes of their formation, and their relevance in Civil Engineering.
2. Interpretation of various geological structures, their roles and influences on Civil Engineering planning and construction.
3. Applying the concept of hydrogeology for assessment and management of water resources
4. Analysing the geological set-up to evaluate suitability of sites and stability of Civil Engineering structures.
5. Understanding the working principles and applications of various geophysical techniques for interpretation of the subsurface geology.

**MODULE 1**

**Introduction**

Geology and Civil Engineering, earth as a planet, its structure and composition.

[02]

**Petrology**

Sources of rocks, minerals, definition, physical proportion of important rock forming and ore minerals, Rock types (Igneous, Sedimentary, Metamorphic), texture and structure in rocks, Rock cycle, Engineering properties of rocks. [06]

**MODULE 2**

**Physical Geology**

Weathering of rocks, kinds of weathering, agencies, causes and products of weathering. Geological works of wind, running water (rivers), glaciers, and groundwater on rocks. [04]

**Structural Geology**

Outcrop, dip and strike, clinometer, compass. Definition, different parts of folds, faults, joints and unconformity and their recognition in the field and their importance in Civil Engineering projects. [04]

**MODULE 3**

**Engineering Geology**

Geological consideration in selection of sites for dams and reservoirs, tunnels, bridges and highways, landslides – their causes and prevention. Earthquake waves, seismic zones of India and world, earthquakes in India, causes and effects, micro-seismic zoning, engineering consideration against earth quakes. [08]

**MODULE 4**

**Rock Mechanics**

Introduction to rock mechanics and rock engineering, simple failure criteria, Rock masses: strength, deformability, failure criteria, Rock mass classification schemes: Q and RMR, Foundations and slope stability: foundations on discontinuous rock, slope instability basic mechanisms and static equilibrium solutions, Q and RMR. [08]

**MODULE 5**

**Geophysical Techniques**

Different types of geophysical techniques, theories, applications, instruments, advantages and disadvantages, Various applications. [04]

**Hydrogeology**

Occurrence of ground water, types of aquifers, geo-hydrological zones in India, groundwater development in India, Selection for well sites, application of geological and geophysical methods, electrical resistivity, seismic refraction, gravity and magnetic methods. [04]

Total contact hours: **40**

**Reference Books:**

1. Mukherjee P K, **A Text Book of Geology.**
2. Breth F G H and De Freitas, **Geology for Engineering**.
3. Krayrine and Judd, **Principles of Engineering Geology and Getechniques**.
4. Gokhale W, **Manual of Geological Maps** (1987) CBS Publishers, New Delhi.
5. Fetter C W, **Applied Hydrogeology** (2000), Prentice Hall; 4 edition
6. Singhal BBS and Gupta RP, **Applied Hydrogeology of Fractured Rocks** (1999), Springer
7. Goodman R E, **Introduction to Rock Mechanics** (1989), Wiley, 2nd edition.

**CE10105A SURVEYING –I [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basics principles of different methods of plane surveying.
2. Understand the idea and concept of various methods of surveying.
3. Applying the techniques of modern tools to find the measurements in horizontal and vertical plane
4. Understanding the various way to collect data from field in plane table surveying
5. Analysing the field data to calculate the Reduced level of any point on ground.

**Module 1:**

**Introduction**

Principle of surveying, methods, plane and geodetic, principles of chain surveying – chain and tape survey of a field. Maps - scale, coordinate system, Principles, use and adjustment of prismatic compass and surveyors compass, bearings and included angles, declination, local attraction, plotting of open and closed traverses

[06]

**Module 2:**

**Leveling**

Terms and definitions, differential leveling, checking of levels, reducing errors and mistakes in leveling, collimation correction, curvature and refraction, profile leveling, cross sections, reciprocal leveling, contouring - applications and uses

[06]

**Module 3:**

**Tachometry**

Measurement of horizontal and vertical angles, height and distance formulae, theodolite traverse, electronic theodolite. Principles, methods – analytic tacheometer, distance and elevation formulae for horizontal and inclined site with staff vertical and normal.

[08]

**Module 4:**

**Curves**

Introduction, simple curve, basic definition, compound curve, reverse curve, transition curve, lemniscate curve, vertical curve, design of vertical curve.

[09]

**Module 5:**

**Photogrammetric Survey**

**(a)** Terrestial : principles, photo-theodolite, horizontal and vertical distances of points from photographic measurements.

**(b**: Aerial camera, scale of vertical photograph, drag and lift computation of flight plane.

[07]

Total contact hours: 36

**Reference Books:**

* 1. Kanetkar T P and Kulkarni S V, **Surveying and Levelling Part I & II** , Pune VidyarthiGrihaPrakashana, Pune.
  2. Devid Clark, **Plane and Geodetic Surveying for Engineers, Vol I & II,** CBS Publication
  3. Norman Thomas, **Surveying,** Edward Arnold Publishers (ELBS) London.
  4. Arora K R, **Surveying Vol. I & II**, Standard Book House New Delhi
  5. Punmia B.C, **Surveying Vol. I & II,** Lakshmi Publications, New Delhi
  6. NN Basak, surveying and Levelling, Paperback

**MA 10105A.10 ENGINEERING MATHEMATICS – III [ 2 1 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

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

1. Apply Fourier Analysis in real life problems
2. Understand and solve partial differential equations.
3. Apply Vector calculus in hydraulic analysis.
4. Implement probability to make improvements in infrastructure projects.
5. Understand the probability distribution which the structures follow.

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| --- | --- | --- |
| **Module** | **Topics** | **Hrs** |
| Module 1:  **Fourier Analysis** | Periodicfunctions,TrigonometricSeries,Fourierseries,Fourierseriesofoddandevenfunctions,functionswitharbitraryperiod,halfrangeexpansion,Fourierintegrals,Fouriertransforms, Fourier sine and cosine transforms, Convolution theorem(statement only). | 8 |
| Fourier sine and cosine transforms. |  |
| Module 2:  **Partial Differential Equation** | Definition, degree, order of a PDE.Formationof PDE.LinearandnonlinearPDE.Solutionof first order linear PDE. Lagrange’s method, Charpit’s method. Solution of higher order PDE by direct integration. Solution of higher order linear PDE with constant coefficients, homogeneous and non-homogeneous equations. Derivations of one dimensional wave equation (vibrating string) and its solutions by using method of separation of variables.Solutionof2D-Laplace’sequation. | 10 |
| Derivation of one dimensional wave equation (vibrating string). |  |
| Module 3:  **Vector Calculus** | Gradient, divergence and curl and their physical meaning and identities. Line, surface and volume integrals. Simple problems. | 6 |
| Related problems of Line integral. |  |
| Module 4:  **Probability Theory** | Introduction to Probability: Finite sample space, conditional probability and independency,Baye'stheorem,onedimensionalrandomvariable,mean,varianceandexpectation,Chebyschev'sinequality,Twoandhigherdimensionalrandomvariables,covariance,correlationcoefficients | 8 |
| Related problems of Random variables. |  |
| Module 5:  **Probability distributions** | Leastsquaresprincipleofcurvefitting,Distributions:Binomial,Poisson,Uniform, Normal, Gamma, Chi square and exponential, simple problems | 4 |
| Numerical problems related to Probability distributions. |  |
|  |  |

**Text Books:**

1. C. E. Weather burn: Vector Analysis, G Bells &Sons

2. P. L. Meyer, Introductory Probability and Statistical Application – Addison-Wesley Publishing Company.

3. Erwin Kreyszig : Advanced Engineering Mathematics,Wiley

4. I. Sneddon, Elements of Partial Differential Equations, Dover Publications INC

5. S.C. Gupta & V.K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons

**Reference Books:**

1. S. M. Ross: Introduction to probability and statistics for engineers and scientists, Pearson

2. Murray R. Spigel : Vector Analysis, Schaum Outline Series

**CE10106A BUILDING MATERIALS AND CONCRETE TECHNOLOGY**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understand and describe need for modern techniques and new materials in construction industry and to select materials for engineering purpose is very much crucial activity based its properties, suitability, strength and durability. Component in building,
2. Illustrate and explain the main process of building construction to enrich civil engineering technicians in performing their jobs with ease and confidence and will be able to select appropriate material for the given item of work on site. Identify the various building components in detail and interpret drawing and give layout on the field of given structure construction for any building.
3. Identify and analyse the properties and role of ingredients like cement, aggregate, admixtures etc. to produce better quality concrete, admixtures and its types, workability of concrete.
4. Apply and design concrete mix, hardened concrete, and special concrete and apply design mix concepts to produce concrete with adequate strength and durability. Properties of materials, Supervise the construction work of buildings,
5. Ability to identify the current codes related to green building and green rating systems. Understand behavior and characteristics of perform destructive, semi-destructive and non-destructive tests for concrete.

**MODULE 1:**

**Construction Materials**

Tiles: For flooring, roofing and decorative – properties and uses. Lime: Properties and uses. Timber: Varieties, properties, uses, defects, seasoning and preservation. Doors and Windows Different types of doors and windows with necessary sketches. Flooring Granolithic, concrete, marble, and terrazzo flooring including methods of laying. Brick Masonries Bricks: Types, refractive and modular bricks and their application. Bonds in bricks, reinforced brick work, hollow block construction and rat trap masonry.

[08]

**MODULE 2:**

**Components of Building**

Foundations Introduction to different types of foundations – masonry footing, isolated, combined and strap, RCC footings, raft foundation, friction piles and bearing piles, caissons and coffer dams. Walls Load bearing and partition walls, damp proof construction for walls and floors. Roofing Sloped roofs – lean to, coupled and collared roofs, king post and queen post trusses. Stairs Types of R.C. stairs with sketches. Plastering and Painting Colour washing, White washing and distempering of walls. Reinforced Concrete Construction Lintels, beams, slab, and chejjas – functions, methods of construction and detailed sketches, form work details for R.C.C. columns, beams and slabs.

[09]

**MODULE 3:**

**Concrete Technology**

Concrete Technology Fresh Concrete: Definition, Cement: Types, composition, properties and uses. Coarse aggregate and fine aggregate, properties and uses. Physical tests on ingredient of fresh concrete as per I.S. Quality of water and water cement ratio, segregation, and bleeding. Mix design, proportion, batching, workability, mixing, placing, compacting, various methods of curing, Test on fresh concrete as per IS.

[08]

**MODULE 4:**

**Admixtures**

Admixtures: A brief description on commonly used admixtures and their effects on concrete. Types, properties and uses. Effect on water cement ratio.

[05]

**MODULE 5:**

**Properties and design of concrete**

Hardened Concrete: Maturity, creep, shrinkage, Destructive and non-destructive tests as per IS: 13311 Mixed Design: as per IS: 10262.

[06]

**Total contact hours: 36**

**Reference Books:**

1. Shetty M S**, Concrete Technology**, S. Chand and Co, New Delhi

2**. I.S Hand Book on Mix design,** BIS New Delhi

3. Punmia B C, **Building Construction**, Lakshmi Publications, New Delhi.

4., [J. Brooks](https://www.amazon.in/s/ref=dp_byline_sr_book_3?ie=UTF8&field-author=J.+Brooks&search-alias=stripbooks), **Concrete Technology**, Harlow, England ; New York : Prentice Hall, 2010.

5. S. C. Rangwala, **Engineering Materials**.

**CE10107A NUMERICAL METHODS & STATISTICS**

**[ 2 1 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understanding and remembering the important formulae and equations for numerical analysis.
2. Executing various numerical techniques and methods for problem solving.
3. Applying the differential techniques, interpolation and integration for determining response of beams.
4. Evaluating the various solution of non-linear and differential equations.
5. Analysing and justifying solutions based on curve fittings techniques.

**Module – 1:**

**i) Linear Algebraic Equations**

(a) Gauss Elimination method

(b) Gauss Jordan Elimination Method

(c) Choloskey Decomposition method

(d) Gauss Siedal and Jacobi Iterative methods.

**ii) Solution of Non-linear Equations**

(a) Bisection method

(b) Newton - Raphson method

[08]

**Module – 2:**

**i) Numerical Integration**

(a) Trapezoidal rule

(b) Simpsons rule

(c) Gaussian Quadrature

[04]

**ii)Numerical Differentiation**

(a) Forward Difference

(b) Backward Difference

(c) Central Difference

(d) Taylor Series [04]

**iii) Solution of Differential Equations**

(a) Runge – Kutta method

(b) Adams – Bashforth method

[03]

**Module – 3:**

1. **Descriptive Statistics**

Measures of Central Tendency

Measures of Dispersion

Measures of Skewness

Measures of Relationship [06]

1. **Testing of Hypothesis**

Basic concepts concerning Testing of Hypothesis

Procedure of Hypothesis Testing [03]

**Module – 4:**

**Analysis of Variance**

Basic principle of ANOVA

One Way ANOVA

Two Way ANOVA

Analysis of Co-variance (ANOCOVA) [06]

**Module – 5:**

**Linear Regression Analysis**

Dependent and Independent variables

Simple Linear Regression Model

Multiple Linear Regression Model [06]

Total contact hours: **40**

**Reference Books:**

1. Dr. P. Kandasamy, **Numerical Methods**, S.Chand, New Delhi.
2. Krishnaraju N and Muthu K U, **Numerical Methods for Engineering Problems**, Macmilan India, New Delhi.
3. Sastry S S, **Introductory Methods of numerical Analysis**, Prentice Hall of India
4. Rajasekaran S, **Numerical Methods for Science and Engineering**, Wheeler and Co.Pvt Ltd.
5. C.R. Kothari and Gaurav Garg, **Research Methodology, New Age International (P) Limited, Publishers.**

**CE10108A GEOTECHNICAL ENGINEERING – I**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To remember and understand the various physical properties of soil like void ratio, dry density etc.
2. To apply the physical properties in order to calculate effective stresses.
3. To evaluate the permeability, seepage and distribution of stresses with help of the basic soil properties and effective stresses.
4. The student will be able to analyze the risk involved in construction due to excessive settlement with help of the physical properties
5. The student will be able to evaluate the shear strength of soil.

**Module – 1:**

**Index Properties and Soil Classification**

Soil as a three phase material, physical properties of soil – specific gravity, void ratio, porosity, degree of saturation, bulk density, dry density, saturated density, relative density, moisture content, inter-relationships between them, Atterberg’s limits,.

IS classification of soils. sieve analysis, hydrometer analysis, field identification of soils

[08]

**Module – 2:**

**Flow through Soils**

Concept of permeability, Darcy’s law, factors affecting permeability, laboratory determination of permeability of soils, permeability of stratified deposits, principles of effective, neutral and total stresses, Various Cases of and their effective stress calculations and capillarity in soils.

[08]

**Module – 3:**

**Seepage through Soils**

Cases of Upward flow, Downward flow and no flow. Laplace equation (no derivation), flow nets, their properties and applications, phreatic line, piping, graded filters. quick sand condition

[07]

**Module – 4:**

**Compaction of Soils and Stress Distribution in Soils**

Optimum moisture content, maximum dry density and zero air voids line, factors affecting compaction, IS light and heavy compaction tests.

Assumptions in stress distribution, limitations and comparison of Boussinesq’s and Westergaard’s theory for stresses in soils, use of Boussinesq’s and Westergaard’s equations for determination of stress distribution (no derivation) for point load, and uniformly loaded circular and rectangular areas.

[07]

**Module – 5:**

**Compressibility of Soils**

Concept of consolidation of soils, definition of - compressibility index, coefficient of compressibility, coefficient of volume compressibility, normally consolidated, pre-consolidated, over consolidated and under consolidated soils, one dimensional consolidation – Terzaghi’s theory ( no derivation), consolidation test, Casagrande’s method for determination of pre-consolidation pressure.

[06]

Total contact hours: **36**

**Reference Books**:

1. Das B M, **Principles of Geotechnical Engineering,** Cengage Learning India Pvt. Ltd
2. Punmia P C, **Soil Mechanics and Foundations**, Laxmi Publications Pvt. Ltd.
3. Murthy V N S, **A Text Book of Soil Mechanics and FoundationEngineering**, Sai Kripa Technical Consultant, Bangalore.
4. Gopal Ranjan and Rao A S R, **Basic and Applied Soil Mechanics**, New Age International
5. Terzagi K and Peck R B, **Soil Mechanics in Engineering Practice,** A Wiley International
6. Taylor D W , **Fundamentals of Soil Mechanics**, Asia Publishing House, Bombay
7. Ramiah B K and Chickanagappa L S, **Hand Book of Soil Mechanics andFoundation Engineering**, Oxford and IBH
8. Lambe T W and Whitman R V, **Soil Mechanics - SI version**, John Wiley and Sons.

**CE10109A Structural Analysis I [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the concept of indeterminacy and stability of structures.
2. Analysis of determinate beams and trusses.
3. Evaluation of shear stresses, bending stresses and combined stresses developed in structures.
4. To determine the slope and deflection of beam.
5. To understand the concept of Torsion and axially loaded Compression member and its application in real life structures.

**Module 1: Introduction**

Determinate and indeterminate structures, Degree of freedom, stable and unstable structures.

[03]

**Module 2: Deflection of beams**

Derivation of Double Integration Method, slope and deflection of statically determinate beams loaded with various type of loading. Slope and deflection by (a) Moment area method (b) Conjugate beam method.

[08]

**Module 3: Strain Energy**

Strain energy, strain energy due to axial force and bending moment, virtual work on rigid and elastic bodies, principle of virtual work, and Castigliano’s theorem, Unit load method, Betti’s theorem, Maxwell’s law of reciprocal deflections, Problems.

[08]

**Module 4: Analysis of Plane Trusses**

Analysis of plane trusses by method of joints, method of sections,and Maxwell Diagram. Deflection of trusses by unit load method.

[11]

**Module 5: Three hinged arches, Cables and Suspension bridges**

Analysis of three hinged parabolic and semi-circular arches. Determination of horizontal reaction, normal thrust, radial shear and bending moment. Analytical solution of cable structure, length of a cable, three hinged suspension bridges with stiffening girder

[08]

Total Contact Hours – **38**

**Reference Books:**

**Name of book Author(s) Publisher(s)**

1. Strength of Materials S.S.Bhavikatti Vikas

2. Structural Analysis-I S.S.Bhavikatti Vikas

3. Elements of Strength of Materials Timoshenko and Young EWP

4. Theory of Structures S. Ramamrutham Dhanpat Rai P C

5. Theory of Structures Pumina, Jain & Jain LP

6. 5. Theory of Structures Khurmi&Khurmi S. Chand

7. Structural Analysis R.C. Hibbler Pearson

**CE10110A DESIGN OF RC STRUCTURES – I [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Apply the direct design method to design the Flat Slab
2. Understanding the basic concepts of design for slender column.
3. Description of various methods of R.C.Design.
4. Applying the different methods to design the different kind of beams and slabs.

5. Design of compression member

**Module 1:**

**Design by Working Stress Method**

Role of reinforcement, behavior of RCC sections, Principles of design of reinforced concrete members – Straight line theory, assumptions, determination of neutral axis, determination of stress and strain due to bending moment Basic concepts of design for bending moment and shear forces - under reinforced, over-reinforced and balanced beam. Design of singly/ Doubly reinforced sections. [07]

**Module 2:**

**Limit State Method**

Principle of limit state method of design, characteristic loads, characteristic strength, partial safety factors, stress strain characteristics of concrete and steel. Introduction to stress block parameters for collapse, limit state of serviceability.

[08]

**Module 3:**

**Limit State Design of Beams and Slabs**

Design of rectangular beams (singly and doubly reinforced), design for shear and torsion.

Limit state design of one way and two-way slabs for various boundary conditions

[12]

**Module 4:**

**Limit State Collapse in Compression**

Limit state collapse in compression: design of axially loaded short RC columns of square/ rectangular cross-sections under axial loading.

[04]

**Module 5:**

**Column footing**

Types of footing, design of isolated footing.

[05]

**Total Contact Hours: 36**

**Reference Books:**

1. Shah H J, **Reinforced Concrete Vol.I,**Charotar .
2. Sinha N.C and Roy S.K, **Fundamentals of Reinforced Concrete**, S Chand .
3. Shah N L and Karve S R, **Illustrated Reinforced Concrete Design**,
4. Karve S R and Shah Limit **state Theory and Design of Reinforced Concrete**.
5. Jain A K **Reinforced Concrete – Limit State Design**.

6. Mallick& Gupta **Reinforced concrete Design**

7. P.C. Varghese **Limit State Design of Reinforced Concrete**

8. Pillai and Menon **Reinforced Concrete Design**, Tata McGraw Hill

9. **IS 456 – 2000** Code of Practice for plain and reinforced concrete.

10. **SP-16 -1980** Design Aids for Reinforced Concrete IS 456 – 1978.

**CE10111A TRANSPORTATION ENGINEERING**

**[ 3 1 0 4 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the interactions between transportation planning and land use planning, economics, social planning and master plans.
2. To understand the principles and practices of transportation engineering and urban transportation planning.
3. Application of the basics of the geometric design of highways.
4. To develop knowledge about the different concepts of traffic engineering including traffic control, highway capacity, level of service etc.
5. To undertake various Traffic studies and apply the knowledge in planning and design of pavement and geometrics.

**Module– 1:**

**Introduction**

Importance of transportation, Different modes of transportation, Historical Development, Classification of roads, road patterns, master plans, road development plans, PMGSY, engineering surveys, Highway planning survey, location, soil surveys. Highway Materials and Testing: Subgrade soil, sub base and base course materials, bituminous materials, quality control tests, testing of soil, stone aggregates and bitumen.

[07]

**Module– 2:**

**Geometric Design of Highways and Traffic Engineering**

Cross-sectional elements, horizontal and vertical alignments, Width, camber, gradient, sight distances, horizontal and vertical alignment, radius of curvature, super elevation, curve resistance, grade compensation.

[07]

Traffic characteristics, Traffic studies, Traffic flow characteristics, traffic control devices. Traffic studies on Flow, Speed, Travel time - delay and O-D study, PCU, , Parking study, Accident study, Microscopic and macroscopic parameters of traffic flow, Control devices, Highway capacity and Level of Service.

[06]

**Module – 3:**

**Highway Pavements**

Earthwork, construction of various layers of the pavements, flexible pavement and their design, IRC: 37-2012 method of design, Rigid pavement and their design, IRC: 58-2011 method of design, causes of failures of pavements, joints in concrete pavements.

[06]

**Module – 4:**

**Railway Engineering**

Introduction, Permanent Way and Components, History and administrative setup of Indian Railways; rail gauges, Component parts, ballast, sleepers, rails, fastenings, railway creep, anti-creep devices, guard rails, maintenance and improvement of permanent way, drainage.

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Geometric design of railway Track – Speed and Cant.

[12]

**Module–5:**

**Airport**

Factors to be considered in airport planning, ICAO classification of airports, site selection, airport surveys.

Runway length, width, sight distance, grades and change of grades, taxiways, aprons, orientation of runway, effect of wind direction and cross wind component including wind rose diagram.

Visual Aids – night aids, instrumental landing systems and their functioning.

[04]

Total contact hrs: **42**

**Reference Books:**

1. Khanna and Justo, **Highway Engineering**.
2. Hewes, **Highway Engineering**.
3. Sehgal and Bhanot, **A Text Book of Highway Engineering**.
4. Vazirani and Chandola, **Transportation Engineering Part I**
5. Kadiyali L R, **Traffic and Transportation Planning**.
6. Nayak B S, **A Book on Maintenance Engineering for Civil Engineers**.
7. R Srinivasa Kumar, **Transportation Engineering**
8. Khanna, Arora and Jain, **Airport Planning and Design**.
9. Sehgal and Bhanot, **A Text Book on Highway Engineering and Airport**
10. Rangwala, **Railway Engineering**
11. Satish Chandra and M.M. Agarwal, **Railway Engineering**

**CE10112 A IRRIGATION ENGINEERING [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To remember various aspects of distribution of water in a irrigation system
2. To understand the governing factors for water requirements of crops.
3. To apply different theorems to find out sediment transport.
4. To analyze different factors for reservoir site selection without affecting the surrounding environment.
5. To understand the basic components of river training works.

**Module 1:**

**Introduction**

Definition, necessity, benefits and ill-effects of irrigation, classification of irrigation projects, types of irrigation systems, their merits and demerits, methods of distribution of water, comparative study of these methods, need for planned utilization of water resources.

[05]

**Module 2:**

**Water Requirements of Crops**

Introduction, functions, factors affecting, quality of irrigation water, main crops and their seasons, consumptive use of crops and irrigation requirements, irrigation efficiencies, duty, delta, base period, relationship among them, related terms, estimation of design discharges, storage capacities, factors affecting duty and measures to improve duty, soil moisture contents, depth and frequency of irrigation, assessment of irrigation water charges.

[08]

**Module 3:**

**Sediment Transport and Design of Irrigation Channels**

Importance of sediment transport, sediment load, bed formation, mechanics of sediment transport, shield’s diagram, regime channel.

[05]

**Module 4:**

**Water Logging, Salinity and Rivers, Their Behaviour, Control and Training**

Definition of salinity and water logging, causes of water logging, water logging control, leaching, open drainage, tile drainage and reclamation of saline lands. Importance of rivers and necessity of controlling them, types of rivers and their characteristics, classifications of rivers, behaviour of rivers, control and training of rivers, methods of river training.

                                                           [12]

**Module 5:**

**Gravity dams, Spillways and Earth dams**

Non-overflow section, forces acting on gravity dams, design of gravity dams by step method, introduction to other methods like trail load, finite element, slab analogy etc., stresses in dams, stress concentration in openings of dams, design of sluices, air vents and galleries, Types of spillways, design of spillways, energy dissipators, gates, types of hoists. Investigations, design of cross section of dams, slope stability analysis, settlement analysis.

[10]

Total contact hrs: **40**

**Reference Books:**

* 1. Punmia B C, and Pande B B, **Irrigation and Water Power Engineering**, Standard Publishers, New Delhi.
  2. Sharma R K, **Irrigation Engineering and Hydraulic Structures**, Oxford and IBH
  3. Garg S K, **Irrigation Engineering and Hydraulic Structures**, Khanna

Publishers.

* 1. Modi P N, **Irrigation, Water Resources and Water Power Engineering**.
  2. Priyani V B, **Fundamental Principles of Irrigation and Water Power**, Chartor Book Stall, TulasiSadan, Station Road, Anand
  3. MichealA M, **Irrigation Theory and Practice**, Vikas Publishers, N.Delhi.
  4. Singh Bharath, Nemchand and Bros, Roorkee, **Fundamental of Irrigation Engineering.**
  5. Cregar, **Engineering of DamsVol I, II and III**, Justin and Hinds-Wiley Elsevier, N Delhi
  6. Houk John Wiley New York, **Irrigation Engineering Vol I & II**
  7. Sharma K R, Sri Sunder Das, **Irrigation Engineering Vol I & II,** Noble Book Service New Rajendra Nagar New Delhi.
  8. Arora K R ,**Irrigation, Water Power and Water Resources Engineering**

**CE10113A STRUCTURAL ANALYSIS-II [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To apply the concept of strain energy to find the slope and deflection of beams and trusses.
2. To understand the mechanism of arches, cables and suspension bridges and analysis of these type of structures.
3. Description of various analysis approaches available for the analysis of Indeterminate structures and its application.
4. Analysis of Indeterminate beams.
5. Analysis of Indeterminate frames.

**Module 1: Analysis of simple statically indeterminate beams by:**

(a) Consistent deformation method

(b) Three-moment method.

[07]

**Module 2: Analysis of Indeterminate beams and frames by:**

(a) Slope deflection method: Degree of freedom, Fixed end moments, derivation of slope – deflection equation, slope-deflection equation for beams and frames, problems.

(b) Moment distribution method: Steps of moment distribution method, distribution factor at a pinned end and at a fixed end, problems.

(c) Kani’s Method: Introduction, Application to indeterminate beams non-sway and sway portal frames**.**

[10]

**Module 3: Analysis of Multistorey Frames by Approximate Methods**

Introduction, Substitute frame method, Portal method, Cantilever method, Factor method, Problems.

[07]

**Module 4: Unsymmetrical bending, shear center and Theories of Failures**

Introduction, Principal moment of Inertia, Stresses in Beam due to Unsymmetrical Bending, Shear Centre.

Theories of Failures, Max Principal stress theory, Max strain theory, Max shear stress theory, Max strain energy theory, and Max distortion energy theory.

[07]

**Module 5: Influence line diagram for determinate beams**

ILD, Use of ILD, ILD for simply supported beams, cantilever beams and overhanging beams, Max SF and BM values due to moving loads.

[07]

Total Contact Hours – **38**

**REFERENCE BOOKS:**

**Name of book Author(s) Publisher(s)**

1. Structural Analysis-I S.S.Bhavikatti Vikas

2. Structural Analysis-II S.S.Bhavikatti Vikas

3. Elements of Strength of Materials Timoshenko and Young EWP

4. Theory of Structures S. Ramamrutham Dhanpat Rai P C

5. Structural Analysis R.C. Hibbler Pearson

6. Intermediate Structural Analysis C.K. Wang McGrawHill

**CE10114A ENGINEERING HYDROLOGY [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the concepts related to precipitation, it’s data collection and analysis.
2. Utilize infiltration equations to compute infiltration rate, depth of infiltration and indices associated.
3. To identify factors affecting evaporation/transpiration and estimate the losses due to evaporation
4. To understand the processes associated with surface runoff to estimate runoff volume
5. To develop runoff hydrographs and recognize its significance in engineering practices

**Module 1: Introduction and Precipitation**

Definition and scope of the subject, world water resources, water resources of India, hydrologic cycle, hydrological data, hydrological equation.

Types of precipitation, rainfall intensity, duration and measurement, annual precipitation- depth, area, duration analysis, mean rainfall on a basin, isohytal, Theission polygon, supplementing missing precipitation records, double mass curve analysis, moving average curve.

[07]

**Module 2: Infiltration and Water Losses**

Definition and factors affecting infiltration, infiltrometers, infiltration indices, infiltration equations, infiltration curves, determination of loss rates.

Evaporation and transpiration, factors affecting evaporation, measurement and estimation of evaporation, evaporation formulae, measure to reduce evaporation, transpiration process and factors affecting transpiration, evapo-transpiration.

[08]

**Module 3: Runoff and Hydrographs**

Surface runoff process, types of catchments, catchments characteristics, factors affecting runoff, estimation of runoff, rainfall runoff correlations, use of multi-linear regression equation, stream gauging, mass flow curves and their uses.

Hydrographs and their characteristics, base flow separation, unit hydrographs, derivation of unit hydrograph, instantaneous unit hydrograph, S – hydrograph and its use, Snyder’s synthetic unit hydrograph, uses of unit hydrograph.

[13]

**Module 4: Flood Estimation and Routing**

Rational Method, Empirical Formulae, Unit Hydrograph Method, Flood Frequency Method, Gumbel’s Method, Log-Pearson Type III Distribution, Partial duration series, Regional Flood Frequency Analysis, Level pool routing, Attenuation, Hydrologic Channel routing, Hydraulic method of flood routing, Flood control in India

[07]

**Module 5: Ground Water Hydrology**

Forms of subsurface water, aquifer properties, equation of motion both confined and unconfined aquifers, steady flow into a well

[05]

Total contact hrs: **40**

**Reference Books:**

1. Vente Chow, **Applied Hydrology**, McGraw Hill
2. Mutreja, **Applied Hydrology**, McGraw Hill
3. Subramanya K, **Engineering Hydrology**, Tata McGraw Hill
4. Raghunath H M, **Hydrology**, Wiley New Delhi, Kanna Publishers
5. Nelson, Introduction to Copula, Springer

**CE10115A ENVIRONMENTAL ENGINEERING**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Design Water and Waste Water Treatment Units with Different Flow Conditions
2. Apply concept of physical and chemical characteristics of water and waste water.
3. Understand the safe disposal of waste water.
4. Compute the quantity of storm and sanitary sewage.
5. Analyse the solid waste disposal and Industrial waste management.

**Module 1: Introduction and Quality of Water**

Need for protected water supply, essentials of water supply, project documents preparation. Population forecasting, different methods, rate of demand – factors affecting and its variation.

Physical, chemical and biological characteristics, drinking water standards.

[08]

**Module 2: Treatment and Distribution of Water**

Aeration of water, types of aerators, theory of sedimentation, sedimentation with coagulation, coagulants, feeding devices, mixing devices, flocculation, design considerations. Types of filters – design considerations, disinfection theory, methods of disinfections, chlorination, other treatment methods, softening of water, removal of iron and manganese, Defluoridation.

Distribution methods, systems of supply, service reservoirs and their capacity, layouts of distribution.

[08]

**Module 3: Quantity, Characteristics and Disposal of Sewage**

Aim and object of sewage disposal, systems of sanitation, systems of sewage disposal, investigation of sanitary projects, Design of sewers, flow variations, partial flow diagrams.

Aerobic and anaerobic process, cycles of decomposition. Dilution, self-purification of streams, oxygen sag curve, land disposal - suitability, sewage farming and sewage sickness, septic tanks, oxidation ponds, oxidation ditch, aerated lagoons.

[08]

**Module 4: Treatment of Sewage**

Flow diagrams, screens, grit chamber, skimming tank, primary sedimentation, secondary clarifiers.

**(a) Secondary Treatment:** Trickling filters – theory, parts, operation and design, RBCs activated sludge process – meaning, flow diagram, modifications, bulking of sludge, sludge volume index, sludge disposal, digestion of sludge followed by drying, sludge digesters.

**(b) Tertiary Treatment**: Chlorination of sewage, coagulation of sewage etc.

[08]

**Module 5: Solid Waste Disposal and Air Pollution**

Quality and quantity of refuse, collection and conveyance of solid wastes, disposal of solid waste by composting and other methods, salvaging, grinding and discharging into sewers.

Types of pollutants, their sources and impacts, air pollution control, air quality standards, Air quality Index and limits.

[08]

Total contact hrs: **40**

**Reference Books:**

1. Sawyer and McCaurty, **Chemistry for Environmental Engineering**.

2. **IS: Standards**: 2490 – 1974; 3360 – 1974; 3307 – 1974.

3. **Manual on Sewage and Sewage Treatment CPHEO**, Ministry of Urban development, Delhi

4. Garg S K, **Environmental Engineering – II**, Khanna Publishers.

5. Metcalf and Eddy, **Waste Water Engineering**, **Treatment and Reuse**, Tata McGraw Hill

6. **Standard Methods** – APHEA.

7. **Manual on Water Supply and Treatment CPHEEO**,

8. Garg S K**, Environmental Engineering**, Khanna Publishers Delhi.

9. Birdie G S, **Water supply and Sanitary Engineering**, Dhanpath Rai and Sons.

**CE10116A DESIGN OF RC STRUCTURES– II**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Apply the direct design method to design the Flat Slab.
2. Understanding the basic concepts of design for slender column.
3. Apply the concept of limit state method to analyze and design of various types of stair case.
4. Analyze and design of footings using the concept of limit state method.
5. Utilize the concept of limit state method to analyze and design of retaining wall and water tank.

**Module 1: Design of Flat slab**

Interior panels - direct design method [06]

**Module 2: Design of column and footing**

Design of eccentric short column, Design of Slender column, design of combined footings. [11]

**Module 3: Stair cases**

Types of stairs, design of dog legged stair case. [06]

**Module 4: Retaining walls**

Types of retaining walls, design of cantilever retaining walls. [06]

**Module 5: Water tanks**

Design of water tanks as per IS: code 3370, rectangular and circular tanks resting on ground. [06]

Total Contact hours: **35**

**Reference Books:**

1. Shah H J, **Reinforced Concrete Vol.I,**Charotar .
2. Sinha N.C and Roy S.K, **Fundamentals of Reinforced Concrete**, S Chand .
3. Shah N L and Karve S R, **Illustrated Reinforced Concrete Design**,
4. Karve S R and Shah **Limit state Theory and Design of Reinforced Concrete**.
5. Jain A K **Reinforced Concrete – Limit State Design**.

6. Mallick& Gupta **Reinforced concrete Design**

7. P.C. Varghese **Limit State Design of Reinforced Concrete**

8. Pillai and Menon **Reinforced Concrete Design**, Tata McGraw Hill

**CE10117A CONSTRUCTION PLANNING, ORGANIZATION & EQUIPMENTS [ 2 0 0 2 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understand various stages of construction planning and scheduling
2. Apply the network analysis in a project plan
3. Analyse a project plan using PERT and CPM.
4. Evaluate the relationship of project cost with the scheduling and updating.
5. Identify the advancements in concreting equipment and techniques.

**Module – 1: Introduction**

Management - Characteristics, Purpose, Different level Management, Roles and Skills. Project, Project management, Project life cycle, Introduction to Construction management- Classification of construction works, Requirement of Construction Industry, Characteristics, Importance, Necessity, Objective, Function, Various Construction Stages, Construction Team.

[04]

**Module – 2: Function of Construction Management and Project Updating**

**Construction Planning**: Principles of planning, Objectives, Stages of planning by different agencies. Data required for updating, updating flow chart, Target delivery date, Process and progress report on project updating.

[04]

**Module – 3: Network Analysis**

Introduction, Definition, Terminology, Classification of network, Fulkerson’s rule for numbering the events. Network logic, Difference between AOA and AON diagram, Common error in drawing network, Scheduling- Gantt or Bar charts, milestone charts, Network analysis- Objective, Procedure and advantage of network technique, CPM and PERT, Work break down structure.

[08]

**Module – 4: Project scheduling and Resource levelling:**

Introduction, Resource levelling and allocation, importance of project schedule and other project schedule details. Network crashing and cost-time trade off

[04]

**Module – 5: Management of Construction Equipment’s**

Classification of construction equipment: Earthwork equipment and Concreting equipment, factor affecting selection of construction equipment’s, Plant and equipment acquisition.

[04]

Total contact hours: **24**

**Reference Books**

1. Kumar Neeraj Jha, **Construction Project Management,** Theory and Practice, PEARSON.
2. K K CHITKARA, **Construction Project Management**, Planning Scheduling and Controlling, McGraw Hill Education (INDIA).
3. Seetharam S, **Construction Engineering and Management**, Umesh Publication, Delhi
4. Sengupta B, Guhatata H, **Construction Management and Planning**, McGraw Hill Companies.
5. Punmia B C, and Khandelwal K K, **Project Planning and Control with PERT andCPM,**Laxmi Publication.

**CE10118A GEOTECHNICAL ENGINEERING – II**

**[ 3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand and apply the concept of Stability of slopes and forces acting on the retaining wall.
2. To apply the shear strength parameters and finally find the bearing capacity of a soil in order to do foundation design.
3. To evaluate the load carrying capacity of a particular footing or foundation.
4. To apply ground improvement techniques in order to improve the strength and bearing capacity.
5. The students will be able to investigate the soil and identify its properties for evaluation of its load carrying capacity.

**Module – 1:**

**Shear Strength of Soils**

Concept of shear strength of soils, Mohr-Coulomb theory and failure criteria, Mohr’s Circle, laboratory determination of shear strength parameters – direct shear, tri-axial, unconfined compression and vane shear tests, limitations of test results.

[07]

**Module – 2:**

**Soil Exploration and Stability of Slopes**

Objective, methods of boring, requirements of good sampler, types of samples, sampler tubes, significant depth, depth and spacing of bore holes, penetration tests, exploration log, planning of exploration programme, Content of Geotechnical investigation report.

Finite and infinite slopes, types of failure of finite slopes, method of slice and friction circle, effect of sudden draw down and submergence.

[07]

**Module – 3:**

**Earth Pressure**

Rankine and Coulomb’s theories for active and passive condition, Bell’s equation for C-F soil, earth pressure at rest - factors influencing earth pressure like surcharge, water table and wall friction.

[06]

**Module – 4:**

**Bearing Capacity of Shallow Footings**

Tezaghi’s theory ( no derivation), modes of shear failure, factors affecting bearing capacity, allowable bearing pressure IS recommendations – permissible, total and differential settlement, estimation of bearing capacity from plate load and penetration tests.

[07]

**Module – 5:**

**Pile Foundation and Well Foundation**

Pile driving, bearing capacity of a single pile in clay and sand – Engineering News and Hiley’s formulae, IS pile load test, group action and negative skin friction.

Components of well foundation, depth of well as per IRC, sinking of wells, tilts and shifts.

[09]

Total contact hours: **36**

**Reference Books:**

1. Arora K R, **Soil Mechanics and Foundation Engineering**, Standard Publishers an

2. Gopal Ranjan and Rao A S R, **Basic and Applied Soil Mechanics**, New Age International

3. Punmia B C, **Soil Mechanics and Foundations**, Laxmi Publications

4. Murthy V N S, **A Text Book of Soil Mechanics and Foundation Engineering**, Sai Kripa Technical Consultant, Bangalore

5. Bowels J E, **Foundation Analysis and Design**, McGraw Hills Book Company

6. Srinivaslu and Vaidyanathan, **Hand Book of Soil Mechanics and Foundation Engineering**, Tata McGraw Hill Book Company.

7. Ramiah B K and Chickanagappa L S, **Hand Book of Soli Mechanics and Foundation Engineering**, Oxford and IBH.

8. Hsai – Yang Fang, **Foundation Engineering Hand Book**, CBS Publishers

**CE10119A REMOTE SENSING AND GIS [ 3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basic principles of Aerial Photography, satellite Remote Sensing, and Geographic Information Sc
2. Understanding the fundamental concepts of Remote Sensing and Geographic Information Science.
3. Applying the techniques of digital image processing and GIS for feature extraction and mapping
4. Analysing and interpreting satellite images for identification of features and events
5. Evaluating and modelling scenarios for decision making on resource assessment and planning

**MODULE - 1**

**Introduction to Remote Sensing**

Definition; Objectives; Basic principle; Process; Spectral signatures; Platforms; Software; Sensor resolutions; Advantages and limitations; Brief history of remote sensing. [01]

**Basic Concepts of Remote Sensing**

Physics of remote sensing; Electromagnetic spectrum; Black body concept; Atmospheric windows; Electromagnetic radiation: wave model and particle model, Stephen Boltzmann Law, Wein’s Displacement Law; Energy interaction: Scattering - absorption – reflection. [03]

**Aerial Photography and Photogrammetry**

Basic principles; Photographic systems; Advantage and Disadvantages; Vertical aerial photography; Scale of photography; Relief displacement; Stereoscopy; Vertical exaggeration; Elements of image interpretation. [03]

**MODULE - 2**

**Satellite Sensors**

Imagining systems; Working principle; Geometry of scanners; CCD arrays and platforms; Satellite orbits; History of space imaging; Satellite missions - LANDSAT, SPOT, IRS etc.; Characteristics of sensors: MSS, TM, LISS – I to IV, Outputs from various sensors. [03]

**Image Visualisation**

Image geometric distortions; Digital image data formats; Image types; Colour theory, False Colour Composites, Band combinations; Band ratio, NDVI. [02]

**Digital Image Processing**

Geometric and radiometric corrections of images; Ground Control Points, Root Mean Square Error; Image resampling; Image contrast enhancement; Image filtering, Linear edge detection and enhancement; Principal Component Analysis; Intensity-Hue-Saturation; Image fusion and resolution merge. [03]

**MODULE - 3**

**Digital Image Classification**

Classification techniques: Parametric, non-parametric, non-metric, hard rule and fuzzy rule based, Supervised and unsupervised, per-pixel and object-oriented classification; Clustering techniques; Accuracy assessment; Linear mixture modelling; ANN based classification; Digital change detection; Change detection techniques; Spectral change vector analysis; Error matrix. [05]

**Beyond Optical Remote Sensing**

Thermal Infra-Red remote sensing; Heat energy budget; Brightness temperature and Emissivity; Hyperspectral remote sensing; Microwave remote sensing: passive and active sensing; Imagining RADAR, LIDAR and SONAR; Applications. [03]

**MODULE - 4**

**Fundamentals of Geographic Information Systems**

Definition; History; Components; Elements of GIS; Data types; Measurement scales of attribute data; Coordinate systems and geo-referencing; Map projections; Coordinate transformations; Resampling; Raster and Vector models; Topology concept; DTM and TIN models; Map digitization. [05]

**Data, Database, and Data Analysis**

Data structures and models; Database management system; Database structures; Database creation; Client-server Network web GISl; Data analysis functions; GIS queries; GIS measurements: Raster versus Vector; Distance measurements; Proximity analysis; Reclassification; Buffering; Raster GIS filtering; Boolean operations; Map overlay; Site suitability analysis and zoning. [05]

**MODULE - 5**

**GIS Analysis and Modelling**

Terrain Analysis: Interpolation techniques; Extraction of terrain parameters: slope, aspect, curvature, hill shading, view shed analysis, contouring.

Network Analysis: Definition and concept of network; Types of network analysis examples: shortest path problem, travelling salesperson’s problem, location-allocation modelling, route tracing; Geocoding; Path analysis.

GIS Modelling

Process modelling in GIS (natural and scale analog models, conceptual models, mathematical models); Multi-criteria evaluation; Criteria weighting: rating, ranking, and pair-wise comparison; Analytic Hierarchic Process (AHP). [04]

**Integrated Remote Sensing and GIS Applications**

Geology and Geohazards: geological structures, landforms, topography, rocks. Identification of minerals and ore deposits; Zoning and micro-zoning for landslide, earthquake, avalanche, beach erosion, land subsidence etc.

Hydrological hazards: flood forecasting, flood inundation mapping, flood-risk zoning; reservoir sedimentation; fluvial geomorphology and environmental appraisal, snow melt initiation; drought and water-scarcity; groundwater potential modeling; groundwater quality; aquifer vulnerability; soil moisture.

Urban and regional planning: mapping and monitoring urban growth and changes; land use/land cover mapping; land degradation; deforestation; desertification; basin erosion; sedimentation; hazard and risk assessment, forecasting etc. [05]

Total contact hours: **42**

**Text Books and Reference Books:**

1. Paul R Wolf, **Elements of Photogrammetry**, McGraw Hill.

2. Lillesand and Kiefer, **Remote sensing and Image Interpretation**, John Wiley and Sons.

3. Ravi R Gupta, **Remote Sensing Geology**, Springer

4. Floyd F Sabins, **Remote Sensing Principles and Interpretation**, WH Freeman and Co.

5. John R Jenson**, Introductory Digital Image Processing**, Prentice Hall.

6. Burrough P A, **Principles of Geographical Information System for Land Resource Assessment,** Oxford University Press.

7. Bonham-Carter G F, **Geographic information systems for geoscientists modelling with GIS** (1995) Pergamon.

8. AlardMeijerink

9. Hall M K, Schaller C J, Walker C S, and Kendal L P, **Exploring Water Resources: GIS Investigations for the Earth Sciences** (2002), Brooks Cole

**CE10120A DESIGN OF STEEL STRUCTURES**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Interpret the various properties of the structural steel and classification of the steel.
2. Explain the Concept of limit state method and working stress method for design of steel structures.
3. Apply the concept of limit state method to analyze and design of tension members in real time problems.
4. Analyze and design of compression members using the concept of limit state method.
5. Utilize the concept of limit state method to analyze and design of flexural members (Beams and plate girders)

**Module 1: Introduction and Connections**

Composition and general behavior of steel, importance of steel construction, structural shape and arrangements, design philosophy (WSM and LSM), Factor of Safety, Permissible and Working Stresses. Specifications and strength of simple riveted connection, bolted connection and welded connection to transfer axial forces. (LSM)

[11]

**Module 2: Tension Members**

Types of tension members, permissible stresses, net sectional area, design of a tension member using welds and bolts. (LSM)

[07]

**Module 3: Compression Members**

Shapes of compression members, design of axially loaded compression members, built-up columns and lacing. (LSM)

[08]

**Module 4: Beams**

Types of sections, lateral stability of beams, bending stress, bearing stress, shear stress, deflection, web buckling, web crippling, diagonal buckling, design of laterally supported beams, built-up beams (plated beams), laterally unsupported beams (only welded connection is considered). (LSM)

[08]

**Module 5: Welded Plate Girders**

Types of sections, elements of plate girder, proportioning of web, proportioning of flanges, self-weight of plate girders, curtailment of flange plates, connections, stiffeners - detailed design. (LSM) [08]

Total contact hrs: 42

**Reference Books:**

1. Negi L S, **Design of Steel Structures.**

2. Duggal S K, **Design of Steel Structures.**

3. Arya A S and Ajmani J C, **Design of Steel Structures.**

4. Dayarathnam P, **Design of Steel Structures.**

5. Ramachandra, **Design of Steel Structures.**

6. N Subramanian, **Design of Steel Structures**

7. S P 6(1) – 1966 Structural Steel Sections.

8. IS 800 – 1984. Code of practice for General Construction in Steel

9. IS 800 – 2007 Code of practice for General Construction in Steel

10. Steel notes in website [www.Insdag.org](http://www.Insdag.org).

**CE10121A ESTIMATING, COSTING AND VALUATION**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Determine the earthwork calculation for roads and canals.
2. Understand preparation of Notice inviting tender document for bidding, tendering process and examining rate analysis of civil works.
3. Evaluate the valuation of building for different specifications and create new technologies to develop concrete estimating methods.
4. Analyze the rates of various civil engineering items used in construction.
5. Prepare the estimate of various kinds of buildings with skill lasting for entire professional life.

**Module – 1: Earth Work Calculation**

Measurement of earth work by cross sections, spot levels, contours, mass diagram and its characteristics.

[06]

**Module – 2: Specifications and Rate Analysis**

Definition, types, principles, detailed specification for different components of buildings. Purpose, factors affecting rate analysis, over-head charges, turn-out of work, rate analysis for different items of building.

[08]

**Module – 3: Departmental Procedure**

Functioning and organization of PWD, tender and its notification, EMD and security deposit, qualification of contractor, responsibilities of engineer, owner, contractor, different methods of execution of work, measurement book, nominal muster roll, running bill, agreement, schedule rate, contract: - types of contracts, termination of contract, work slip, arbitration.

[06]

**Module – 4: Valuation**

Purpose of valuation, different methods of valuation (open land and land with buildings), valuation of properties, types of rent, rent fixation, depreciation – different methods, book value, market value, scrap and salvage value, time value of money, interest factors, amortization, deferred payments.

[08]

**Module – 5: Estimation**

Definition, types of estimates, units of measurement, method of estimation, project contingencies, work charged establishment, plinth area, carpet area, estimation for buildings, R.C.C. works, roads, irrigation works, different types of roofs.

[08]

Total contact hours:  **36**

**Taking out quantities and preparing abstract of estimated cost for**:

1. Residential load bearing structure (use both centre-line and long-wall short-wall method)

2. Office building – framed structure.

3. Slab, culvert, water tank.

4. Waste weir

5. Earth work calculation for roads, reservoirs.

**Reference Books**:

1. Dutta B N, **Estimating and Costing in Civil Engineering**.

2. Chakraborti M, **Estimating and Costing in Civil Engineering**.

3. Birdie, **Estimating and Costing in Civil Engineering**.

4. CPWD Manual for Standard Specification and Rate Analysis.

5. PWD Sikkim Schedule of Rates.

6. Roshan H Nanavati, **Professional Practice**.

**CE10201A FUNDAMENTALS OF REMOTE SENSING AND GIS [ 3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basic principles of Aerial Photography, satellite Remote Sensing, and Geographic Information Sc.
2. Understanding the fundamental concepts of Remote Sensing and Geographic Information Science
3. Applying the techniques of digital image processing and GIS for feature extraction and mapping
4. Analysing and interpreting satellite images for identification of features and events
5. Evaluating and modelling scenarios for decision making on resource assessment and planning

**MODULE - 1**

**Introduction to Remote Sensing**

Basic principle; Process; Spectral signatures; Platforms; Software; Sensor resolutions; Advantages and limitations; Brief history of remote sensing. [01]

**Concepts and Foundation of Remote Sensing**

Physics of remote sensing; Electromagnetic spectrum; Black body concept; Atmospheric windows; Electromagnetic radiation: wave model and particle model, Stephen Boltzmann Law, Wein’s Displacement Law; Energy interaction: Scattering - absorption – reflection. [03]

**Aerial Photography and Photogrammetry**

Basic principles; Photographic systems; Advantage and Disadvantages; Vertical aerial photography; Scale of photography; Relief displacement; Stereoscopy; Vertical exaggeration; Elements of image interpretation. [03]

**MODULE - 2**

**Space Platforms and Remote Sensing Missions**

Geometry of scanners; Type of scanners; History of space imaging; Satellite orbits; Space platforms (LANDSAT, SPOT, IRS etc.); Sensors (MSS, TM, LISS – I, II, III etc.) and their outputs. [03]

**Image Visualization**

Image types; Image distortions; Data and image formats; Colour theory; False Colour Composites; Band combinations; Features of multi-spectral bands; Band ratio; NDVI. [02]

**Digital Image Processing**

Geometric and radiometric corrections of images; Ground Control Points, Root Mean Square Error; Image resampling; Image contrast enhancement; Image filtering, Linear edge detection and enhancement; Principal Component Analysis; Intensity-Hue-Saturation; Image fusion and resolution merge. [03]

**MODULE - 3**

**Digital Image Classification**

Classification types, Supervised and unsupervised, Hard and Fuzzy rule based classifications, Per-pixel and Object oriented classifications, Clustering, Accuracy assessment, Linear Mixture Model, ANN based classification, Digital Change Detection, Spectral change vector analysis. [05]

**Beyond Optical Remote Sensing**

Thermal Infra-Red remote sensing; Heat energy budget; Brightness temperature and Emissivity; Hyperspectral remote sensing; Microwave remote sensing: passive and active sensing; Imagining RADAR, LIDAR and SONAR; Applications. [04]

**MODULE - 4**

**Fundamentals of Geographic Information Systems**

Definition; History; Components; Elements of GIS; Data types; Measurement scales of attribute data. [02]

**Coordinates, Projections, Maps and Models**

Coordinate systems and geo-referencing; Map projections; Coordinate transformations; Resampling; Raster and Vector models; Topology concept; DTM and TIN models; Map digitization. [02]

**Data, Database, and Data Analysis**

Data to information to knowledge, Data structures and models, Conventional data management, Database management system, Database structures, Database creation, Data modelling, Client-server web GIS, Network web GIS. [02]

**GIS Data Analysis**

Data analysis, GIS queries, GIS measurements: Raster versus Vector, Distance measurements, Proximity analysis, Reclassification, Buffering, Raster GIS filtering, Boolean operations, Map overlay, Site suitability analysis and zoning. [03]

**MODULE - 5**

**GIS Analysis and Modelling**

Terrain Analysis: Interpolation techniques; Extraction of terrain parameters: slope, aspect, curvature, hill shading, view shed analysis, contouring.

Network Analysis: Definition and concept of network; Types of network analysis examples: shortest path problem, travelling salesperson’s problem, location-allocation modelling, route tracing; Geocoding; Path analysis.

GIS Modelling: Process modelling in GIS (natural and scale analog models, conceptual models, mathematical models); Multi-criteria evaluation; Criteria weighting: rating, ranking, and pair-wise comparison; Analytic Hierarchic Process (AHP). [04]

**Integrated Remote Sensing and GIS Applications**

Geohazards: Landslide hazard zoning, Seismic micro-zoning. Hydrological hazards: Flood inundation mapping, Flood-risk zoning, Glacial Lake Outburst Flood (GLOF), Drought, Water quality zoning. Regional planning: Mapping urban growth, Groundwater potential modelling, Groundwater quality zoning. [05]

Total contact hours: **42**

**Text Books and Reference Books:**

1. Paul R Wolf, **Elements of Photogrammetry**, McGraw Hill.

2. Lillesand and Kiefer, **Remote sensing and Image Interpretation**, John Wiley and Sons.

3. Ravi R Gupta, **Remote Sensing Geology**, Springer

4. Floyd F Sabins, **Remote Sensing Principles and Interpretation**, WH Freeman and Co.

5. John R Jenson**, Introductory Digital Image Processing**, Prentice Hall.

6. Burrough P A, **Principles of Geographical Information System for Land Resource Assessment,** Oxford University Press.

7. Bonham-Carter G F, **Geographic information systems for geoscientists modelling with GIS** (1995) Pergamon.

8. AlardMeijerink

9. Hall M K, Schaller C J, Walker C S, and Kendal L P, **Exploring Water Resources: GIS Investigations for the Earth Sciences** (2002), Brooks Cole

**CE10202A OPTIMISATION TECHNIQUES [ 3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the concept of classical optimization techniques.
2. Determine the optimum solution using simplex and dual simplex methods.
3. Applying dynamic programming in different optimization problems.
4. Analysis of reseveroir operation policies.
5. To understand the concept of stochastic optimization techniques.

**Module 1: Introduction**

Historical Development; Engineering applications of Optimization; Art of Modeling, Objective function; Constraints and Constraint surface; Formulation of design problems as mathematical design problem, Classification of optimization problem.

[08]

**Module 2: Optimization using Calculus**

Stationary points; Functions of single and two variables; Global Optimum, Convexity and concavity of functions of one and two variables, Optimization of function of one variable and multiple variables; Gradient vectors; Examples, Optimization of function of multiple variables subject to equality constraints; Lagrangian function, Kuhn-Tucker Conditions;

[08]

**Module 3: Linear Programming**

Standard form of linear programming (LP) problem; Canonical form of LP problem; Assumptions in LP Models; Elementary operations, Graphical method for two variable optimization problem; Examples, Motivation of simplex method, Simplex algorithm and construction of simplex tableau; Simplex criterion; Minimization versus maximization problems.

[08]

**Module 4: Dynamic Programming**

Sequential optimization; Representation of multistage decision process; Types of multistage decision problems; Concept of sub optimization and the principle of optimality, Recursive equations – Forward and backward recursions; Computational procedure in dynamic programming (DP), Discrete versus continuous dynamic programming; Multiple state variables; curse of dimensionality in DP

[08]

**Module 5: Stochastic Optimization**

Introduction to probability distribution, Chance constrained linear programming, stochastic dynamic programming, Application

[08]

Total contact hours: **40**

**Reference Books:**

1. Vedula,S. and Mujumdar,P.P., Water Resources Systems : Modeling Techniques and Analysis, Tata-McGraw Hill, 2005.
2. S.S. Rao,"Engineering Optimization: Theory and Practice", New Age International P. Ltd., New Delhi, 2000.
3. G. Hadley,"Linear programming", Narosa Publishing House, New Delhi, 1990.
4. H.A. Taha,"Operations Research:An Introduction", 5th Edition, Macmillan, New York, 1992.
5. K. Deb,"Optimization for Engineering DesignAlgorithms and Examples",Prentice-Hall of India Pvt. Ltd., New Delhi, 1995.

**CE10203A DISASTER MANAGEMENT [ 3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understanding of Disaster management and Risk and Vulnerability Analysis of Disaster.
2. Establishment of Disaster Preparedness and Response.
3. Categorize Rehabilitation, Reconstruction and Recovery.
4. Understand Disaster Response Plan

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **1** | Introduction on Disaster: Different Types of Disaster :   1. Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc 2. Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea,Rail& Road), Structural failures(Building and Bridge),War & Terrorism etc.   Causes, effects and practical examples for all disasters. | **10** |
| **2** | Risk and Vulnerability Analysis:   1. Risk: Its concept and analysis 2. Risk Reduction 3. Vulnerability: Its concept and analysis 4. Strategic Development for Vulnerability Reduction. | **08** |
| **3** | Disaster Preparedness and Response:  Preparedness-   1. Disaster Preparedness: Concept and Nature 2. Disaster Preparedness Plan 3. Prediction, Early Warnings and Safety Measures of Disaster. 4. Role of Information, Education, Communication, And Training. 5. Role of Government, International and NGO Bodies. 6. Role of IT in Disaster Preparedness 7. Role of Engineers on Disaster Management.   Response | **06** |
| **4** | Disaster Response: Introduction   1. Disaster Response Plan 2. Communication, Participation, and Activation of Emergency Preparedness Plan 3. Search, Rescue, Evacuation and Logistic Management 4. Role of Government, International and NGO Bodies 5. Psychological Response and Management (Trauma,Stress, Rumor and Panic) 6. Relief and Recovery 7. Medical Health Response to Different Disasters | **06** |
| **5** | Rehabilitation, Reconstruction and Recovery:   1. Reconstruction and Rehabilitation as a Means of Development. 2. Damage Assessment 3. Post Disaster effects And Remedial Measures. 4. Creation of Long-term Job Opportunities and Livelihood Options, 5. Disaster Resistant House Construction 6. Sanitation and Hygiene 7. Education and Awareness, 8. Dealing with Victims’ Psychology. 9. Long-term Counter Disaster Planning 10. Role of Educational Institute. | **08** |
|  | **Total** | **38** |

**References:**

1. Dr. Mrinalini Pandey. Disaster Management. Wiley India Pvt. Ltd.
2. Jagbir Singh. Disaster Management: Future Challenges and Opportunities.Publishers Pvt. Ltd.
3. J. P. Singhal. Disaster Management. Laxmi Publications.
4. Shailesh Shukla, Shamna. Biodiversity, Environment and Disaster Management. UniquePublications.

**CE10301A GROUND WATER ENGINEERING**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Interpret the various characteristics of aquifers and their significance.
2. Explain the Concept of confined and unconfined aquifers related to groundwater flow problems.
3. Apply the concept of Darcy law to compute the yield from different aquifers.
4. Analyze and design of confined and unconfined wells using well hydraulics.
5. Description of various methods on the process and techniques of natural and artificial recharge of groundwater.

**Module – 1: Introduction and Fundamentals of Ground Water Flow**

Definition of ground water, hydrological classification of geological formations, aquifers and their types, subsurface zones and water-table, springs: occurrence, flow and storage of groundwater in igneous, sedimentary and metamorphic rocks, geological zones in India. Fundamentals of Ground Water Flow Darcy’s law and range of its validity, oil anisotropy, circulation of groundwater in isotropic and anisotropic media, groundwater flow in fractured rocks, parallel plate model, double porosity model, equivalent porous medium model, discrete fracture network model, and equivalent parallel plate model, groundwater flow in confined and unconfined aquifers, Dupuit’s assumptions, principles and mechanics of solute transport, advection, dispersion, molecular diffusion, retardation.

[10]

**Module – 2: Mechanics of Well Flow**

Water table contour map and flow net analysis, groundwater flow problems, steady uniform flow, steady radial flow to a well, a well in a uniform flow, aquifer parameters, introduction to unsteady flow in aquifers, pump tests, radial flow to a well in an extensive confined aquifer, barrier and recharge boundaries, image well, introduction to unsteady radial flow.

[08]

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**Module – 3: Exploration of Groundwater**

Surface and subsurface methods for well-site selection, field investigation, remote sensing and GIS applications, geophysical methods, tracer tests. [08]

**Module – 4: Well Development and Management**

Well-design criteria, size and spacing of wells, diameter of wells, well characteristics, well efficiency, construction and maintenance, screens and casings., dug well versus tube well construction.

[04]

**Module – 5: Groundwater Recharge**

Water level fluctuation and rainfall infiltration factor method, traditional methods of groundwater conservation, artificial recharge of groundwater, planning and site selection, various methods and structures such as rainwater harvesting, stream augmentation, bank filtration, recharge wells, ditch and furrow, well injection, aquifer storage and recovery, groundwater basin management and conjunctive use.

[06]

Total contact hours: 36

**Reference Books**:

1. Todd D K, **Groundwater Engineering**.

2. Walton W C, **Groundwater Resources**, McGraw Hill

3. Sharma and Chawla, **Manual of Groundwater and Tube**, C.B.I.P wells.

4. De Weist R J M, **Geo-hydrology**, John Wiley.

5. Bouwer H, **Groundwater Hydrology**, McGraw Hill

6. Raghunath H M, **Groundwater,** Wiley Eastern Ltd.

**CE10302A ENVIRONMENTAL IMPACT ASSESSMENT**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To make the students understand and remember the basic concept of planning and management of impact studies
2. Ability to remember indices and indicator for describing environment
3. Ability to predict the environmental impact on air, surface, soil and ground water.
4. Evaluate the decision method of alternatives and environmental monitoring
5. Understand the public participation in environmental decision making, government standard in Environmental Impact Assessment.

**Module 1:**Definition and importance, planning and management of impact studies. Matrices, networks, checklists.

[06]

**Module 2:**Description of affected environment, indices and indicators for describing affected environment.

[07]

**Module 3:**Prediction and assessment of impacts on air, surface water, soil and ground water, noise, biological, cultural and socio-economic environment. Practical applications, cradle to grave concept, life cycle analysis, clean technologies, environmental audit, compliance audit, concept of ISO and ISO 14000.

[08]

**Module 4:**Decision methods for evaluation of alternatives. Documentation and environmental monitoring – case studies.

[09]

**Module 5**: Public participation in environmental decision making. Governmental standards for environmental protection, emerging global environmental issues, environmental legislation. Environmental audit, meaning, importance – case studies.

[06]

Total contact hours: **36**

**References**

1. Larry W Canter (1996), “ **Environmental Impact Assessment**”, McGraw Hill International editions, New York.

2. CIRIA special publication 96, Construction Industry Research and Information Association.

3. Mhaskar A K,”**Environmental Audit**” Pune

**CE10303A SOLID WASTE MANAGEMENT [3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To apply the concept of effective disposal to reduce the risk of pollution from hazardous material.
2. To analyse the best suited technique for effective disposal of solid waste.
3. To evaluate the cost involved in transporting the waste from one location to another and thus find the most economical way.
4. Students will learn to do the analysis for route optimization, municipal solid waste characteristics and quantities.
5. To apply the knowledge of Composting, Incineration, Recycle and Reuse Sanitary Land Filling in real World and thus reduce environmental hazards

**Module – 1: Solid Waste and Disposal Methods**

Definition, sources, classification and characteristics, need for integrated solid waste management transport, collection equipment, systems of collection, garbage chutes, transfer stations, route optimization, municipal solid waste characteristics and quantities

Open dumping, selection of site, ocean disposal, feeding to hogs.

[10]

**Module – 2: Sanitary Land Filling**

Definition, land-fills planning, landfill processes, landfill design, landfill operations, post-closure care and use of old landfills, methodology, trench, area, ramp and pit method, site selection, prevention of site pollution, lechate treatment, gas collection and recirculation.

[07]

**Module – 3: Composting**

Aerobic and anaerobic composting, factors affecting, microbiology, different methods, mechanical process.

[07]

**Module – 4: Incineration**

Process 3T,s to control high temperature, design approach, prevention of air pollution, pyrolysis.

[06]

**Module – 5: Recycle and Reuse**

Material and energy, recovery operations, reuse in other industries, plastic wastes, and environmental significance.

[06]

Total contact hours: **36**

**Reference Books:**

1. Tchbanogious G, Theisen and Lilsaissen, **Solid Waste Engineering Principles andManagement Issues**, McGraw Hill.

2. Bhide and Sundreshan, **Solid Waste Management in Dry Countries**.

3. Joseph D. Hagerty, Joseph Pavoli L, John E Heer Jr Van Nostrand Reinhold Co.

1975, **Solid Waste Management**.

**CE10304A TRANSPORT PLANNING [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understand the concept of traffic control aids, traffic management and regulations
2. To Understand and remember the concept of traffic flow and different traffic flow theory.
3. To evaluate the study area and to analyze the different types of Surveys.
4. Students will learn to do the analysis for accident studies, growth of vehicular traffic, passenger trips.
5. To apply the knowledge of transportation planning for urban public transportation systems.

**Module 1: Traffic Control and Regulations**

Traffic signs, signals, road markings and traffic control aids, parking and street lighting, accident studies, traffic management and regulations, pollution, intersection design, safety.

[07]

**Module 2: Traffic Flow Theory**

Diagram of traffic flow, relationship, Lighthill & Witham’s theory, Car following theory, Queneing theory and headways and gaps.

[07]

**Module 3: Transportation Survey**

Definition of study area, Zoning, types of Movements, types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside- Interview Survey, Cordon- Line Survey, Post-Card Questionnaire Survey, Registration- Number Survey, Tag-on-Vehicle Survey.

[08]

**Module 4: Transportation Planning**

Traffic volume, traffic flow patterns, O & D studies, mass transportation facilities, accident studies, growth of vehicular traffic, passenger trips and goods movement.

[06]

**Module 5: Urban Transportation Planning**

Trip generation, modal split, trip distribution, traffic assignment, land use transport models, travel demand and forecasting, decision making theories, traffic problems in cities, urban public transportation systems.

[08]

Total contact hours : 36

**Reference Books:**

1. Fundamentals of Transportation Engineering by C.S.Papacostas, Prentice Hall of India

2. Traffic Engineering and Transport Planning by L.R.Kadiyali, Khanna Publishers

3. Principle of Urban Transport System Planning by B.G.Hutchinson, McGraw Hill

4. Highway Engineering By S.K.Khanna& C.E.C. Justo, Nem Chand & Bros.

**CE10305A DESIGN OF HYDRAULIC STRUCTURES**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To make the students understand and remember the design concept of dams,
2. Ability to solve problems related to spillway and weirs
3. Ability to design both lined and unlined canal section.
4. Evaluate the design concept of canal fall and trapezoidal notch fall
5. Understand the design details of cross regulator and distributary head regulator

**Module -1: Dams**

Gravity dams -Non-overflow section, forces acting on gravity dams, design of gravity dams by step method, introduction to other methods like trail load, finite element, slab analogy etc., stresses in dams, stress concentration in openings of dams, design of sluices, air vents and galleries Earth Dams -Investigations, design of cross section of dams, slope stability analysis, settlement analysis.

[12]

**Module -2: Spillways and weirs**

Types of spillways, design of spillways, energy dissipators, gates, types of hoist. Introduction, causes of failure of weirs, creep theory, Khosla’s theory.

[09]

**Module -3: Design of canal sections**

Design of unlined canals- introduction, design formulae. Kennedy’s theory and Lacey’s theory, drawbacks and comparison. Design of lined canals, design parameters, design procedures, types of lining

[07]

**Module -4: Design of masonry structures**

Canal falls, definition, types, design of trapezoidal notch fall.

[04]

**Module -5: Canal regulators**

Design of cross regulator and distributary head regulator.

[04]

Total contact hours: **36**

**Reference Books**

1. W.P.Justin and Creacer (1954), “ **Engineering for dams**”, Vol I, II & III Wiley Publishers.

2. Leliausky S (1958), “ **Irrigation and Hydraulic Design**”, Vol III, John Wiley Publishers, New York.

3. Sharaar et.al, “ **Earth and Rockfill Da**ms”

4. R.S.Varshney (1978), “ **Concrete Dams**”, IBH Publishers, New Delhi.

5. Garg S.K, (1976), **“ Irrigation and Hydraulic Structures**”, Khanna Publications,

**CE10306A FINITE ELEMENT METHOD OF ANALYSIS**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basic principles of finite element method, theory of elasticity and the relationship between simple stress and strain
2. Understanding the fundamental concepts of Element.
3. To evaluate the cost involved in transporting the waste from one location to another and thus find the most economical way.
4. Students will learn to do the analysis for route optimization, municipal solid waste characteristics and quantities.
5. To apply the knowledge of Composting, Incineration, Recycle and Reuse Sanitary Land Filling in real World and thus reduce environmental hazards

**Module – 1: Introduction**

Brief general description of the method, theory of elasticity, constitutive relationships, plane stress and plane strain.

[04]

**Module – 2: Concept of an Element**

Types of elements, displacement models, compatibility and convergence requirements, displacement models by generalized co-ordinates, Lagrangian polynomials and Hermitian polynomials, natural coordinates, formulation of shape functions for different types of elements.

[09]

**Module – 3: Variational Method of Formulation**

Minimization of potential energy approach, formulation of element stiffness and consistent load vector for different types of elements, static condensation.

[06]

**Module – 4: Isoparametric Elements**

Concept, numerical integration.

[07]

**Module – 5: Applications**

(a) Application of finite element method to pin-jointed and rigid jointed framed structures.

(b) Application to plane stress, plane strain and axi-symmetric problems.

[10]

Total contact hours: **36**

**Reference Books**:

1. Desai C S and Abel J E, **Introduction to the Finite Element Approach**, CBS Publications, New Delhi

2. Krishnamoorthy C S, **Finite Element Anaysis**, Tata McGraw Hill

3. Cook R D, Malkas D S and Plesha M E, **Concepts and Applications of FiniteElement Analysis**, John Wiley and Sons, New York

4. Bathe K J, **Finite Element Procedures in Engineering Analysis**, Prentice Hall

N J

5. Rajasekaran S, **Finite Element Analysis in Engineering Design**, Wheeler Publishing Allahabad.

6. Zinkiewiez O C, **The Finite Element Method**, Tata McGraw Hill Book Co.

**CE10307A GROUND IMPROVEMENT TECHNIQUES**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To make the students understand and remember the various ground improvement techniques available.
2. The students will be able to analyze the quality of the ground, the possibility of failure in excessive settlement or bearing capacity and the need of ground improvement for a particular site.
3. Depending on the properties of the soil and their inspection, the students will be able to evaluate the cost involvement in improving a particular type of soil with each of the techniques.
4. The students will be able to compare the cost involved in improving a particular type of soil by different techniques.
5. The students will be able to apply his engineering knowledge, based on which they will be able to find the best suited, cost effective and easiest technique to improve the quality of a particular type of soil.

**Module – 1: Introduction**

Necessity of ground improvement, scope, texture and structure in rocks, engineering properties of rocks, testing of engineering properties of rocks.

[06]

**Module – 2: Principles of Soil Stabilization**

Methods, chemical – cement – lime stabilization, ash and slag stabilization, grouting principles, examples of application of grouting, stabilization of soils with lime columns, stone columns, deep compaction, consolidation, Other techniques, principles and construction techniques, blasting- design principles and applications, soil reinforcement.

[09]

**Module – 3: Preloading**

Type of soil and applicability, types of preloading, design philosophy, prefabricated vertical drain, design of prefabricated vertical drain (with and without considering smear zone) and case study

**Module – 4: Stone Column**

Introduction, Type of soil and suitability, design principle, use of standard design code and new developments, design example and case study

[07]

**Module – 5: Reinforced Earth**

Introduction, principles and advantages of reinforced earth, behaviour of reinforced earth, design methods, material specifications, soil nailing – construction procedure, design and specifications, civil engineering application of geo-synthetics.

[10]

Total contact hours: **36**

**Reference Books**:

1. Fang H Y, **Foundation Engineering Hand Book**, CBS Publishers New Delhi

2. Alam Singh and Chowdhary G R, **Soil Engineering in Theory and Practice Part – 3**, CBS Publishers.

3. Alam Singh, **International Overviews Current Practice in Geotechnical Engineering**, IBT Publishers.

4. **Geotechnical Engineering – Indian Experiences**, A Compilation of IGS Annual Lectures: 1978 – 1992 by Kuberan R, Nakul Dev and Govindan K K, Indian Geotechnical Society.

**CE10308A STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING [ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understand the concept of earthquake, its cause and terminology related to earthquakes.
2. Apply knowledge of dynamic forces to form and solve equations of motion.
3. Evaluate Single degree and multi degree freedom systems using various methods
4. Compute and evaluate the earthquake forces using equivalent static force method
5. Understand seismic design philosophy, and provisions of ductile code.

**Module – 1: Engineering Seismology**

Terminology, causes and effects of earthquakes, magnitude and intensity, accelerograms, faults, folds, selection of sites for structures, ground motion in an earthquake, types of seismic waves, seismic zones, modified Mercalli scale.

[05]

**Module – 2: Introduction**

Objectives, dynamic loading, difference between static and dynamic force, types of motions, formulation of equations of motion: (a) D,Alembert’s principle (b) Principle of virtual work.

[03]

**Module – 3: Single Degree of Freedom Systems**

(a) Components of the system, types of vibration, undamped and damped free vibrations, logarithmic decrement.

(b) Forced vibrations due to harmonic excitation, steady state and transient response, transmissibility, vibration isolation, evaluation of damping, half power bandwidth method.

[10]

**Module – 4: Multi-Degree of Freedom Systems**

Equations of motion, undamped and damped free vibration, Eigen values and Eigen vectors, orthogonality conditions, power method, characteristic equation method.

[10]

**Module – 5: Methods of seismic analysis**

Seismic design philosophy, equivalent static lateral force method with examples, ductility considerations in earthquake resistant design in RC buildings (IS: 13920)

[08]

Total contact hours: **36**

**Reference Books**:

1. Rao S D, **Mechanical Vibrations**, Addison Wesely New York

2. Chopra A K, **Dynamics of Structures – Theory and Applications to EarthquakeEngineering**, Prentice Hall of India

3. Seto, **Mechanical Vibrations**, Schuam,s Outline Series, McGraw Hill Book Co.

4. Jai Krishna, Chandrasekaran A R and Brijesh Chandra, **Elements of EarthquakeEngineering**, South Asian Bulishers, New Delhi

5. Thaniby W T, **Theory of Vibrations with Applications**, CBS Pblishers

6. Paz M, **Structural Dynamics**, CBS Publishers, New Delhi

7. Mukhopadhay, **Vibrations- Structures and Structural Systems**, Oxford and IBH, New Delhi

8. Biggs J M, **Introduction to Strucural Dynamics**, McGraw Hill Publications

9. Claugh and Penzien, **Dynamics of Structures**, McGraw Hill Publications

10. Ghosh S K, **Earthquake Resistant Design of Concrete Structures**, SDCPL-R and d Centre, New Mumbai

11. Humar J C, **Dynamics of Structures**, Prentice Hall N.J.

**CE10309A ADVANCED FOUNDATION ENGINEERING**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To evaluate the bearing capacity with different method.
2. To design pile and pile cap.
3. To analyze and design foundation on expansive soil.
4. To understand the concept of machine foundation
5. To apply ground improvement techniques in order to improve the strength and bearing capacity.

**Module – 1: Bearing Capacity and Design of Piles and Pile caps**

Brinch Hansen’s, Meyerhoff’s and Skempton’s bearing capacity equations. Plate load test and penetration tests. Design principles of shallow foundations, Isolated, combined and raft foundations. Brom’s theory. Principles of design of sheet and anchor bulk head.

[11]

**Module - 2: Well foundation**

Bearing capacity, lateral stability. Terzaghi’s method and IRC method.

[03]

**Module – 3: Foundation on Expansive Soils**

Problems of foundations on expansive soils. Remedial measures.

[03]

**Module – 4: Coffer dams and Machine foundations**

Types, design and analysis for stability. Degree of freedom – general criteria, mass-spring-dash-pot model. Block foundation subjected to vertical, horizontal and rocking vibrations. Elastic half space approach. Vibration isolation.

[13]

**Module – 5: Ground Improvement Techniques**

Necessity, traditional methods, reinforced earth structures. Materials, application and design principles. Principles and construction of granular piles, sand drains, geodrains, lime columns.

[06]

Total contact hours: **36**

**Reference Books**

1. Bowles J E, (1997), “**Foundation Analysis and Design**”, McGraw Hill, New York.

2. Winterkorn H F and Fange H Y, (1991), “ **Foundation Engineering Hand book**”, Van Nostand Reinhold Company, New York.

3. Teng W C, (1981), “ **Foundation Design**”, Prentice Hall of India”, New Delhi.

4. Srinivaslu P and Vaidyanathan C V, (1987), “ **Hand Book of Machine Foundations**”, Tata McGraw Hill.

5. Poulos H G and Davis E H, (1980), “ **Pile Foundation Analysis and Design**”, John Wiley and Sons, New York.

**CE10310A ADVANCED STRUCTURAL DESIGN**

**[ 3 0 0 3 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understanding the Airy’s theory to design bunkers and silos.
2. Apply the concept of working stress method to analyze and design of water tank.
3. Solve the problem related to Design of Box Culvert
4. Analyze and Design of Grid Floors and Portal Frames
5. Utilize the concept of limit state method to analyze and design of Beams Curved in Plan.

**Module – 1: Design of Bunkers and Silos**

Classification of bunkers, lateral pressure on silos, Airy’s theory, detailed design of bunkers and silos.

[08]

**Module – 2: Design of Water Tanks**

Under ground Water Tanks (circular and rectangular), Under ground Water Tanks (circular and rectangular).

[06]

**Module – 3: Design of Box Culvert**

Type of box culverts, design principles, example

[06]

**Module – 4: Design of Grid Floors and Portal Frames**

Design of grid floors by approximate methods and IS code method, design of portal frames- single storey and single bay.

[08]

**Module – 5: Design of Beams Curved in Plan**

Design beams curved in plan.

[08]

Total contact hours: **36**

**Reference Books**

1. Hughese B P, **Limit State Theory for Reinforced Concrete Design**.

2. Mallick and Gupta, R**einforced Concrete**.

3. Park R and Paualy, **Reinforced Concrete Structures**.

4. Ramachandra, **Limit State Design**.

5. Jain O P and Jaikrishna, **Design of Reinforced Concrete Structures Vol. 2**.

6. Krishnaraju N, **Advanced R.C.C. Design**.

**CE10311A ADVANCED STRUCTURAL ANALYSIS**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the concept of indeterminacy and analysis of indeterminate structures.
2. Evaluation of shape factor, collapse load, and plastic moment carrying capacity of structures using the concept of plastic analysis.
3. Analysis of indeterminate beams, trusses and frames by matrix method.
4. Ability to solve problems related to influence lines.
5. Ability to analyze the problems of beams and frames by Column Analogy method.

**Module – 1: Introduction**

Classification of structures, equation of static equilibrium, internal forces, free-body diagram, degree of static indeterminacy, degree of kinematic indeterminacy, stability. Column Analogy method - Introduction, Sign convention, stresses in a column, application to beams, application to symmetric frames.

[09]

**Module - 2: Plastic Analysis**

Ductility behaviour in the plastic range, concept of plastic hinge, plastic moments, shape factor for different shapes of cross section, redistribution of moment, collapse mechanism. Upper and lower bound theorems. Determination of collapse loads using static and kinematics methods for simple structures.

[09]

**Module - 3: Analysis by Displacement Method**

Matrix formulation of displacement method, generation of 1- dimensional frame element stiffness matrix, flexural, axial and shear deformations, concept of local effects, generation of load vector, effects of finite joints, application to plane frames.

[06]

**Module - 4: Analysis by force method**

Matrix formulation of force methods, Solution of simultaneous equations generation of 1-dimensional frame element stiffness matrix, flexibility and displacement approaches, concept of local effects, generation of local vector, application to plane frames.

[06]

**Module - 5**:**Influence Lines for Indeterminate Structures**

Concept of influence lines using equilibrium methods and by using Muller Breslau principle for both statically determinate and indeterminate structures. [06]

Total contact hours: 36

**References**

1. Reddy C S (2004),”**Basic Structural Analysis**”, Tata McGraw Hill, New Delhi.

2. Rao Prakash D.S (1996), “**Structural Analysis**” Universities Press, India.

3. Gupta S P, Pandit G S, and Gupta R (2003), “ **Theory of Structures**”,volume 2,

McGraw Hill, New Delhi.

4. Vaidyanathan R, and Perumal R, (2004), “ **Comprehensive Structural Analysis**”,

Vol I & II, Laxmi Publications, New Delhi.

**CE10312A BRIDGE ENGINEERING [3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basic principle to investigate bridge.
2. Understanding the standard specification of road bridges as per IS Codes.
3. Analysis of culverts.
4. Ability to design the concrete bridges.
5. Interpret the various properties of substructures and super structures of bridges.

**Module 1: Introduction**

Definitions, components of a bridge, classification, importance and standard specifications. Site selection, data drawing, design discharge, linear water way, economical span, location of piers and abutments, vertical clearance above HFL, scour depth, traffic projection, investigation report, choice of bridge type.

[07]

**Module – 2: Standard specifications for road bridges**

IRC bridge code, determination of dead loads and live loads, wind loads, longitudinal forces, centrifugal forces, horizontal forces due to water current, buoyancy effect, earth pressure, temperature effect, deformation stresses, secondary stresses, erection stresses, seismic forces.

[07]

**Module - 3: Culverts and Concrete bridges**

RCC slab culvert, pipe culvert and box culvert. Concrete bridges- Analysis and design of small bridges and culverts, structural details of minor bridges and culverts, T-beam reinforces concrete bridges and pre-stressed concrete bridges, continuous bridges, cantilever bridges.

[10]

**Module - 4: Sub structures**

Different types of bridge bearings, piers and masonry abutments, different types of foundation and their choices, wing walls, abutment and pier design for minor bridges, depth of bridge foundation, length of clear span and number of spans and the effect of contraction on the normal scour depth, return wall, wing wall.

[05]

**Module – 5: Super structures**

Construction of superstructures for temporary bridges, semi-permanent bridges, submergible bridges, low-cost bridges, steel-arch bridges, RCC bridges and cable stayed bridges, wearing course, expansion joint, approach road, approach slab, protection works for shallow foundation for minor bridges, special precautions during construction, failure and restoration of bridge super structure, sub-structure and its maintenance.

[07]

Total contact hours: **36**

**References**

1. Ponnuswamy S, “ **Bridge Engineering**”, Tata McGraw Hill Publishing Co., New Delhi, 2003.

2. Whitney C.S, “ **Bridges**”, Greenwich House 1983.

3. N.K.Raju, “ **Design of bridges**”, Oxford & IBH Publishing Co. pvt.ltd.

4. D.J.Victor, “ **Essentials of bridge engineering**”, Oxford & IBH Publishing Co. pvt. Ltd.

5. Indian Road Congress Codes”

**CE10313A REPAIR AND REHABILITATION OF STRUCTURES**

**[3 0 0 3]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Acquiring practical knowledge and hands-on experience in Non Destructive Testing Techniques.
2. Identify the causes of deterioration of concrete, effect of earthquake.
3. Identifying the suitable method for repairs of structural components.
4. Analyse and identify the proper method of repairs on steel structures.
5. Interpret various rehabilitation methods for under water structures.

**Module – 1:**

NDT and semi destructive testing. Appraisal of damage and deterioration of structures by non-destructive and other techniques.

[12]

**Module – 2:**

Causes of deterioration of concrete, environmental aspects and earthquake effects.

[07]

**Module – 3: Repair and strengthening of superstructure**

Structural components, load bearing wall, panel walls, strengthening of foundation, grouting, grout material, guniting, shotcreting, under pinning.

[07]

**Module – 4: Repair of steel structures**

Repair of bridges, buildings, towers etc., monuments and historical structures.

[05]

**Module – 5: Prevention of water leakage in structures**

Under-water repair, durability of repairing material, case histories.

[05]

Total contact hours: **36**

**Reference Books:**

1. Testing of Concrete in Structure by Bungey, Surrey University Press

2. Non Destructive Testing by Malhotra &Carino (CRC Press)

3. Corrosion of Steel in Concrete by Broomfield John P

**CE10401A PLANNING AND COMPUTER AIDED DRAWING OF BUILDINGS [0 0 2 1]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Remembering the basics of Auto Cad- Command and purpose
2. Understand the idea and concept of Page layout and settings, Format, Units, Dimensions, engineering drawing.
3. Applying the different commands to draw foundations, doors and windows.
4. Understanding the concept of engineering drawing, plan, elevation and section.
5. Preparing complete set of drawings and reports.

**Module 1: Introduction to Auto Cad**

Preliminary introduction to Basics of Auto Cad- Command and purpose, Basic keys, Page layout and settings, Format, Units, Dimensions, Basic drawing.

**Module 2: Foundations**

Draw plan, elevation and sectional view for different types of foundations with details.

**Module 3: Doors and Windows**

Plan, elevation and sectional views for different types of doors and windows in detail.

**Module 4: Plan and Elevation of Residential Buildings**

Plan, and elevation of two storey residential building

**Module 5: Sectional Views of Residential Buildings**

Sectional views of two storey residential building

**Reference Books**

1. Rangwala, Civil Engineering Drawing
2. [Dr. N. Kumara Swamy](https://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Dr.+N.+Kumara+Swamy&search-alias=stripbooks) , [A. Kameswara Rao](https://www.amazon.in/s/ref=dp_byline_sr_book_2?ie=UTF8&field-author=A.+Kameswara+Rao&search-alias=stripbooks), Building Planning and Drawing
3. A Kamal, Book of House Plans and Elevations
4. V.B. Sikka , A Course In Civil Engineering Drawing.
5. S. Vishal, AUTOCAD Drawing.
6. Gurucharan Singh and Subhashchandra, Text Book of Civil Engineering Drawing.
7. Prof. Sham Tickoo, Exploring AutoCAD Civil 2020

**CE10402A GEOLOGY LAB [ 0 0 2 1]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Learn identification of different rock-forming and ore minerals in hand specimens.
2. Learn identification and differentiation of important rocks in hand specimens
3. Compute true thickness of beds using dip, width and vertical thickness.
4. Draw profile view of a geological map based on the plan view.
5. Interpret geological maps to identify geological structures and sequence of geological events.

**Identification and description of minerals:** with uses and distribution in India

[Rock forming minerals: Quartz group – rock crystal, amethyst, ragate, jasper, orthoclase, microcline, plagioclase, muscovite, biotite, kaolinite, calcite, magnesite, dolomite, hornblende, gypsum, olivine, corundum, garnet, talc, asbestos, chlorite]

[Ore Minerals: Haematite, banded-haematite-jasper, magnetite, limonite, chromite, chalcopyrite, pyrite, galena, sphalerite, stibnite, pyrolusite, psilomelane]

**Megascopic study:**Rocks with their composition, texture, structure and engineering importance.

[Rocks: Granite, gabbro, dunite, pegmatite, dolomite, basalt, obsidian, pumice, conglomerate, breccia, sandstone, limestone, shale, laterite, gneiss, phyllite, schist, slate, quartzite, marble]

**Interpretation of geological maps:** Horizontal, inclined, folded, faulted beds and unconformity.

Determination of thickness of strata on horizontal ground, Dip and strike problems, bore hole problems and their uses in dams, tunnels and reservoir sites.

**CE10403A SURVEYING LAB [ 0 0 2 1 ]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understanding the practical use of different kind of surveying instruments.
2. Explaining the methods and techniques of experiments with detailed concept.
3. By Conducting the experiments, collect data from the field to perform required calculations to achieve the objective for different types of surveying experiments.
4. Able to control the accumulation of errors in experiments.
5. Preparing Laboratory reports.

**Module1:** Compass Traversing

1. construction of regular pentagon.
2. construction of regular hexagon.

**Module 2: Leveling**

1. Simple leveling – to find out elevation of different points shown on the ground with respect to given arbitrary B.M.
2. To find difference in level between two points by reciprocal leveling.

**Module 3:** Measurement of distances and elevations:

1. To find RL and distance when the base of object is accessible.
2. To find RL and distance when the base of object is inaccessible.

**Module 4:** Contouring using Tacheometer.

**Module 5: Curve Surveying**:

1. Simple curve using Theodolite
2. Setting out compound curves
3. Setting out reverse curves

**Reference Books:**

1. Kanetkar T P and Kulkarni S V, Surveying and Levelling Part I & II
2. Punmia B C, Surveying Vol I & II, Lakshmi Publications

**CE10404A FLUID MECHANICS LAB [ 0 0 2 1]**

**SCHEME OF EXAMINATION**

Questions to be set: 06 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To understand the principles of fluid flow and conduct experiments to determine the associated parameters.
2. To assess the energy losses in fluid flowing through pipes
3. To impart training to use various flow measuring devices for making engineering judgments in real time flow scenarios.
4. To gain knowledge on performance and testing of hydraulic turbines and pumps.
5. Prepare reports based on interpretation of experimental results.
6. Calibration of V-notch
7. Calibration of rectangular notch
8. Calibration of Cippoletti notch
9. Calibration of Orifices
10. Calibration of mouthpieces
11. Calibration of venturi meter
12. Calibration of Orifice meter
13. Determination of friction factor of pipes
14. Experiment on Venturi flume
15. Experiment on standing wave flume
16. Calibration of broad crested weir
17. Calibration of curved weir
18. Impact of jet on vanes
19. Test on Centrifugal pump
20. Test on Pelton Turbine
21. Test on Francis Turbine
22. Demonstration of Kaplan Turbine
23. Demonstration of fluid pressure measurement using differential manometer and piezometer

**Reference Books:**

1. Modi P N and Seth S M, **Hydraulics and Fluid Mechanics**, Standard Book House.
2. Jain A K, **Fluid Mechanics**, Khanna Publishers.
3. Subramanya K, **Theory and Applications of Fluid Mechanics**, Tata McGraw Hill Publishing Co. Ltd, New Delhi.

**CE10405A MATERIAL TESTING LAB [ 0 0 2 1 ]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Understanding the theoretical concept of various properties of construction materials.
2. Interpreting the concept of different kinds of experiments for different materials.
3. Conducting the experiments to validate the theoretical knowledge on the properties of construction materials.
4. Analyzing the results obtained from experiments and interpret the result and its deviation from normal standard if any.
5. Preparing Laboratory reports.

**(a) Test on cement**

* 1. Determination of Specific Gravity of cement.
  2. Determination of fineness of cement.
  3. Determination of standard consistency of cement.
  4. Determination of setting times of cement.
  5. Determination of soundness of cement.
  6. Determination of strength of cement.

**(b) Test on Fine and Coarse aggregates for concrete**

* 1. Determination of specific gravity of fine aggregate.
  2. Determination of specific gravity of coarse aggregate.
  3. Determination of fineness modulus of fine aggregate.
  4. Determination of fineness modulus of coarse aggregate.
  5. Determination of bulking of sand.
  6. Determination of clay ( or silt) content in sand.

**(c) Test on concrete**

* 1. Determination of workability of concrete by slump test.
  2. Determination of workability of concrete by compaction factor test.
  3. Determination of workability of concrete by Vee-Bee consistometer test.
  4. Determination of compressive strength of concrete.
  5. Determination of tensile strength of concrete.

**(d) Test on Aggregates**

* 1. Determination of aggregate impact value.
  2. Determination of aggregate abrasion value. (Los Angeles test)
  3. Flakiness and Elongation indices of aggregates – demonstration
  4. Rebound hammer test – demonstration.

**(e) Revision of experiments**

**Reference Books:**

1. Shetty M S, **Concrete Technology**, S Chand and Co.
2. Neville A M, **Properties of concrete**, ELBS London.
3. Gurucharan Singh, **Materials of Construction**.
4. V VShastry and M L Gamber, **Laboratory Manual of Concrete Testing Part I & II**

**CE10407A COMPUTER AIDED STRUCTURAL ANALYSIS AND DESIGN [ 0 0 2 1]**

Introduction, Importance of the lab, Computer aided structural analysis and design softwares (STAAD, SAP, ETABS etc.)**.**

* 1. Analysis of plane trusses.
  2. Analysis and design of determinate beam.
  3. Analysis of Indeterminate beam.
  4. Analysis and design of non-sway plane frames.
  5. Analysis of sway plane frames.
  6. Analysis of space trusses.
  7. Analysis of multistorey frames due to vertical loading (point load, self weight, dead load, live load etc.).
  8. Analysis of multistorey frames due to wind load.
  9. Seismic Analysis of multistorey frames.
  10. Analysis and design of multistorey frames due to various load combination.

**Reference:**

1. STAAD Pro manual
2. SAP manual
3. ETABS manual
4. IS 875 , IS 1893, IS 456, IS 800

**CE10408A ENVIRONMENTAL ENGINEERING LAB**

**[ 0 0 2 1]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. To compute total solids, suspended solids, dissolved solids, volatile and fixed solids both water and waste water
2. To understand concept of physical characteristics of water and waste water.
3. To understand the safe disposal of waste water.
4. To compute chemical characteristics of water and waste water.
5. To evaluate physical properties of filter sand.

1. Determination of solids: Total solids, suspended solids, dissolved solids, volatile solids, fixed solids, settlable solids.

2. Determination of Alkalinity, Acidity and pH.

3. Determination of Calcium, Magnesium and total Hardness.

4. Determination of Chlorides.

5. Determination of Dissolved Oxygen.

6. Determination of Residual Chlorine and chlorine demand.

7. Determination of percentage available chlorine in Bleaching powder.

8. Determination of B.O.D.

9. Total count test and MPN determination.

10. Filter sand analysis – Effective size and uniformity coefficient.

**Reference Books**

1. **Standard methods for the examination of Water and Waste water**, ALPHA – AWWA - WPCF

2. Sawyer and McCarty, **Chemistry for Environmental Engineering**.

3. **IS: 3025 -1964, Methods of sampling and test** (physical and chemical) for water used in Industry.

4. S K Hussain, **A Text Book of Water Supply and Sanitary Engineering**.

5. **Methods for Chemical Analysis of Water and wastes** – 1974 U.S. EPA t echnology transfer 625/6-75003 p.p 266 – 267.

6. G S Birdie, **Environmental Engineering.**

7. **Drinking Water Standards**, IS: 10500 – 1983.

**CE10409A GEOTECHNICAL ENGG. LAB [ 0 0 2 1 ]**

**SCHEME OF EXAMINATION**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**

After completion of this course, students should be able to

* 1. To understand and apply the concept of soil mechanics to find the basic soil parameter like unit weight, water content, Atterberg’s limit etc.
  2. To identify the type of soil
  3. To identify the and analyze the seepage characteristics
  4. To evaluate the strength of the soil by finding cohesion and angle of internal friction
  5. To evaluate the bearing capacity of the soil.

1. Determination of natural moisture content.
2. Determination of specific gravity
3. Determination of Atterberg’s limits.
4. Determination of in-situ unit weight by
   1. sand replacement method
   2. core cutter method.
5. Determination of coefficient of permeability by
   1. Constant head permeameter
   2. Variable head permeameter.
6. Compaction test – Standard and modified compaction tests, use of Proctor needle.
7. Determination of shear strength characteristics by
   1. Direct shear test
   2. Unconfined compression test
   3. Triaxial test ( no pore pressure and volume change measurement)
   4. Vane shear apparatus
8. Field Tests – Demonstration of the following tests:
   1. Cone penetration tests
   2. CBR tests

**References:**

1. IS: 2720 Part II, 1973, Soil test, determination of Water Content
2. IS: 2720 Part III sec: I, 1980, Soil test, determination of Specific Gravity.
3. IS: 2720 Part XXIX, 1975, Soil test, determination of dry density of soils in place by the core cutter.
4. IS: 2720 part IV, 1965, method of test for soil, grain size analysis.
5. IS: 2720 part V, 1965, determination of liquid and plastic limits
6. IS: 2720 part VI, 1964, determination of shrinkage factors
7. IS: 2720, part XXVIII, 1966, determination of dry density of soil in place by sand replacement method.
8. IS: 2720, part VII, 1965, determination of dry density by using light compaction
9. IS: 2720 part XVII, 1966, soil test, laboratory determination of permeability
10. IS: 2720 part XI, 1971, soil test, determination of shear strength
11. IS: 2720 part XIII, 1972, soil test, direct shear test
12. IS: 2720, part XXXIX, sec. I, 1977, soil test, direct shear test.
13. IS: 2720 part X, 1973, soil test, determination of unconfined compression
14. IS: 2720 part XVI 1965, Laboratory determination of CBR
15. Bowles J E, Engineering Properties of Soil and their Measurement, McGraw Hill
16. Lambe T W, Soil Testing for Engineers, John Wiley and Sons
17. Cheng Liu and Jack B Evett, Soil Properties, Testing, Measurements and Evaluation, Prentice Hall New Jersey.

**CE10410A Geoinformatics Lab [ 0 0 2 1]**

**Course Outcomes (CO):**

After completion of this course, students should be able to

1. Acquiring practical knowledge and hands-on experience in remote sensing technique.
2. Learning various GIS operations for creation, analysis and interpretation of thematic maps
3. Applying various digital image processing techniques to extract hidden features and information
4. Classifying digital satellite images using supervised and unsupervised classification techniques
5. Performing analysis and modelling through integration of remote sensing and GIS

Digital Image Processing

Teaching Plan

Practical 1: Computation of spatial statistics on 2-D matrices

Practical 2: Import, format conversion and display of images

Practical 3: Geometric correction and image to image registration

Practical 4: False Colour Composites (FCC) and filtering operations

Practical 5: Image space and feature space conversion, sampling concepts

Practical 4: Unsupervised classification on an image

Practical 5: Supervised classification on an image

Practical 6: Error Matrix Calculation

Geographic Information Systems LAB

Teaching Plan

Practical 1: Data joining, query analysis

Practical 2: Digitisation: point, line, area

Practical 3: Geoprocessing tools (Conversion of coordinates and projections)

Practical 4: Spatial analysis tools (Interpolation)

Practical 5: Network analysis, shortest path, location-allocation

Practical 6: Overlay analysis exercise

Practical 7: AHP exercise with sample data

Practical 8: Case study with sample GIS database

**Reference Books:**

1. John R Jenson, Introductory Digital Image Processing, Prentice Hall.
2. Burrough P A, Principles of Geographical Information System for Land Resource Assessment, Oxford University Press.
3. Bonham-Carter G F, Geographic information systems for geoscientists modelling with GIS (1995) Pergamon.
4. ESRI

**Sub Code: BA 10146A Credit: 2 (L-2, T-0, P-0)**

**Subject Name: INDUSTRIAL MANAGEMENT**

**Questions to be set: 05 (All compulsory)**

Course Objective: To provide basic knowledge of functions of management along with their practical implications

**Course Outcomes (CO):**

CO1: To provide basic knowledge and application of functions of management

CO2: To help students to understand and apply principles of management evolved by pioneers of management.

CO3: To enable students to apply basic quantitative techniques for making decisions related to operations management

CO4: To help student apply various techniques for optimal production management

CO5: To apply concepts of materials management for maintaining optimal inventory

\*\* Not more than 20% of total topics to be allotted for assignment

|  |  |  |  |
| --- | --- | --- | --- |
| **Module** | **Topics to be covered** | **Topics** | **Hrs** |
| Introduction | In Class | Philosophy and Development of Management thought. Concept and definition of management, Functions and Roles of Management, Social Responsibilities of Management. | 3 |
| \*\* Assignment Topics |  |  |
| Pioneersin Management | In Class | Taylor’s Scientific Management, Contribution of Henry Fayol, Maslow, McGregor, Gilbreth and Mayo. | 3 |
| \*\* Assignment Topics |  |  |
| Quantitative Techniques in Managerial Decisions | In Class | Concept of budget and budgetary control. Time-event network analysis; ABC Analysis, Break-even Analysis; Decision Tables; Concept of productivity, measuring productivity, Use information technology | 5 |
| \*\* Assignment Topics |  |  |
| Production Management | In Class | Types of production; Types of Planning, Manufacturing Planning; Production planning, Scheduling; Work study & Method Study; Systems of wage payments, bonus, Automation. Organization of production, planning and control department. | 5 |
|  | \*\* Assignment Topics |  |  |
| Materials Management | In Class | Practice of purchasing and materials management, quality, Inventory Management, EOQ model; Value Analysis and Value Engineering. | 4 |
| \*\* Assignment Topics |  |  |

**Text Books:**

1. H. Koontz and H. Weihrich, “Management”, McGraw Hill
2. Dobler W.D. “Purchasing & Materials Management”, TMHC, New Delhi

**Behavior Management and Leadership (Capsule Course/Certificate course)**

**Sub. Code: GN10102A**

Credits: 3

Course Level: UG & PG

Course Code: BML - 1

**Course Outcomes (CO):**

CO1: Evaluate self-awareness, self-management concepts to help others understand themselves better

CO2: Judge ethical issues and values in professional/personal situations and decision making

CO3: Demonstrate enhanced ability to think and reason creatively while solving problems

CO4: Estimate Stress levels and causes and develop strategies for managing stress

CO5: Acquire better capabilities to communicate and forge interpersonal relationships

CO6: Develop abilities to build teams and lead them

|  |  |  |
| --- | --- | --- |
| **UNIT** | **Topics** | **Hrs 36** |
| **I** | SELF-AWARENESSAND SELF-MANAGEMENT: Understanding self, dimensions of self, Concept and Importance of self-esteem, positive and negative self-esteem, Developing positive self-esteem, Self-development and happiness. Role of motivation in self-growth, nature and types of motivation, factors affecting motivation, Achievement motivation, Relationship between achievement motivation and emotions. Nature and Significance of self-management skills, Aspects of self-management, Social competency behavior | **6** |
| **II** | **VALUES & ETHICS:** Meaning, types and determinants of Values, Concept of Ethics, Relationship between Values and Ethics Its implication in one’s life. Concept of Moral Development, factors responsible for moral development. Ethical Decision making, Challenges in its implementation. Prevention of Corruption &Crime; Personal Values-Empathy, honesty, courage, commitment. Professional Values-Work ethics, respect for others, Its role in personality development. | **6** |
| **III** | **THINKING AND REASONING:** Nature and types of thinking, Problem Solving- Types of problems, Approaches to problem solving, Steps and styles of problem solving, Hindrances to Problem Solving Process- Perception, Expression, Emotion, Intellect; Creative Thinking**- M**eaning, nature and characteristics of creativity, factors affecting creativity, stages of creativity, personality of a creative person, factors enhancing creativity. Reasoning-types of reasoning, Distortion in thinking and reasoning | **5** |
| **IV** | **EMOTIONAL INTELLIGENCE&COPING WITH STRESS:** Nature of Emotions, biology of emotions, Need for and importance of Emotions, Emotion Anger: Introduction to Anger, types of anger, causes of anger, consequences of anger, Expression of anger-passive and aggressive anger, Anger management; Introduction to Emotional Intelligence, Competencies in emotional intelligence, Types of emotional intelligence, Strategies to enhance emotional intelligence; Expected outcomes of emotional intelligence; Nature of stress, relation between demands and coping, types and causes of stress, Indicators of stress, coping strategies to manage stress, Effective time management strategies. | **6** |
| **V** | COMMUNICATION: Nature and importance of communication, types of communication-indicators of verbal and non-verbal communication, communication styles; Assertiveness-Introduction, types of behavior, nature of assertiveness, Assumptions and Rights in Interpersonal communication, strategies to become assertive, Assertiveness in daily life, Characteristics of an assertive person. | **4** |
| **VI** | INTERPERSONAL RELATIONSHIPS: Importance of interpersonal relations, Types of Interpersonal Relationships, Barriers to effective communication in relationships, steps to improve interpersonal communication, Role of feedback in interpersonal communication, Conflict management, strategies for maintaining good interpersonal relations, relating to others in virtual world | **5** |
| **VII** | LEADERSHIP &TEAM BUILDING  Leadership- Definition, Meaning, Nature and Functions of leader, Types of leaders, Leadership styles, Functions of a Leader, Decision-making, personality traits of an effective leader; Significance and nature of team building, Stages of team building, types of teams, factors influencing the effectiveness of a team | **4** |

# Text & References:

* 1. Wadkar A (2016). Life Skills for Success, Sage Publications, New Delhi, India
  2. SmitherRobertD. (1994).ThePsychologyofWorkandHumanPerformance,Harper CollinsCollegePublishers
  3. SinghA. January(2013); AchievingBehavioural ExcellenceforSuccess;WileyPublication.
  4. Raman,A.T.(2003)KnowledgeManagement:AResource Book. ExcelBooks,Delhi.
  5. Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
  6. J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
  7. Pestonjee, D.M.; Stress and Coping: The Indian Experience
  8. Clegg, Brian; Instant Stress Management – Bring calm to your life now
  9. Phil Lowe Koge Page: Creativity and Problem Solving, New Delhi, 1996
  10. Bensley, Alan D.: Critical Thinking in Psychology – A Unified Skills Approach, (1998), Brooks/Cole Publishing Company.

Sub Code: **GN11001A Credit: 0 (L-3, T-0, P-0)**

**QUANTITATIVE APTITUDE AND LOGICAL REASONING**

**(Optional Audit Course)**

Questions to be set: 05 (All Compulsory)

**Course Outcomes (CO):**On successful completion of the course

|  |  |
| --- | --- |
| **CO1** | Student will be able to solve variety of problems in the space of quantitative domain. |
| **CO2** | Students will be able to use data to determine or to deduce other facts from a set of given data. |
| **CO3** | Students will be able to use shortcuts, tricks and techniques to solve the problems with accuracy. |
| **CO4** | Students will be able to demonstrate essential skills pertaining to business communications. |

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| **Module** | **Topics** | **Hrs.** |
| Module 1:  **Quantitative Aptitude** | Problems on Trains, Time and Distance, Height and Distance, Time and Work, Simple Interest, Compound Interest, Profit and Loss, Partnership, Percentage, Problems on Ages, Calendar, Clocks, Average, Area, Volume and Surface Area, Permutations and Combinations, Probability, Numbers, Problems on Numbers, Problems on HCF and LCM, Decimal Fraction, Simplification, Square Root and Cube Root, Surds and Indices, Ratio and Proportion, Chain Rule, Pipes and Cistern, Boats and Streams, Allegation and Mixtures, Logarithm, Races and Games, Stocks and Shares, Probability, True Discount, Odd man out and Series. | 16 |
| Module 2:  **Puzzles, Problem Solving and Analysis** | Sudoku, Number Puzzles, Missing Letter Puzzles, Playing Card Puzzles, Clock Puzzles, Logical Connectives and Syllogisms, Data Interpretation, Cases, Venn Diagrams. | 5 |
| Module 3:  **Logical Reasoning** | Number Series, Letter and Symbol series, Verbal Classification Essential Part, odd man out and visual reasoning, Analogies, Artificial Language, Matching Definitions, Making Judgements, Verbal Reasoning, Logical Problems, Logical Games, Data Arrangement and Blood Relations, Analyzing Arguments, Statement and Assumption, Course of action, Statement and Conclusion, Theme Detection, Cause and Effect, Statement and Argument, Logical Deduction. | 10 |
| Module 4:  **Professional Builder** | CV Writing, Verbal & Non Verbal Communication, Group Discussion, Netiquettes, Telephone Etiquettes. | 5 |

# References:

1. R.S.Aggarwal, Quantitative Aptitude for Competitive Examinations, S CHAND.
2. ShakuntalaDevi, Puzzles to Puzzle You.
3. R.V. Praveen, Quantitative Aptitude and Reasoning, 2nd Revised Edition 2013, Prentice-Hall of India Pvt.Ltd.

**Sub Code: GN10103A**  **Credit: 1 (L-1, T-0, P-0)**

**PROFESSIONAL COMMUNICATION & TECHNICAL WRITING**

**Questions to be set:** 05 (All Compulsory)

**Course Outcomes:**

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

* 1. Develop skills required for effective communication of scientific knowledge in terms of oral presentation
  2. Enhance skills required for effective communication of scientific knowledge in terms of technical writing
  3. Analyze the importance of peer review and criticisms on Technical papers and proposals
  4. Understand the importance of Ethics in research

|  |  |  |
| --- | --- | --- |
| **Module** | **Topics** | **Hrs** |
| Module 1:  < Introduction> | Discussion of research ideas and where they come from | 4 |
| Module 2:  <Hypothesis reasoning> | Highlights on hypothesis reasoning and testing  Discussion on Hypothesis testing and experiments | 6 |
|  |
| Module 3:  <Advanced Skills and Discussion on Scientific writing> | Discussion on Scientific writing – how to get started  Define the purpose of a proposal Gather, record, and interpret data | 2 |
|  |
| Module 4:  <Highlights on Publishing and peer review process and Schematic diagrams > | Highlights on Publishing and peer review process: The good, the bad, the ugly.  Rationale on the usage of Schematic diagrams, figures, tables and flow charts | 4 |
|  |
| Module 5:  <Different forms of writing > | Discussion on different forms of writing viz. scientific report, proposal, and reviews  Enhancing oral presentation skill sets | 4 |

**Text Book**

1. George E. Kennedy, Tracy T. Montgomery, Technical and Professional Writing, Pearson, 2002.

**References**

Charles T. Brusaw, Gerald J. Alred, Walter E. Oliu, Handbook of Technical Writing, 9780312057336, 4th Edition 2018.

**Sub Code: GN10101A [2-1-0-3]**

**UNIVERSAL HUMANVALUES-II: UNDERSTANDING**

**HARMONY and ETHICAL HUMAN CONDUCT**

## Course Objectives:

This introductory course input is intended:

* 1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
  2. To facilitate the development of a Holistic perspective among students towards life and professionaswellastowardshappinessandprosperitybasedonacorrectunderstandingof the Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
  3. TohighlightplausibleimplicationsofsuchaHolisticunderstandingintermsofethicalhuman conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

**Pre-requisites:** None. However, it is desired that students may have gone through UHV-I: Universal Human Values-Introduction

## Course Outcome (CO):

1. Students are expected to understand self-exploration and Basic Human Aspirations.
2. To understand harmony in themselves (Human being).
3. To become more aware of their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
4. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hopedthattheywouldbeabletoapplywhattheyhavelearnttotheirownselfindifferentday-to-day settings in real life, at least a beginning would be made in this direction.

Therefore, the course and further follow up is expected to positively impact common graduate attributes like:

* 1. Holistic vision of life
  2. Socially responsible behaviour
  3. Environmentally responsible work
  4. Ethical human conduct
  5. Having Competence and Capabilities for Maintaining Health and Hygiene
  6. Appreciation and aspiration for excellence (merit) and gratitude for all

**Module 1 –Introduction to Value Education** (9 Hrs)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: PracticeSession *PS1 Sharing aboutOneself*

Lecture 3: Self-exploration as the Process for Value Education

Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice SessionPS*2 Exploring HumanConsciousness*

Lecture 5: Happiness and Prosperity – CurrentScenario

Lecture 6: Method to Fulfil the Basic HumanAspirations

Tutorial 3: PracticeSessionPS*3 Exploring Natural Acceptance*

## Module 2 – Harmony in the Human Being (9 Hrs)

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body

Lecture 8: Distinguishing between the Needs of the Self and the Body

Tutorial 4: Practice Session PS*4 Exploring the difference of Needs of Self and Body*

Lecture 9: The Body as an Instrument of the Self

Lecture 10: Understanding Harmony in the Self

Tutorial 5: Practice Session PS*5 Exploring Sources of Imagination in the Self*

Lecture 11: Harmony of the Self with the Body

Lecture 12: Programme to ensure self-regulation and Health

## Tutorial 6: Practice Session PS*6 Exploring Harmony of Self with the Body*

## Module 3 – Harmony in the Family and Society (9 Hrs)

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction

Lecture 14: 'Trust' – the Foundational Value in Relationship

Tutorial 7: Practice Session PS*7 Exploring the Feeling of Trust*

Lecture 15: 'Respect' – as the Right Evaluation

Tutorial 8: Practice Session PS*8 Exploring the Feeling of Respect*

Lecture 16: Other Feelings, Justice in Human-to-Human Relationship

Lecture 17: Understanding Harmony in the Society

Lecture 18: Vision for the Universal Human Order

Tutorial 9: Practice Session PS*9 Exploring Systems to fulfil Human Goal*

## Module 4 – Harmony in the Nature/Existence (6 Hrs)

Lecture 19: Understanding Harmony in the Nature

Lecture 20: Interconnectedness, self-regulation, and Mutual Fulfilment among the Four Orders of Nature

Tutorial 10: Practice Session PS*10 Exploring the Four Orders of Nature*

Lecture 21: Realizing Existence as Co-existence at All Levels

Lecture 22: The Holistic Perception of Harmony in Existence

## Tutorial 11: Practice Session PS*11 Exploring Co-existence in Existence*

## Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

## (9 Hrs)

**Lecture 23:** Natural Acceptance of Human Values

**Lecture 24:** Definitiveness of (Ethical) Human Conduct

**Tutorial 12: Practice Session PS***12 Exploring Ethical Human Conduct*

**Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

**Lecture 26:** Competence in Professional Ethics

**Tutorial 13: Practice Session PS***13 Exploring Humanistic Models in Education*

**Lecture 27:** Holistic Technologies, Production Systems and Management Models-Typical Case Studies

**Lecture 28:** Strategies for Transition towards Value-based Life and Profession

## Tutorial 14: Practice Session PS*14 Exploring Steps of Transition towards Universal Human Order*

## Content for Practice Sessions (Tutorials)

Inordertoconnectthecontentoftheproposalswithpractice(living),14practicesessionshavebeen designed. The full set of practice sessions is available in the Teacher’s Manual as well as the website.

### Practice Sessions for Module 1 – Introduction to Value Education

PS1 Sharing aboutOneself

PS2 Exploring Human Consciousness

PS3 Exploring NaturalAcceptance

***Practice Sessions for Module 2 – Harmony in the Human Being***

PS4 Exploring the difference of Needs of Self and Body

PS5 Exploring Sources of Imagination in theSelf

PS6 Exploring Harmony of Self with theBody

### Practice Sessions for Module 3 – Harmony in the Family and Society

PS7 Exploring the Feeling of Trust PS8 Exploring the Feeling ofRespect

PS9 Exploring Systems to fulfil HumanGoal

### Practice Sessions for Module 4 – Harmony in the Nature (Existence)

PS10 Exploring the Four Orders of Nature

PS11 Exploring Co-existence in Existence

### Practice Sessions for Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

PS12 Exploring Ethical Human Conduct

PS13 Exploring Humanistic Models in Education

PS14 Exploring Steps of Transition towards Universal Human Order

**Text Book**

*A Foundation Course in Human Values and Professional Ethics*, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1

**The Teacher’sManua**l

Teachers’ Manual for *A Foundation Course in Human Values and Professional Ethics*, RRGaur,RAsthana,GPBagaria,2ndRevisedEdition,ExcelBooks,NewDelhi,2019. ISBN978-93-87034-53-2

## Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak,1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
3. The Story of Stuff(Book).
4. The Story of My Experiments with Truth - by Mohandas KaramchandGandhi
5. Small is Beautiful - E. FSchumacher.
6. Slow is Beautiful - CecileAndrews
7. Economy of Permanence - J CKumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - byDharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
11. India Wins Freedom - Maulana Abdul KalamAzad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland(English)

**CE10504A MINOR PROJECT [ 0 0 4 2 ]**

|  |  |  |  |
| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Mini Project | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Mini Project should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Mini Projects are assigned at the end of 5th Semester and the final evaluation is carried out at the end of 6th Semester. | 02 |
| 2 | Mini Project Review | The progress of the project will be evaluated in phases through interim seminars/ presentations. |
| 3 | Evaluation | The faculty/ guide will assess the Mini Project |

**CE10601A RESEARCH PROJECT/ INDUSTRIAL PROJECT - I [ 0 0 14 7 ]**

|  |  |  |  |
| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Research or Industrial Project | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Research Project may be the First Phase of the Major Project.  Alternatively, students if wish may carry out Industrial Project in industry in India or abroad. They will submit a Project Report and deliver a seminar at the end of this project –I online or offline. | 07 |
| 2 | Project Review | The progress of the project will be evaluated in phases through interim seminars/ presentations. |
| 3 | Evaluation | The project will be evaluated by a panel of faculty members of the parent department as well as of other department of the institute. |

**CE10602A MAJOR PROJECT / INDUSTRIAL PROJECT - II [ 0 0 24 12 ]**

|  |  |  |  |
| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Major Project | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Major Project should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Major Projects are assigned at the end of 6th Semester (based on their Mini Project) and the final evaluation is carried out at the end of 8th Semester. | 12 |
| 2 | Major Project Review | The progress of the project will be evaluated in phases through interim seminars/ presentations. |
| 3 | Evaluation | The project will be evaluated by a panel of faculty members of the parent department as well as of other department of the institute. |

**CE10901A INDUSTRIAL TRAINING I [ 0 0 2 1 ]**

The students are required to undergo training in Civil Engineering industries or Design Farms for **two weeks** after 4th Semester during the Summer Vacation. After returning back from the Industrial Training, the students must submit a detail report of the training and give seminar/ presentation.

Members of the Departmental Training and Placement Cell will evaluate and award marks based on the report and the presentation.

The Industrial Training may be carried out by students in groups, however, they need to submit report and give presentation separately.

**CE10902A INDUSTRIAL TRAINING II [ 0 0 2 1 ]**

The students are required to undergo training in Civil Engineering industries or Design Farms for **four weeks** after 6th Semester during the Summer Vacation. After returning back from the Industrial Training, the students must submit a detail report of the training and give seminar/ presentation.

Members of the Departmental Training and Placement Cell will evaluate and award marks based on the report and the presentation.

The Industrial Training may be carried out by students in groups, however, they need to submit report and give presentation separately.

Alternatively, students can be encouraged to learn programing languages like C, C++, Python or advanced macro and VB script in Excel. NPTEL or Udemy course can be used.

**HONORS**

**IN**

**EARTHQUAKE-RESISTANT STRUCTURES**

**Outcome of the course:**

* Students who take this course will gain a thorough, critical understanding of advanced seismology and earthquakes.
* Students will gain an understanding of advanced concrete technology.
* Students who take this course will gain a basic knowledge of structural dynamics.
* Students will gain a detailed understanding of Seismic Design Philosophy construction technique of structures.

**Course structure**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject code** | **Subject name** | **Dept** | **Sem** | **L** | **T** | **P** | **Credit** |
| CE10314A | Engineering Seismology | CE | IV | 3 | 0 | 0 | 3 |
| CE10315A | Advanced Concrete Technology | CE | V | 3 | 0 | 0 | 3 |
| CE10316A | Introduction to Structural Dynamics | CE | VI | 3 | 0 | 0 | 3 |
| CE10317A | Earthquake Design and Construction | CE | VII | 3 | 0 | 0 | 3 |
| CE10701A | Seminar | CE | VII | 0 | 0 | 1 | 1 |
| CE10603A | Project | CE | VII | 0 | 0 | 14 | 7 |
|  | **Total Credit** |  |  | **12** | **0** | **15** | **20** |

**ENGINEERING SEISMOLOGY [3 0 0 3]**

**Subject code: CE10314A**

**Course Outcomes:**

**CO1**: Critical understanding of advanced seismology and causes of earthquakes.

**CO2**: Remembering the seismic hazard and a detailed understanding of wave equations and their solutions.

**CO3**: Assess the design basis ground motion parameters and its application in earthquake engineering for disaster mitigation.

**CO4**: Processing, analysis and interpretation of earthquake data, determination of magnitude, epicentral distance, focal depth, focal mechanism, seismic hazard and risk, seismic zoning.

**CO5**: Prediction of earthquake – a brief idea.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **01.** | Propagation of earthquake Waves, Body & surface waves, laws of reflection, refraction and attenuation, travel times curves, internal structure of earth. | **7** |
| **02.** | Seismicity of earth, major earthquakes in the world, important Indian Earthquakes, earthquake catalogs, plate tectonics, causes of earthquakes. Magnitude, energy, intensity, acceleration, return period, frequency, Ground motion characteristics. | **12** |
| **03.** | Earthquake recording instruments, seismographs, different modes of recording analogue, digital, micro earthquake, teleseismic, local, strong motion, band width and their engineering implications. | **8** |
| **04.** | Processing, analysis and interpretation of earthquake data, determination of magnitude, epicentral distance, focal depth, focal mechanism, seismic hazard and risk, seismic zoning. | **7** |
| **05.** | Introduction to earthquake prediction– a brief idea. | **4** |
| **Total** | | **38** |

**References:**

1. Richter, C.F. Elementary Seismology, Eurasia Publishing House (Pvt)LTD,New Delhi
2. Agrawal,P.N., Engineering Seismology,Oxford & IBH Publishing Co.Pvt.Ltd,New Delhi
3. Aki,K and Richard, P.G.Quantitative seismology, Theory and Methods,Vol.I and II,W.H. Freeman & Co.
4. Rikitake,T.,1976 Earthquake Prediction, Elsevier Science, Amsterdam
5. Oldham,1989 Report on Great Earthquake of 12th June 1897, Memoir Geological Survey of India,V29.
6. Latest Codes of IS-1893-part-I 2016.

**ADVANCED CONCRETE TECHNOLOGY [3 0 0 3]**

**Subject code: CE10315A**

**Course Outcomes:**

**CO1**: Remembering advanced concrete terminology.

**CO2**: Understanding mixed design of concrete, high strength of concrete requirements for advanced concrete.

**CO3**: Remembering and understanding to use plasticizers, effect of water cement ratio and super plasticizers used in the construction works.

**CO4**: Analyzing the various Non Destruct Test (NDT)

**CO5**: Analyzing and evaluating the durability and fire hazards in concrete.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **01.** | **Concrete science:** Standards – specifications – Ingredients - cement and its types – Coarse Aggregate – Fine Aggregate, Chemical admixtures - Mineral admixtures - Polymer concrete, Mix design - Mix Design by IS :10262-2019 - Mix Design by ACI :312 - Other methods of mix design. | **08** |
| **02.** | **Concrete Types:** Normal Vibrated Concrete - High volume fly ash concrete - High strength concrete - Ready mix concrete, pervious concrete, Fiber Reinforced concrete –Self compacting concrete – Bacterial Concrete - Self curing concrete - Geopolymer Concrete. Useof waste materials in concrete:Waste from industry - Recycled aggregates – Sustainability, Green concrete - Eco-Friendly Concrete. | **11** |
| **03.** | **Durability and fire hazards in concrete:** Deterioration of concrete - Factors effecting the durability - Sulphate attack - Acid attack, Alkali Aggregate reaction – Carbonation – Abrasion. | **07** |
| **04.** | **Non Destruct Test (NDT):** Rebound Hammer Test - Ultrasonic pulse velocity test - Core Extraction for Compressive Strength Test - Windsor Probe System – pull out resistance test – pull off test. | **06** |
| **05.** | **Under Water Concrete:** Concrete in Cold weather - Concrete in Hot weather - miscellaneous topics. | **06** |
| **Total** | | **38** |

**References:**

1. Concrete Materials, Properties, Specification and Testing by S. Popovics, Standard Publishers, India.
2. Properties of Concrete by A.M. Neville, ELBS Ed.
3. Waste Materials in Concrete Manufacture by Satish Chandra, Indian Standard Publishers
4. Non-destructive Testing in Concrete by Bungey, Surrey University Press, London.
5. IS 456, (2000), Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.
6. M. S. Shetty, Concrete Technology: Theory and Practice.
7. M.L. Gambhir, Concrete Technology.

**INTRODUCTION TO STRUCTURAL DYNAMICS [3 0 0 3]**

**Subject code: CE10316A**

**Course Outcomes:**

**CO1**: Understanding the basic knowledge of structural dynamics.

**CO2**: Remembering and understanding the Single degree of freedom system.

**CO3**: Application of Multi degree of freedom system in earthquake engineering.

**CO4**: Analysis of the analysis of multi-degree of freedom un-damped systems – Raleigh method, Power Method

**CO5**: Analysis of Static and dynamic structures.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **01.** | **Introduction:** Objectives, dynamic loading, types of dynamic problems. Formulation of equations of motion: a) D'Alembert's principle b) Principle of virtual work c) Variational approach. | **04** |
| **02.** | **Single Degree of Freedom Systems:** Components of the system, un-damped and damped free vibrations, logarithmic decrement, Forced vibrations due to harmonic excitation – steady state and transient response, transmissibility, vibration isolation, Forced vibrations due to general dynamic loading. | **14** |
| **03.** | **Multi-Degree of Freedom Systems:** Equations of motion, un-damped and damped free vibration, eigenvalues and eigen vectors, orthogonality conditions. | **08** |
| **04.** | **Damping**: Free vibration of shear buildings with and without damping, Approximate methods for the analysis of multi-degree of freedom un-damped systems – Raleigh method, Power Method. | **04** |
| **05.** | **Static and dynamic Analysis of structures:** Static and Response spectrum and Time history method. | **08** |
| Total | | **38** |

**References:**

1. Rao, S.D., (1995), 'Mechanical Vibrations',3rd ed., Addison Wesely, NewYork, 19.

2. Chopra A.K., (2001), 'Dynamics of structures– Theory and application to Earthquake Engg.’ Prentice - Hall of India Pvt. Ltd.New Delhi.

3. Seto, (1964), 'Mechanical vibrations, Schuam's Outline Series', McGraw Hill, Book Co., New York 19.

4. Jai Krishna, Chandrasekaran, A.R. and Brijesh Chandra, (1994), 'Elements of Earthquake Engg'., 2nd ed., South Asian Publishers, New Delhi,

5. Thansi by W.T, (1988), 'Theory of vibration – with Applications', C.B.S. Publishers and Distributors, New Delhi.

6. Paz. M, (2004), 'Structural Dynamics', 2nd ed., C.B.S. Publishers and Distributors, New Delhi.

7. Mukhopadhay., (2000), 'Vibrations of structures and structural systems' Oxford and IBH, New Delhi.

8. Biggs J.M., 'Introduction to structural dynamics' (McGraw Hill publications)

9. Clough and Penzien, (1993), 'Dynamics of structures' – McGraw Hill publications.

**EARTHQUAKE DESIGN AND CONSTRUCTION [3 0 0 3]**

**Subject code: CE10317A**

**Course Outcomes:**

**CO1**: Critical understanding of advanced seismology and causes of earthquakes.

**CO2**: Understanding and remembering the Seismic Design Philosophy and geometric configuration of buildings.

**CO3**: Distinguish Masonry Buildings and Reinforced Concrete Buildings.

**CO4**: Categorize the importance of Open Ground Storey, Short Columns, Shear walls.

**CO5**: Evaluate Load Paths, Non-structural Elements, Confined Masonry Construction, Sinking of Buildings, Quality control during Earthquakes.

|  |  |  |
| --- | --- | --- |
| **Module**  **no.** | **Description** | **Hours** |
| **01.** | Causes of Earthquakes. Ground shaking, Seismic Zones, Seismic Effects on Structures, Indian Seismic Codes. | **3** |
| **02.** | Architectural Features Affect, Twisting of Buildings During Earthquakes, Seismic Design Philosophy of Buildings, Ductile Buildings for Good Seismic Performance, and Flexibility of Buildings. | **5** |
| **03.** | Earthquake response of Brick Masonry, Structural Configuration of Masonry Buildings, Importance of horizontal bands in masonry buildings, Importance of vertical reinforcement in masonry buildings, Earthquake Resistant Stone Masonry Buildings. Earthquake Affect in Reinforced Concrete Buildings, Role of Beams and Columns in RC Earthquakes resistant Buildings Resist. Importance of Beam-Column Joints in RC Buildings. | **11** |
| **04.** | Effect of Open Ground Storey Buildings, Short Columns Vulnerable during Earthquakes. Shear Walls in Seismic Regions. Reduction of Earthquake Effects on Buildings. Importance of Load Paths in Buildings, Harms Load Paths in Buildings, Importance of Non-structural Elements against Earthquakes. | **11** |
| **05.** | Confined Masonry Construction, Essential Features of Confined Masonry Houses, Foundations of Earthquake-Resistant Buildings. Sinking of Buildings into the Ground during Earthquakes, Quality control in Earthquake-Resistant Buildings. | **8** |
| Total | | **38** |

**References:**

1. BMTPC, (2000), Guidelines: Improving Earthquake Resistance of Housing, Building Materials and Technology Promotion Council, New Delhi.
2. Bridge Rules, (1964), Rules Specifying the Loads for the Design of Super Structure and Sub-Structure of Bridges and for Assessment of the Strength of Existing Bridges, Government of India, Ministry of Railways (Railway Board).
3. IRC 6, (2000), Standard Specifications and Code of Practice for Road Bridges - Section II: Loads and Stresses, Indian Roads Congress, New Delhi.
4. IS 456, (2000), Indian Standard Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.
5. SP 22 (S&T), (1982), Explanatory Handbook on Codes for Earthquakes Engineering - IS 1893:1975 and IS 4326:1976, Bureau of Indian Standards, New Delhi.
6. Paulay,T., and Priestley,M.J.N., (1992), Seismic Design of Reinforced Concrete Buildings and Masonry.
7. John Wiley, USA Mazzolani,F.M., and Piluso,V., (1996), Theory and Design of SeismicResistant Steel Frames, E&FN Spon, UK.
8. ACI 318, (2005), “Building Code Requirements for Structural Concrete and Commentary,” American Concrete Institute, USA.
9. IS 13920, (1993), “Indian Standard Code of Practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces,” Bureau of Indian Standards, New Delhi.
10. SP 123, (1991), “Design of Beam-Column Joints for Seismic Resistance,” Special Publication, American Concrete Institute, USA.

**SEMINAR [0 0 1 1]**

**Subject code: CE10701A**

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| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Seminar | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Seminar should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Seminar will be assigned at the 7th Semester and the final evaluation is carried out at the end of 8th Semester. | 01 |

**PROJECT [0 0 14 7]**

**Subject code: CE10603A**

|  |  |  |  |
| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Project | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Project should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Projects will be assigned at the beginning of the 8th Semester and the final evaluation is carried out at the end of 8th Semester. | 07 |

**MINOR SPECIALIZATION**

**NATURAL HAZARDS AND DISASTER MANAGEMENT**

**Outcome of the course:**

* Students who take this course will gain a thorough, critical understanding of advanced seismology and earthquakes. Specialization
* Students will gain an understanding of flood and drought.
* Students who take this course will gain a basic knowledge of Landslide Hazard Assessment and Mitigation.
* Students will gain a detailed understanding of Disaster Management.

**Course structure**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Subject code** | **Subject name** | **Department** | **L** | **T** | **P** | **Credit** | **Sem** |
| CE10801A | Engineering Seismology | CE | 3 | 0 | 0 | 3 | IV |
| CE10802A | Flood and Drought | CE | 3 | 0 | 0 | 3 | V |
| CE10803A | Landslide Hazard Assessment And Mitigation | CE | 3 | 0 | 0 | 3 | VI |
| CE10804A | Disaster Management | CE | 3 | 0 | 0 | 3 | VII |
| CE10702A | Seminar | CE | 0 | 0 | 2 | 1 | VII |
| CE10604A | Project | CE | 0 | 0 | 14 | 7 | VIII |
|  | **TOTAL CREDIT** | | | | | **20** |  |

Minor specialization (Semester: IV)

**ENGINEERING SEISMOLOGY [3 003]**

**Subject code: CE10801A**

**Course Outcomes:**

**CO1:** Students who take this course will gain a thorough, critical understanding of seismology and causes of earthquakes.

**CO2:** Understanding of seismic hazard and a detailed understanding of wave equations and their solutions. Students will be able to use, interpret and evaluate.

**CO3:** Assess the design basis ground motion parameters and its application in earthquake engineering for disaster mitigation.

**CO4:** Processing, analysis and interpretation of earthquake data, determination of magnitude, epicentral distance, focal depth, focal mechanism.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **1** | Propagation of earthquake Waves, Body & surface waves, laws of reflection, refraction and attenuation, travel times curves, internal structure of earth | **7** |
| **2** | Seismicity of earth, major earthquakes in the world, important Indian Earthquakes, earthquake catalogs, plate tectonics, causes of earthquakes. Magnitude, energy, intensity, acceleration, return period, frequency, Ground Motion characteristics. | **15** |
| **4** | Earthquake recording instruments, seismographs, different modes of recording analogue, digital, micro earthquake, teleseismic, local, strong motion, band width and their engineering implications. | **8** |
| **5** | Processing, analysis and interpretation of earthquake data, determination of magnitude, epicentral distance, focal depth, focal mechanism, seismic Hazard and risk, seismic zoning. Introduction to earthquake prediction – a brief idea. | **10** |
|  | TOTAL | **38** |

References:

1. Richter, C.F. Elementary Seismology, Eurasia Publishing House (Pvt)LTD, New Delhi 2.
2. Agrawal, P.N., Engineering Seismology, Oxford & IBH Publishing Co.Pvt.Ltd, NewDelhi
3. Aki,K and Richard, P.G. Quantitative seismology, Theory and Methods, Vol.I andII.W.H. Freeman & Co.
4. Rikitake, T., 1976 Earthquake Prediction, Elsevier Science, Amsterdam 5.
5. Oldham, 1989 Report on Great Earthquake of 12th June 1897, Memoir Geological Survey of India, V29.
6. Latest Codes of IS-1893-part-ERS

Minor specialization (Semester: V)

**FLOOD AND DROUGHT [3003]**

**Subject code: CE10802A**

**Course Outcomes:**

**CO1**: An understanding of flood and flood routing.

**CO2**: An understanding of the Drought and Drought management system.

**CO3**: To know the water resources scenario in India.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **1** | **Introduction:**  Definition and scope of the subject, Flood and drought with human Introduction | **03** |
| **2** | **Flood:**  Rational Method, Empirical Formulae, Unit Hydrograph Method, Flood Frequency Method, Gumbel’s Method, Log-Pearson Type III Distribution, Partial duration series, Regional Flood Frequency Analysis, Extremes of Extremes-Envelope curve, Data for frequency studies, Design Flood, Design. Storm, Risk, Reliability and safety factor | **12** |
| **3** | **Flood Routing:**  Introduction, Basic equations, Level pool routing, Attenuation, Hydrologic Channel routing, Hydraulic method of flood routing, Clark’s method for IUH, Nash conceptual model, Flood control, Flood control in India. | **05** |
| **4** | **Drought:** Classification, Types of drought, Aridity Index, Impact of drought, Possible modification of drought components **Drought Management: Definition**, Water Harvesting, Rain water Harvesting, Flood water harvesting, Different types of water harvesting | **12** |
| **5** | **Droughts in India:** Causes, Status, Surface water resources of India Utilizable water resources, Total water requirement and available water Resources scenario in India | **06** |
|  | **Total** | **38** |

**References:**

1. Ven te Chow, Applied Hydrology, McGraw Hill.
2. Mutreja, Applied Hydrology, McGraw Hill.
3. Subramanya K, Engineering Hydrology, Tata McGraw Hill.
4. Raghunath H M, Hydrology, Wiley New Delhi, Kanna Publishers.
5. Nelson, Introduction to Copula, Springer.

Minor specialization (Semester: VI)

**LANDSLIDE HAZARD ASSESSMENT AND MITIGATION [3 0 0 31 ]**

**Subject code: CE10803A**

**Course Outcomes:**

**CO1:** Students who take this course will gain a basic knowledge of landslides and factors Landslides.

**CO2:** Students will gain a detailed knowledge of classification and mapping of landslides.

**CO3**: Students will gain a detailed understanding of landslides hazard and effect of stability of Slopes.

**CO4:** Students will gain a detailed understanding of landslides control measures and case studies of landslides.

|  |  |  |
| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **1** | **Introduction: Definition;** overview of Hazard assessment techniques on regional, semi detail and detailed scales and their application for planning purposes; Terrain classification and ma in methods, use of RS and GIS. | **04** |
| **2** | **Factors for landslide:** Causative factors of landslides natural including inherent factors and external factors as well as anthropogenic factors; Impacts of natural causative factors like lithology, structure, slope morphometry, relative relief, hydrogeological conditions and land use and land cover on stability of slopes Impacts of external factors like concentrated rain fall and earth quakes on slope stability; Various causes of slope instability in Himalaya; extreme hydro-meteorological conditions leading to landslide dams and Related damages | **10** |
| **3** | **Classification and Mapping:**  Classification of landslides and mass movements, Landslide hazard zonation (LHZ) on regional scales in India; LHZ mapping technique suggested by Bureau of Indian Standards with exam les; Application of regional scale LHZ maps. | **04** |
| **4** | **Landslide hazard studies and stability of slopes:** Landslide hazard studies on detailed scale of 1: 1000; Mechanics of landslide; Markland test for landslide probability, Strength of slope materials; Assessment of rock mass properties; Overview of slope stability studies for slopes characterized by overburden debris and rock materials. | **06** |
| **5** | **Landslide Control Measures:** Landslide control measures – grading of slopes, retaining walls, breast walls, drainage measures, rock bolts and rock anchors, Biotechnical measures, Special toe walls and other stability Measures. **Case studies in India:** Case studies of important landslides of Himalaya and their control practices. | **14** |
|  | **Total** | **38** |

**References:**

1. Mitigation of Natural hazards and Disasters: International perspective. Haque, C. Emdad, Springer, Dordrecht.Mutreja.
2. Environmental geosciences. Keller, EA. John Wiley & Sons, NY.
3. Natural hazard risk assessment and Public policy. Petak, W.J. and Atkinson, A.D.Springer Verlag, NY.
4. Subramanya K, Engineering Hydrology, Tata McGraw Hill.
5. A field manual for landslide investigations, R.Anbalagan, B. Singh, D.Chakraborthy and A. Kohli. DST Government of India, New Delhi.

Minor specialization (Semester: VII)

**DISASTER MANAGEMENT [3003]**

**Subject code: CE10804A**

**Course Outcomes:**

**CO1:** Students who take this course will gain a thorough, critical understanding of Disaster management and Risk and Vulnerability Analysis of Disaster.

**CO2**: Students will gain a detailed understanding of Disaster Preparedness and Response.

**CO3:** Students will gain a detailed understanding of Rehabilitation, Reconstruction and Recovery.

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| --- | --- | --- |
| **Module no.** | **Description** | **Hours** |
| **1** | Introduction on Disaster: Different Types of Disaster :   1. Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc 2. Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea,Rail& Road), Structural failures(Building and Bridge),War & Terrorism etc.   Causes, effects and practical examples for all disasters. | **10** |
| **2** | Risk and Vulnerability Analysis:   1. Risk: Its concept and analysis 2. Risk Reduction 3. Vulnerability: Its concept and analysis 4. Strategic Development for Vulnerability Reduction. | **08** |
| **3** | Disaster Preparedness and Response:  Preparedness-   1. Disaster Preparedness: Concept and Nature 2. Disaster Preparedness Plan 3. Prediction, Early Warnings and Safety Measures of Disaster. 4. Role of Information, Education, Communication, And Training. 5. Role of Government, International and NGO Bodies. 6. Role of IT in Disaster Preparedness 7. Role of Engineers on Disaster Management.   Response   1. Disaster Response: Introduction 2. Disaster Response Plan 3. Communication, Participation, and Activation of Emergency Preparedness Plan 4. Search, Rescue, Evacuation and Logistic Management 5. Role of Government, International and NGO Bodies 6. Psychological Response and Management (Trauma,Stress, Rumor and Panic) 7. Relief and Recovery 8. Medical Health Response to Different Disasters | **12** |
| **4** | Rehabilitation, Reconstruction and Recovery:   1. Reconstruction and Rehabilitation as a Means of Development. 2. Damage Assessment 3. Post Disaster effects And Remedial Measures. 4. Creation of Long-term Job Opportunities and Livelihood Options, 5. Disaster Resistant House Construction 6. Sanitation and Hygiene 7. Education and Awareness, 8. Dealing with Victims’ Psychology. 9. Long-term Counter Disaster Planning 10. Role of Educational Institute. | **08** |
|  | **Total** | **38** |

**References:**

1. Dr. Mrinalini Pandey. Disaster Management. Wiley India Pvt. Ltd.
2. Jagbir Singh. Disaster Management: Future Challenges and Opportunities.Publishers Pvt. Ltd.
3. J. P. Singhal. Disaster Management. Laxmi Publications.
4. Shailesh Shukla, Shamna. Biodiversity, Environment and Disaster Management. UniquePublications.

**SEMINAR [0 0 1 1]**

**Subject code: CE10702A**

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| --- | --- | --- | --- |
| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Seminar | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Seminar should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Seminar will be assigned at the 7th Semester and the final evaluation is carried out at the end of 8th Semester. | 01 |

**PROJECT [0 0 14 7]**

**Subject code: CE10604A**

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| **Serial No** | **Subject** | **Objective** | **Total Credit** |
| 1 | Project | The students are required to undertake innovative and research oriented project under the direct supervision of a faculty member of the department. The Project should not only to reflect their knowledge gained in the previous semesters but also to acquire additional knowledge and skills by their own effort. The Projects will be assigned at the beginning of the 8th Semester and the final evaluation is carried out at the end of 8th Semester. | 07 |

**DEPARTMENT OF CIVIL ENGINEERING**

**Sikkim Manipal Institute of Technology, Majhitar**

Minutes of the meeting of the BOS internal members held on 25/04/2022

Agenda: Revision of the existing syllabus of B.Tech (Civil Engineering) and to make total course credit 163.

Members present:

1. Dr. Chandrashekhar Bhuiyan

2. Mr. Sajal Sarkar

3. Mr. Guru Prasad Sharma

In the proposed syllabus, the total credit for the 4 year B.Tech degree course in Civil Engineering is made 163. This new syllabus will be applicable for students admitted during the academic session 2022-23 and thereafter. Following changes are proposed in the new syllabus.

1. The proposed ‘New’ syllabus has been prepared in line with the National Education Policy 2020. However, Civil Engineering unlike other branches of engineering is an amalgamation of diverse fields of engineering. There is little similarity or commonality among these fields/ subjects such as: Structural Engineering, Geotechnical Engineering, Water Resources Engineering, Transportation Engineering, Geoinformatics, Environmental Engineering, Surveying etc. Therefore, an effort has been made to keep a balance between Core Subjects, Elective Subjects, and General Subjects.
2. COA-1102/COB-1102 Mechanics of Solids (Common for all branches) will be removed since it is felt less relevant for students of other departments (e.g. CSE, IT, ECE etc.). In place of this subject, **CE10101A Elements of Civil Engineering** will be introduced for students of all branches. This course will provide idea about Civil Engineering to all students across the departments.
3. In the 4th Semester, the existing syllabus has Numerical Methods. With incorporation of Statistics, it is now renamed as **Numerical Methods & Statistics**.
4. In the 4th Semester, in lieu of Program Elective and Open Elective, two essential core subjects: Transportation Engineering and Irrigation Engineering are kept. These are essential for Civil Engineers and cannot be removed.
5. In the 5th Semester, Core Subjects are not replaced by Program Electives. However, students will choose an Open Elective from other departments.
6. In the 6th Semester, instead of Industrial Training, there is Construction Planning & Management which is equivalent to Industrial Training for Civil Engineering students.
7. In the 6th Semester, only one Program Elective is kept to accommodate Estimating, Costing & Valuation which is essential for all Civil Engineers.
8. In the proposed new syllabus there are six theory subjects and three practical subjects in the 3rd, 4th and 5th semesters. Whereas there would be five theory subjects and two practical (lab) subjects in the 6th and 7th semesters since there would be Mini Project in the 6th Semester and Campus Drive for job placement of the students in the 7th Semester (as per institute decision).
9. Besides, there would be two Industrial Trainings for the students to provide them more exposure and experience to deal with real world assignments, problems, and challenges. So, CE 1581: Industrial Training-I has been proposed in the 5 Semester, while CE 1781: Industrial Training-II is proposed in the 7th Semester.
10. Some of the subjects have been shifted from one semester to another. Also, this is being done with a view to balance the number of theory and practical subjects and year wise promotional credit requirements. New subject codes have been proposed for these subjects.
11. Some subjects have been renamed either to make the name more appropriate (for example, CE 1504: Water Resources Engineering is renamed as CE 1504. Engineering. Hydrology) or to make the subject comprehensive and relevant by merging two subjects (for example, CE 1304: Building Science & Technology and CE 1406. Construction Materials & Concrete Technology have been merged to form CE 1307: Building Materials and Concrete Technology).
12. Certain subjects (including electives) have been felt less important and hence are removed to accommodate new and relevant subjects.
13. All the elective subjects are grouped separately for the 6th and 7th semesters. In the 6th Semester, students would be able to opt for two electives out of the list. A student would be able to choose one of the two electives from the subjects offered online by MOOC/ SWAYAM etc. The department is going to introduce ‘Recent Trends in Civil Engineering as a new elective subject in the 6th Semester. The main objective and intention is to make students well aware and updated about the recent developments in various fields of Civil Engineering. Although this subject is being introduced as an elective, the department may float this subject as ‘compulsory elective’ if felt necessary.
14. It is proposed to combine all elective subjects in one pool with the following advantages:
15. (a) Students will have the options to choose their electives of interest.

(b) Department will have the options to float electives depending on availability /workload of the subject teacher. This is very much necessary since the department do not always have required number of teaching faculty.

1. The students will be allowed to choose any of the elective from the pool as their choice subject to the condition:

(a) Those electives are offered by department in a particular semester.

(b) The same student cannot take the same elective twice (i.e., if already opted for and passed it in a previous semester).

1. The comparison of the proposed syllabus with the previous syllabus is attached herewith for better understanding.
2. The proposed syllabus was sent to the BOS External Members for their approval. External BOS Members: Prof. (Dr.) Dhrubajyti Sen (Indian Institute of Technology Kharagpur), Prof. (Dr.) Shantarama Patil (Manipal Institute of Technology) and Mr. ParthaPratim Roy (ZURU Tech India Pvt. Ltd., Kolkata Office).
3. Other important salient features of the new/ proposed syllabus are as follows:

Total number of Core Theory Subjects: 21

Credits for and Core Theory and Elective subjects: 03 to 04

Total number of Practical Subjects (Labs): 09

Credit for each Lab: 01

Minimum number of Program Elective Subjects to be opted by the students: 02

Minimum number of Open Elective Subjects to be opted by the students: 03

Inclusion of MOOC courses (as decided by the department) as an alternative of Program Elective and Open Elective subjects.

Project Based Learning from 3rd Semester to encourage students in research.

Options for students for Research oriented or Industry oriented Major Projects

Total credit for projects: 24

Prof. (Dr.) Chandrashekhar Bhuiyan

(Professor & Head)

Mr. Sajal Sarkar Mr. Guru Prasad Sharma

(Assistant Professor –SG) (Assistant Professor –SG)