

SCIA1102	CONSTRUCTION MATERIALS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To introduce the basic materials used in civil engineering construction field.

UNIT 1 BUILDING MATERIALS**9 Hrs.**

Soil - classification of soil – Stone - Tests on stones - Deterioration and Preservation of stone work - Bricks - Classification - Manufacturing of clay bricks - Tests on bricks - Compressive Strength - Water Absorption - Efflorescence - Bricks for special use - Refractory bricks - Fly Ash Bricks and Concrete blocks - Light weight blocks and panels.

UNIT 2 LIME CEMENT AGGREGATES MORTAR STEEL**9 Hrs.**

Lime - Preparation of lime mortar - Cement - Ingredients - Manufacturing process - Types and Grades - Properties of cement and Cement mortar - Hydration - Compressive strength - Tensile strength - Fineness - Soundness and consistency - Setting time - Aggregates - Natural stone aggregates - Crushing strength - Impact strength - Flakiness Index - Elongation Index - Abrasion Resistance - Mortar - classifications - properties of good mortar - uses of mortar - Manufacture of steel - properties and uses of different types of steel - mechanical and heat treatment of steel - Anticorrosive measures for steel.

UNIT 3 CONCRETE**9 Hrs.**

Constituents of concrete (Cement and aggregate): Proportioning of concrete, water-cement ratio, Fresh concrete, Batching, Mixing, Transportation and placing, Compaction, Curing and finishes - Admixtures (Chemical, mineral) – RMC specifications.

UNIT 4 TIMBER AND MODERN MATERIALS**9 Hrs.**

Timber - Market forms - Industrial timber - Doors and Windows – specification - Plywood - Veneer - False ceiling materials - Panels of laminates - Steel - Aluminum and Other Metallic Materials - Composition - Aluminium composite panel - Uses - Market forms - Mechanical treatment. Glass - Ceramics - Sealants for joints - Fibre glass reinforced plastic.

UNIT 5 MODERN MATERIALS, PLASTERING - PAINT - VARNISHING – DPC**9 Hrs.**

Clay products - Refractory's - Composite materials - Types - Applications of laminar composites Fibre textiles - Geo-membranes and Geo-textiles for earth reinforcement – Internal and external plastering materials - white and colour washing - painting, varnishing and distempering - Dampness and fire proofing - anti termite measures.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Understand the applications of basic building materials.
- CO2 - Know the properties and characteristics of cement, lime and steel
- CO3 - Know the production and placing process of concrete.
- CO4 - Assess the usage of timber and composite materials.
- CO5 - Compare the properties of common and alternate building materials.

TEXT / REFERENCE BOOKS

1. Duggal S.K., "Building Materials", 4th Edition, New Age International, 2008.
2. Gambhir M.L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Education, 2004.
3. Gambhir M.L. & Neha Jamwal, "Building Materials, products, properties and systems", Tata McGraw Hill Education Pvt. Ltd, New Delhi, 2012.
4. IS456 - 2000: Indian Standard specification for plain and reinforced Concrete, 2011.
5. IS4926 - 2003: Indian Standard specification for ready-mixed concrete, 2012.
6. Jagadish K.S, "Alternative Building Materials Technology", New Age International, 2007.
7. Rajput R.K., "Engineering Materials", S. Chand and Company Ltd., 2008.
8. Rangwala S.C., "Engineering Materials," Charotar Publishing House, Anand, 1993.
9. Varghese P.C., "Building Materials", PHI Learning Pvt. Ltd., New Delhi, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 marks each - No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**80 Marks**

SCIA1201	CONCRETE AND CONSTRUCTION TECHNOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study details regarding properties and testing of building materials.
- To study details regarding the construction of building components. To study properties of concrete and concrete mix design.
- To impart the basic concepts in different types of concrete.

UNIT 1 INTRODUCTION**11 Hrs.**

Mortar – Types – Sand – properties – uses Timber products: properties and uses of plywood, fibre board, particle board. Iron and Steel –Reinforcing steel – types – specifications. Structural steel – specifications miscellaneous materials (only properties, classifications and their use in construction industry): Glass, Plastics, A.C. Sheets, Bitumen, Adhesives, Aluminium. Cement – Different types – Chemical composition and Properties – Hydration of cement – Tests on cement – IS Specifications – Aggregates – Classification – Mechanical properties and tests as per BIS – Grading requirements – Water – Quality of water for use in concrete.

UNIT 2 CONCRETE AND ADMIXTURES**9 Hrs.**

Concrete – Aggregates – Mechanical & Physical properties and tests – Grading requirements –Water quality for concrete – Admixtures – types and uses – plasticizers – accelerators – retarders–water reducing agents Making of concrete - batching – mixing – types of mixers –transportation – placing – compacting – curing. Properties of concrete – fresh concrete – workability – segregation and bleeding - factors affecting workability & strength – tests on workability – tests for strength of concrete in compression, tension& flexure Concrete quality control – statistical analysis of results – standard deviation – acceptance criteria – mix proportioning (B.I.S method) – nominal mixes.

UNIT 3 PROPORTIONING OF CONCRETE MIX**8 Hrs.**

Principles of Mix Proportioning – Properties of concrete related to Mix Design – Physical properties of materials required for Mix Design – Design Mix and Nominal Mix – BIS Method of Mix Design – Mix Design Examples

UNIT 4 FRESH AND HARDENED PROPERTIES OF CONCRETE**9 Hrs.**

Workability – Tests for workability of concrete – Segregation and Bleeding – Determination of strength Properties of Hardened concrete – Compressive strength – split tensile strength – Flexural strength – Stress-strain curve for concrete – Modulus of elasticity – durability of concrete – water absorption – permeability – corrosion test – acid resistance- destructive and non destructive test.

UNIT 5 SPECIAL CONCRETES**8 Hrs.**

Light weight concretes – foam concrete- self compacting concrete – vacuum concrete – High strength concrete – Fibre reinforced concrete – Ferrocement – Ready mix concrete – SIFCON – Shotcrete – Polymer concrete – High performance concrete – Geopolymer Concrete- Bio Concrete.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Understand construction materials, their components and manufacturing process,
- CO2 - Know the properties of concrete and quality control,
- CO3 - Understand the fundamentals of mix design of concrete.
- CO4 - Study the properties of concrete in fresh and hardened concrete.
- CO5 - Understanding the different types of concrete in details.

TEXT / REFERENCE BOOKS

1. Arora and Bindra, Building construction, Dhanpath Rai and Sons.
2. Punmia B.C., Building construction. Laxmi Publications.
3. Rangwala S.C., Engineering Materials, Charotar Publishers.
4. Shetty M.S., Concrete Technology, S. Chand & Company.
5. Sahu G.C. & Joygopal Jena., Building Materials and Construction, McGraw Hill Education.
6. Gambhir M.L., Concrete Technology, Tata McGraw Hill.
7. Krishna Raju N, Design of Concrete Mixes, CBS Publishers.
8. National Building Code.
9. Neville A.M. and Brooks.J.J, Concrete Technology, Pearson Education.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****PART A:** 10 Questions of 2 marks each - No choice**PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**Exam Duration: 3 Hrs.****20 Marks****80 Marks**

SCIA1202	FUNCTIONAL DESIGN OF BUILDINGS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To study about the climate and orientation and understand the Design of building suitable to the Tropical climate with Green Building Concepts.

UNIT 1 INTRODUCTION TO CLIMATE AND ORIENTATION**9 Hrs.**

Factors that determine Climate - Components of climate - Site Climate - Characteristics of different climates, Climatic zones of India. Orientation - Sun path diagram, Meaning, factors affecting orientation, orientation criteria for tropical climate.

UNIT 2 THERMAL SENSATION AND TRANSFER OF HEAT IN BUILDINGS**9 Hrs.**

Body heat balance - Introduction to effective temperature and comfort zone. Transfer of heat definitions Periodic heat flow in building elements - introduction to time - lag and decrement factor - Thermal comfort factors.

UNIT 3 BUILDING ENVELOPE**9 Hrs.**

General, Mandatory requirements - Fenestration - Opaque construction - building envelope sealing, Prescriptive requirements - Roofs - cool roofs - opaque walls - vertical fenestration - skylights.

UNIT 4 ENERGY CONSERVATION IN BUILDINGS THROUGH VENTILATION AND LIGHTING**9 Hrs.**

Introduction to ventilation - Fresh air - Stack effect - Air movement through buildings - Air movement around buildings - layout planning for air movement - Traditional methods for aiding ventilation. Lighting - different types of lighting - study of interiors in lighting - their effects. Mandatory requirements - lighting control - exit signs - exterior building grounds lighting - Introduction to Energy conservation in buildings.

UNIT 5 ENERGY EFFICIENT BUILDINGS AND TECHNOLOGIES**9 Hrs.**

Introduction and need for energy efficiency in existing buildings. Renewable energy systems - solar passive cooling and heating of buildings, solar active thermal and photovoltaic systems, building management system Introduction to Green Buildings Concepts and green buildings ratings for certification, Case studies.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Summarize the different types of weather and climatic conditions influences human comfort.
- CO2 - Understanding periodic heat transfer and decrement factor through building materials
- CO3 - Assess the building envelope and fenestration suitable for specific climate
- CO4 - Assess the types of ventilation and lighting system for energy conservation
- CO5 - Analyse the green building concept and its capacity to save energy.
- CO6 - Understand Integrated building management system

TEXT / REFERENCE BOOKS

1. Otto Koenigsberger, Ingersoll and Szokalay, "Manual of Tropical Housing and Building Part 1 - Climate Design". Longmans London, 2013.
2. Arvind Krishnan, Nick baker and Simos Yannas, "Climate Response Architecture", Tata McGraw Hill Publication, 2010.
3. Martin Events, "Housing, Climate and Comfort", Architectural Press, London, 2008.
4. Francis D.K.Ching, "Interior Design Illustrated", VNR Publications.
5. USAID India - User Guide on "Energy Conservation Building Code", Bureau of Energy Efficiency, 2011.
6. Baird, George, "Energy performance of Buildings" C R C Publisher, 2011.
7. Desai, Ashok K., "Non - Conventional energy", Wiley Eastern Publisher, 2012.
8. IGBC, ECBC 2017 Latest version for Reference.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 marks each - No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**80 Marks**

SCIA2201	BUILDING PLANNING AND DRAWING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

- To learn the details of the building elements

SUGGESTED LIST OF EXPERIMENTS

1. Section of Stepped wall footing and Isolated RCC column footing.
2. Elevation of paneled door, Single and Doubled Glazed window.
3. Plan and Elevation section of Dog-Legged staircase.
4. Elevation of King post and Queen Post Truss.
5. Plan, Elevation and Section of Residential Building with Double bed room.
6. Plan, Elevation and Section of one storey Building.
7. Plan, Elevation and Section of Hospital Building.
8. Plan, Elevation and Section of School Building.
9. Plan, Elevation and Section of Library Building.
10. Plan, Elevation and Section of Workshop.
11. Plan, Elevation and Section of Bank building.
12. Approval Drawing of Residential Building.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Understands the concept of design of buildings as per National building code
- CO2 - Explores basic knowledge about substructure and superstructure with specifications based on building bye laws
- CO3 - Prepare building drawings for all types of buildings, trusses, doors and windows, staircase and footings.
- CO4 - Prepare drawings for trusses, doors and windows.
- CO5 - Implement the regulations for layout planning

SCI1201	MECHANICS OF SOLIDS I	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To enable the student to understand the behaviour of deformable structural elements, subjected to different types of loadings

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Determine the stress-strain and axial deformation of prismatic and composite bars
- CO 2 - Construct the mohr's circle diagram to find the major minor principal stresses and shear stresses for two dimensional system.
- CO 3 - Calculation of bending moment and shear forces of beams and show the variations in terms of diagrams for whole span.
- CO 4 - Understand the behavior of beams under bending, Torsion, and shear stresses.
- CO 5 - Compute the stresses and deformations of solids and hollow circular shafts.
- CO 6 - Analysis of Trusses using various methods to Identify the nature of forces and determine the magnitude of forces.

UNIT 1 STRESS AND STRAIN

12 Hrs.

Stress & strain - Hooke's law, Application to Prismatic and non prismatic sections, Composite sections. Elastic constants - **Poisson's ratio, Young's Modulus, Rigidity Modulus, Bulk Modulus** Problems in relation between Elastic constants. Thermal stresses - elongation of a bar due to temperature.

UNIT 2 PRINCIPAL STRESSES AND STRAINS

12 Hrs.

Principal Planes and Principal stresses - Two dimensional stress systems - Mohr's Circle construction for principal stresses. Analysis of Strain - Direct strain on a oblique plane due to direct pull - Direct strain on a oblique plane due to shear stress - strain on inclined section due to two perpendicular normal strains - Mohr's circle of strains.

UNIT 3 BENDING MOMENTS AND SHEAR FORCES

12 Hrs.

Types of Beams, supports and loads - Concept and Significance of Shear force and Bending moment - **Shear force and Bending moment diagram for cantilever, simply supported and overhanging beams.**

UNIT 4 BENDING & SHEAR STRESS DISTRIBUTION, TORSION

13 Hrs.

Stresses in Beams - Simple bending theory - Shear stress distribution for Rectangular and I section - Simple Torsion theory - Stresses and deformations in Solid and Hollow circular shafts.

UNIT 5 ANALYSIS OF TRUSSES

11 Hrs.

Frames - Assumptions - Reactions and supports - Various types of trusses - **Analysis of simple trusses** Method of joints, sections and tension co-efficients.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Bansal R.K., "Strength of Materials", 5th Edition, Laxmi Publications, 2013.
2. Ramamrutham R., "Strength of Materials", 14th Edition, Dhanpat Rai Publications, 2011.
3. Punmia B.C., "Strength of Materials", Laxmi Publications, 2011.
4. Subramanian R., "Strength of Materials - Theory and Problems", Oxford University Press, 2010.
5. Rajput R.K., "Strength of Materials", S Chand and Company Ltd., New Delhi, 2007.
6. Timoshenko S.P. and Gere J.M., "Mechanics of Materials", 6th Edition, Tata McGraw Hill, 2007.
7. Egor.P. Popov, "Introduction of Mechanics of Solids", 2nd Edition, Prentice Hall of India, New Delhi, 2007.
8. Kazimi, "Solid Mechanics", 1st Edition, Tata McGraw - Hill Book co Ltd., 2003.
9. Vazirani V.N. and Ratwani N.M., "Strength of Materials" Vol.I, Khanna Publishers, 1996.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1202	MECHANICS OF FLUIDS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To understand the basic properties of the fluid, fluid kinematics, fluid dynamics and to analyse and appreciate the complexities involved in solving the fluid flow problems. To develop an understanding of fluid flow patterns and learns to use boundary layer theory and drag.

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- CO 2 - Calculate the conjugate depths in a flow.
- CO 3 - To find frictional losses in a pipe when there is a flow between two places
- CO 4 - Explain the various methods available for the boundary layer separation
- CO 5 - Analyse the model and the prototype

UNIT 1 FLUID PROPERTIES AND FLUID STATICS 10 Hrs.

Fluid - Definition, - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, Types of fluids - Compressibility - Vapour pressure, Capillarity and Surface tension.

Fluid statics: Concept of fluid static pressure (Pascal's law and Hydrostatic law), absolute and gauge pressures - [Pressure measurements by manometers and pressure gauges](#) - forces on planes (vertical, horizontal and inclined) - Total pressure - centre of pressure - buoyancy - Meta centre.

UNIT 2 FLUID KINEMATICS AND DYNAMICS 9 Hrs.

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms) - Equation of streamline - stream function - velocity potential function - circulation - flow net.

Fluid dynamics - equations of motion - Euler's equation along streamline - Bernoulli's equation - applications Venturi meter, Orifice meter and Pitot tube. Momentum equation and its application.

UNIT 3 FLOW THROUGH PIPES 9 Hrs.

Viscous flow - Laminar flow through circular tubes (Hagen poiseuille's) - friction factor - pipe roughness - [Major and minor losses of flow in pipes](#) - Darcy - Weisbach's equation - Hydraulic and energy gradient - Pipes in series and in parallel - Moody's diagram

UNIT 4 BOUNDARY LAYER 9 Hrs.

Boundary layer - definition - boundary layer on a flat plate - thickness and classification - displacement, energy and momentum thickness - Boundary layer separation and control - drag in flat plate - drag and lift coefficients.

UNIT 5 DIMENSIONAL ANALYSIS AND MODEL STUDIES 8 Hrs.

Fundamental dimensions - dimensional homogeneity - Rayleigh's method and Buckingham Pi-Theorem Dimensionless parameters - Similitude and model studies - Distorted Models.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Modi P.N and Seth "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House New Delhi. 2004
2. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 2001.
3. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 5th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2008.
4. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw Hill, 2000.
5. Fox W.R. and McDonald A.T., Introduction to Fluid Mechanics John Wiley and Sons, Singapore, 1995.
6. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010 4. Roberson J.A and Crowe C.T., "Engineering Fluid Mechanics", Jaico Books Mumbai, 2000.
7. White, F.M., "Fluid Mechanics", Tata McGraw Hill, 5th Edition, New Delhi, 2003.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 questions from each unit with internal choice, each carrying 12 marks

Marks 20% Theory & 80% Problematic Questions may be asked

Exam Duration : 3 Hrs.

20 Marks

80

SCI1203	SURVEYING I	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To study the basic principle in surveying for Area calculation

Course outcomes

On the end of the course, student will be able to

- CO 1- Describe the basic principles and classification in surveying, calculate the area by linear measurements.
- CO 2 - Convert the bearing systems to calculate the total included to detect the occurrence of local attraction.
- CO 3 - Distinguish and analyze the suitability of plane table surveying method for a given area.
- CO 4 - Understand the importance of different types of Bench marks, Calculate the reduced levels and gradient, enumerate the Characteristics of contour of map.
- CO 5 - Identify the number of sides affected and calculate the Omitted measurements in the traversing.
- CO 6 - Conduct Preliminary and location surveys for engineering projects, setting out of buildings and various types of curves in the field.

UNIT 1 INTRODUCTION AND CHAIN SURVEYING 7 Hrs.

Definition - principles - classifications - field and office work - scales - conventional signs - direct measurements - equipments - Chains - Tapes - Arrows - use of cross staff - **Ranging and chaining** - reciprocal ranging - setting offsets - well conditioned triangles - Overcoming obstacles in chaining - Areas enclosed by straight line irregular figures - Errors in linear measurement and corrections.

UNIT 2 COMPASS SURVEYING AND PLANE TABLE SURVEYING 9 Hrs.

Prismatic compass - Surveyor's compass - Bearings - systems and conversions - local attraction - magnetic declination - dip - traversing. Plane table instruments and accessories - advantages and disadvantages - methods radiation - intersection - traversing – resection.

UNIT 3 LEVELLING AND APPLICATIONS 12 Hrs.

Level line - Horizontal line - Levels and Staves - Spirit level - sensitiveness - Bench marks - Types of instruments - Temporary and Permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and Refraction - Reciprocal levelling - Longitudinal and Cross sections - Plotting - **Calculation of Areas and Volumes** Field procedure - Trapezoidal and Simpson's Rule, Contouring - Methods - Characteristics and uses of contours - Plotting - Capacity of Reservoirs - Sources of errors and adjustments.

UNIT 4 THEODOLITE SURVEYING 9 Hrs.

Theodolite - Vernier and Microptic - **Description and uses** - Temporary and Permanent adjustments of Vernier transit - Horizontal angles - Vertical angles - Traversing - Adjustment of closing error by Bowditch and Transit rules with distribution - Omitted measurements.

UNIT 5 ENGINEERING SURVEYING 8 Hrs.

Reconnaissance, Preliminary and location surveys for engineering projects - **Procedures for setting out** a building - pipelines - sewers - **setting out of curves** - simple curve - compound and reverse curves - transition curves: functions and requirements - vertical summit curves.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Kanetkar T.P., "Surveying and Levelling", Vol.I and Vol.II, 24th Edition Pune Vidyarthi Griha Prakashan, , 2009.
2. Punmia B.C., "Surveying", Vol.I and Vol.II, 16th Edition Lakshmi Publications(P) Ltd., New Delhi, 2009 and 15th Edition, 2008.
3. Rangwala C., "Surveying and Levelling", 4th Edition Charotar Publishers, 2009.
4. Clark D., "Plane and Geodetic surveying", Vol.I and Vol.II, CBS Publishers, New Delhi, 1993.
5. Duggal S.K., "Surveying", 3rd Edition, Vol.I and Vol.II, Tata Mc Graw Hill, 2006.
6. Bas ak N.N., "Surveying and Levelling", 18th Edition, Tata Mc Graw Hill, 2008.
7. Subramanian R., "Surveying and Levelling", Oxford University Press, 2007
8. Bhavikatti, S.S. "Surveying & Levelling" Volume I&II 2009

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

SCI1204	HIGHWAY ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To give an overview about the highway engineering with respect to planning, design, construction and maintenance of highways as per IRC standards, specifications and methods.

Course Outcomes

On the end of the course, student will be able to:

- CO1 - Define highway engineering and planning, listing the factors of highway alignment.
- CO2 - Determine the characteristics of highway cross sectional elements.
- CO3 - Examine the material characteristics of highway.
- CO4 - Compare the design standards of various types of pavement.
- CO5 - Assess the pavement failures and evaluate the pavement performance.
- CO6 - Develop a method to lay a road on waterlogged areas and on desert sand.

UNIT 1 HIGHWAY PLANNING AND CLASSIFICATION 9 Hrs.

Introduction to Transportation systems - Highway development in India - Classification of Roads - Planning of roads - Institutions for Highway planning - Highway alignment - factors influencing highway alignment - **Planning or Engineering surveys for alignment**: objectives, conventional and modern methods - **Demonstration of Highway Alignment Software (MX Road)**.

UNIT 2 GEOMETRIC DESIGN ELEMENTS 9 Hrs.

Factors influencing geometric design - Cross sectional elements of urban and rural roads - Sight distance, Gradient, Super elevation, Horizontal curves, Vertical curves, widening of pavement on curves (problems included).

UNIT 3 HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 9 Hrs.

Highway construction materials - properties - **Tests on Sub grade soil** - **Tests on Aggregates** - **Bitumen Characteristics, Tests on Bitumen and Bitumen Mix Design** - Introduction to innovative highway materials Construction procedure of Earth roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Roads, Cement Concrete Roads.

UNIT 4 PAVEMENT DESIGN 9 Hrs.

Pavement Components and their role - Types of Pavements - Flexible and Rigid - **Design of Flexible and Rigid Pavements** (IRC Methods only) - Joints in Rigid Pavements - Introduction to Pavement Design Software.

UNIT 5 PAVEMENT FAILURE AND MANAGEMENT 9 Hrs.

Introduction - Types of Pavement failures - **Pavement maintenance** - Pavement evaluation - Surface, Structural - Pavement Management System - Strengthening of pavements - Highway drainage: Surface Drainage and Sub-surface drainage system - Erosion control - drainage in water logged areas, on desert sand and hill roads.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Khanna S.K., Justo C.E.G. and Veeraragavan A., "Highway Engineering", NemChand Publishers, 2014.
2. Kadiyali L.R., "Principles and Practices of Highway Engineering", 8th Edition, Khanna Technical Publication, Delhi, 2013.
3. Subramanian K.P., "Highways, Railways, Airport and Harbour Engineering", SciTech Publications India, Chennai, 2010.
4. Indian Road Congress (IRC), Guidelines and Special Publications of Planning and Design.
5. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia, 2012
6. Ian D. Walsh, "ICE manual of highway design and management", ICE Publishers, 1st Edition, USA, 2011

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

80% Theory & 20% Problematic Questions may be asked

SCI1205	ENGINEERING GEOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To introduce the basic geology to civil engineering students, to inspire the students to think clearly and critically the solution of the civil engineering problems in the context of geological knowledge

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the basic concepts of geological process and their features of the earth.

CO2 - Understand the important importance of minerals, petroleum and coal geology.

CO3 - Detailed explanation of classification, formation, structure and texture of igneous, sedimentary and metamorphic rocks and engineering properties of the rocks.

CO4 - Study about structural geology

CO5 - Assess and appropriately adjust the results of geological study in order to secure construction and operation of a technical project.

CO6 - Exploring appropriate literature, to plan and carry out an individual research or in groups.

UNIT 1 GENERAL GEOLOGY

9 Hrs.

Geology in Civil Engineering - Branches of geology - Earth structure and composition - Continental drift Weathering - types and products - Geological work of Rivers, Wind and Sea - Geophysical Methods - Seismic and Electrical Methods for Subsurface Investigation.

UNIT 2 MINEROLOGY

9 Hrs.

Physical properties of Minerals - Study of following rock forming minerals - Quartz, Felspar, Piroxene, Amphibole, Mica, Calcite, Gypsum and Clay minerals, Fundamentals of the process of formation of ore minerals coal and petroleum - their origin and occurrence in India.

UNIT 3 PETROLOGY

9 Hrs.

Classification of Rocks - Igneous, Sedimentary and Metamorphic Rocks - Origin, Structure and Classification Metamorphism - Engineering Properties - Distribution of Dolerite, Syenite, Basalt, Sandstone, Limestone, Conglomerate, Quartzite, Marble, and Schist - Rock mechanics - Introduction - Laboratory test - Uniaxial compressive strength, tensile, shear strength, modulus of elasticity, triaxial test - Field test - jack test, shear test, seismic test.

UNIT 4 STRUCTURAL GEOLOGY

9 Hrs.

Civil Engineering Importance of Folds, Faults, Unconformity and Joints relevance to civil engineering Prospect of ground water.

UNIT 5 ENGINEERING APPLICATIONS IN GEOLOGY

9 Hrs.

Geological consideration in construction of Dam, Tunnel and important international and Indian examples of failures of dams, tunnels and their causes, factors affecting the seepage and leakage of the reservoirs and the remedial measures, silting of reservoirs. Earthquake, causes and Distribution in India - Remote Sensing for Civil Engineering Applications.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Parbin Singh., "Engineering and General Geology", Katson Publication House, 2009.
2. Chenna Kesavulu N., "Text book of Engineering Geology", Macmillan India Ltd, 2003.
3. Mukherjee P.K., "Engineering Geology", World Press, 2006.
4. Billings M.P., "Structural Geology": Prentice Hall, 2006.
5. Legget., "Geology and Engineering", 2nd Edition, McGraw Hill Book Company, 2006.
6. Blyth. "Geology for Engineers", 7th Edition, ELBS, 1995.

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****PART A : 10 questions of 2 marks each - No choice****PART B : 2 Questions from each unit with internal choice, each carrying 12 marks****Exam Duration : 3 Hrs.****20 Marks****80 Marks**

SC1206	MECHANICS OF SOLIDS II	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn the computation of deflection of beams and trusses using energy principles, analysis of indeterminate beams and columns, state of stress in three dimensions.

Course Outcomes

On the end of the Course, student will be able to:

- CO1 - Determine the slope and deflection with various load conditions in cantilever and simply supported beams.
- CO2 - Understand the concept of strain energy and its calculation due to various forces.
- CO3 - Study of Castigliano's first theorem - Betti's theorem -Maxwell's law of Reciprocal deflection.
- CO4 - Study of behavior of columns with different end conditions.
- CO5 - Analysis of stresses for thin and thick cylinder.
- CO6 - Discuss the failure of material using various theories.

UNIT 1 SLOPE & DEFLECTION OF BEAMS 12 Hrs.

Double integration method - Macaulay's method - Moment area method - Conjugate beam method for simply supported and cantilever beams - problems in finding slope & deflection of beams.

UNIT 2 STRAIN ENERGY 12 Hrs.

Strain energy - Strain energy due to axial forces, Strain energy due to bending, Strain energy in pure shearing, Strain energy in torsion. Castigliano's first theorem - Betti's theorem - Maxwell's law of Reciprocal deflection - problems in calculating the Strain Energy.

UNIT 3 THEORY OF COLUMNS 12 Hrs.

Axial load combined bending and axial load - Euler's formula for long struts - Limitations of Euler's formula Long columns under eccentric loading - Secant, Perry's & IS code formula. Rankine, Gordon's formula - problems in finding the safe load on the column.

UNIT 4 THIN CYLINDERS & SPHERES, THICK CYLINDERS 12 Hrs.

Stresses in Thin cylindrical shell due to internal pressure - Deformation in Thin cylinders - Spherical shells subjected to internal pressure - Deformation in Thin spherical shells. Thick cylinders - Lamé's equation - Shrink fit Compound cylinders.

UNIT 5 THEORIES OF FAILURE 12 Hrs.

Theories of Failure - Maximum Principal Stress theory - Maximum Principal strain theory - Maximum shear stress theory - Strain energy theory - shear strain energy theory - problems in finding factor of safety - Graphical representation of theories for two dimensional stress system.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Bansal R.K., "Strength of Materials", 5th Edition, Laxmi Publications, 2013.
2. Ramamrutham R., "Strength of Materials", 14th Edition, Dhanpat Rai Publications, 2011.
3. Punmia B.C., "Strength of Materials", Laxmi Publications, 2011.
4. Subramanian R., "Strength of Materials Theory and Problems", Oxford University Press, 2010.
5. Rajput R.K., "Strength of Materials", S Chand and Company Ltd., New Delhi, 2007.
6. Timoshenko S.P. and Gere J.M., "Mechanics of Materials", 6th Edition, Tata McGraw Hill, 2007.
7. Egor.P. Popov, "Introduction of Mechanics of Solids", 2nd Edition, Prentice Hall of India, New Delhi, 2007.
8. Kazimi, "Solid Mechanics", 1st Edition, Tata McGraw - Hill Book co Ltd., 2003.
9. Vazirani V.N. and Ratwani N.M., "Strength of Materials" Vol. I, Khanna Publishers, 1996.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1207	APPLIED HYDRAULIC ENGINEERING	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

Course Outcomes

On the end of the Course, student will be able to:

- CO1 - Develop the basic knowledge of open channel flow characteristics and types of flow
- CO2 - Explain the terms of the open channel flow equation and design of most economical channel sections
- CO3 - Compute and analyze the Gradually varied flow characteristics and various surface profiles in open channels
- CO4 - Identify the rapidly varied flow characteristics – Hydraulic Jump, surges and its types with practical applications
- CO5 - Understand the working of hydraulic machines like pumps and turbines.
- CO6 - Analyze the performance of hydraulic machines.

UNIT 1 UNIFORM FLOW

12 Hrs.

Free surface flows - Comparison with pipe flow, Classification of flow in open channels. Uniform flow Equations for uniform flow - Chezy's and Manning's equations, **Most efficient channel sections of different geometry**. Velocity distribution in open channels - **Determination of normal depth and velocity, Specific energy and Specific force diagrams, Critical flow in rectangular channel.**

UNIT 2 GRADUALLY VARIED FLOW

12 Hrs.

Dynamic Equation for gradually varied flow - in wide rectangular channels - different forms of the dynamic equation, channel bottom slopes - Study of surface profiles and its Characteristics in prismatic channels, backwater computation Direct step method and Standard step method, Graphical method - Applications.

UNIT 3 RAPIDLY VARIED FLOW

12 Hrs.

Rapidly varied flow, hydraulic jump - initial and sequent depths, non-dimensional equation, Practical application of hydraulic jump, Types of jump in horizontal floor, Basic characteristics of the jump, Energy loss, efficiency, height of jump. **Energy dissipation** - Surges and surge through channel transitions.

UNIT 4 TURBINES

12 Hrs.

Impact of Jet on vanes - Turbines - classification - impulse turbines - Pelton wheel - Reaction turbines - Francis and Kaplan Turbines - draft tubes - Governing of a Francis turbine - **Performance of turbines** - specific speed and their significance.

UNIT 5 PUMPS

12 Hrs.

Centrifugal pump: **description and working** - Head, discharge and efficiency - pressure rise - minimum starting speed - cavitation - priming - multistage pumps - characteristic curves. Reciprocating pump: **Description and working types** - discharge and slip - power required to drive the pump - Indicator diagram - Air vessel - work done against friction with and without air vessels.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Jain. A.K., "Fluid Mechanics", Khanna Publishers, Delhi, 2010.
2. Modi P.N. and Seth S.M., "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2002.
3. Subramanya K., "Flow in open channels", Tata McGraw Hill, New Delhi, 2009.
4. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
5. Rajesh Srivastava, "Flow through open channels", Oxford University Press, New Delhi, 2008.
6. Bansal R.K., "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit with internal choice, each carrying 12 marks

80

Marks 20% Theory & 80% Problematic Questions may be asked

SCI1208	RAILWAYS, AIRPORT AND HARBOUR ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

- To have an awareness on components of railway permanent way as per the Guidelines.
- To understand the concepts of railway track laying, yard, station equipments and maintenance.
- To gain knowledge on the design of turnout, signal and track circuiting.
- To understand the concepts of airport planning and design standards.
- To understand the concepts of harbor and its components.

Course Outcomes

On the end of the Course, student will be able to:

- CO1 - Aware of the components of railway permanent way as per the Guidelines.
- CO2 - Understand the concepts of railway track laying, yard, station equipments and maintenance.
- CO3 - Learn the design of turnout, signal and track circuiting.
- CO4 - Understand the concepts of airport planning and design standards.
- CO5 - Understand the concepts of harbor and its components.

UNIT 1 RAILWAY PLANNING

10 Hrs.

Development of railways in India - Comparison of roadways and railways - Components of a permanent way and its functions - Rails, Gauges, Sleepers, Ballast, Formation, Rail fittings and fastenings - Coning of wheels Defects in rails: creep in rails, Track Stress - **Gradient and Grade compensation on curves** - Speed on curves - Super elevation and Negative super elevation - Maximum Permissible speed on curve (Problems included) - Widening of gauge on curves.

UNIT 2 RAILWAY CONSTRUCTION AND MAINTENANCE

9 Hrs.

Track construction - **Calculation of Materials required for track laying** - Track maintenance - Track drainage Types of stations: Way side, Junction, Terminal - Types of station yards: Passenger, Goods, Marshalling and Locomotive - Station equipments - Introduction to Modern Developments in Railways.

UNIT 3 POINTS & CROSSINGS, SIGNALING & INTERLOCKING

10 Hrs.

Types of Points / Switch: Stub, Split switch - Types of crossing: acute angle, Obtuse angle, Square - Design calculation of Turnout - Various types of Track junctions - Signaling and Interlocking - **Different types of signals, their working and location** - Control systems of signals - Mechanical method of interlocking systems - Track circuiting.

UNIT 4 AIRPORT PLANNING AND DESIGN

9 Hrs.

Introduction - classification of airports - Factors influencing the selection of new airport site and ICAO stipulations - layout characteristics, socio-economic characteristics of the Catchment area - components of Airport Runway Orientation: Wind Rose Diagram - **Problem on Basic and Actual runway length** - Aircraft Parking system Drainage - Airport Zoning - Runway and Taxiway Markings and lighting - **Design standards and planning of Airport as per Indian condition.**

UNIT 5 WATERWAYS

7 Hrs.

Introduction - General terminologies - Ports: Classification, Requirements - Docks: Classification - Harbour: Classification, Requirements -- Harbour Layout and Terminal Facilities - Coastal Protection Structures - Breakwaters: Classification - Signals: floating and fixed - light house and beacon - Inland Water Transport - Container transportation.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Saxena Subhash C. and Satyapal Arora., "A course in Railway Engineering", 7th Edition, Dhanpat Rai and sons, Delhi, 2009.
2. Khanna S.K., Arora M.G. and Jain S.S., "Airport Planning and Design", NemChand and Bros., Roorkee, 2012.
3. Oza H.P. and Oza G.H., "Dock and Harbour Engineering", Charotar Publishing House, 2013.
4. Satish Chandra, and Agarwal M.M., "Railway Engineering", Oxford University Press, New Delhi, 2013.
5. <http://nptel.ac.in/>

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80

Marks 90 % Theory & 10% Problematic Questions may be asked

SCI1209	SURVEYING II	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To study the modern equipment used in surveying with the application of measurement in RS and GPS.

Course Outcomes

On the end of the Course, student will be able to:

- CO1 - Understand the different operation methods in tacheometric systems.
- CO2 - Explain the classification in triangulation methods and process of reduction to centre.
- CO3 - Compute the errors to apply adjustment in the surveying measurements.
- CO4 - Identify the location of sounding methods and prediction of tides in hydrographic surveying
- CO5 - Understand the astronomical terms and field observations to calculate the azimuth and time.
- CO6 - Observe the measurements in total station to calculate the area and volume and understand the basics of remote sensing.

UNIT 1 TACHEOMETRIC SURVEYING

9 Hrs.

Systems of tacheometry - Tangential, Stadia and substance methods, Stadia systems - Horizontal and inclined sights - Vertical and normal staff - Fixed and movable hair - Stadia constants - Analytic lens - Use of substance bar.

UNIT 2 CONTROL SURVEYING

9 Hrs.

Horizontal and vertical control methods - Triangulation methods - Classification of triangulation systems - Network - Signals - Types of signals - Erection of signals - Base line - Choices - Instruments and accessories - Extension of base lines. - Satellite station - Reduction to centre.

UNIT 3 SURVEYING ADJUSTMENTS

9 Hrs.

Errors - Difference between accuracy and precision - Classification of errors - True and most probable value - Weighted observations - Method of equal shifts - Principle of least square - Level nets - Normal equation - Correlates.

UNIT 4 HYDROGRAPHIC AND ASTRONOMICAL SURVEYING

9 Hrs.

Tides - Prediction of tides - Mean sea level - **Sounding - Location of soundings and methods** - Three point problem - Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - **Latitude and longitude of a place - Celestial co-ordinate systems** - Nautical almanac - Star Constellation - Field observations and calculations for azimuth and time.

UNIT 5 MODERN SURVEYING AND APPLICATIONS

9 Hrs.

Terrestrial and aerial Photographs - Stereoscopy - Parallax - Electromagnetic distance measurement - Carrier waves - Principles - Instruments - **Modern surveying equipment - Total Station - Basic Concepts - Principles - Application of Measurements - Linear and angular - Satellite imagery - Remote sensing - Google Earth maps.**

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Kanetkar T.P., "Surveying and Levelling", Vol. I and Vol. II, Pune Vidyarthi Griha Prakashan, 2013.
2. Punmia B.C., "Surveying", Vol. I and Vol. II, Lakshmi Publications(P) Ltd., New Delhi, 2014
3. Clark D., "Plane and Geodetic surveying", Vol. I and Vol. II, CBS Publishers, New Delhi, 2009.
4. Duggal S.K., "Surveying", Vol. I and Vol. II, Tata McGraw Hill publisher, 2011.
5. Basak N.N., "Surveying and Levelling", Tata McGraw Hill publisher, 2008.
6. Subramanian R., "Surveying and Levelling", Oxford University Press, 2010

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

SCI1210	ENVIRONMENTAL ENGINEERING I	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To create the awareness and importance of the water among the students for public usage with following the standards.

Course Outcomes

On the end of the course, student will be able to:

- CO1 - To study the objectives, requirements and need of protected water supply, planning factors for public water supply and forecasting methods and its applications.
- CO 2 - To know about the Intakes and intake works and hydraulic designs of pressure pipes materials for pipes, laying jointing and testing of pipes,. Appurtenances of pipes, correction and prevention and pumps and pumping station.
- CO 3 - Analysis of physical, chemical and biological characteristics of water and the standards, sampling of water and importance of water borne diseases.
- CO 4 - Design of sedimentation, coagulation, flocculation and filtration. Disinfection methods for removal of iron and manganese, De-fluoridation - Water softening Desalination - Membrane filtration.
- CO 5 - To understand general requirements, classification, methods of supply, storage and distribution reservoirs. Layout of distribution system and analysis of distribution networks. .
- CO 6 - Students will able to understand importance of Environmental engineering and operation and maintenance of water supply.

UNIT 1 WATER AND ENVIRONMENT

9 Hrs.

Objectives of public water supply - Requirements of water supply - Need of protected water supply - Planning factors for public water supply - Types of demand - Rate of consumption - Factors affecting the rate of consumption population Forecasting Methods and its applications - Variation in demand pattern - Sources of water - Types Quantitative and qualitative studies.

UNIT 2 CONVEYANCE OF WATER

10 Hrs.

Intake and intake works - Channels and pipes for conveying water - Hydraulic design of pressure pipe Materials for pipes - Selection, specification and applications - CI, GI, Steel, RCC, AC and plastic - Laying of pipes Jointing and testing of pipes - Appurtenances of pipes - Corrosion of pipes and prevention. Pumps and pumping stations - Suitable location for pumping station - Selection of pumps.

UNIT 3 QUALITY OF WATER

8 Hrs.

Analysis of water - physical, chemical & bacteriological characteristics - Coliform test, Algae toxins and Algae index - Most Probable Number - Sampling - Drinking water standards - Water borne diseases.

UNIT 4 TREATMENT OF WATER

9 Hrs.

Objectives - Layout of treatment plants - Theory, principles, types and design of Sedimentation, coagulation, flocculation and filtration - Disinfection - Iron and Manganese Removal - De-fluoridation - **Water softening Desalination - Membrane filtration.**

UNIT 5 DISTRIBUTION SYSTEM

9 Hrs.

General requirements, Classification - Methods of supply - Storage and distribution reservoirs - Function, classification, Balancing or equalizing tank - Capacity - Layout of distribution system - Analysis of distribution networks - Equivalent pipes and Hardy cross method - Operation and maintenance - Leak detection - Appurtenances - Water supply to buildings.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Garg S.K., Water Supply Engineering, Khanna Publishers, 2010.
2. Birdie G.S., Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 2014
3. Duggal K.N., Elements of Environmental Engineering, S.Chand & Co Ltd.,2008
4. Manual on Operation and Maintenance of Water Supply Systems, CPHEEO, April 2003.
5. Peavy H.S, Rowe D.R. and George Tchobanoglous, Environmental Engineering, McGraw Hill Book Company, New Delhi, 2010.
6. Environmental Engineering Hand Book.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1301	STRUCTURAL ANALYSIS I	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn the modern method of analysis of beams, frames, Arches, Suspension and Bridges.

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - State the various theorems and its applications
- CO 2 - Understand theorem of three moments and its application in beams and frames
- CO 3 - Apply Newton's Laws of force equilibrium to determine axial forces, shear forces, and bending moments in statically determinate beams, trusses, frames, arches, and cables.
- CO 4 - Analyze beams and frames by moment distribution method
- CO 5 - Evaluate slope and deflection for various load cases in continuous beams and frames
- CO 6 - Analyze the cables and suspension bridges

UNIT 1 FIXED AND CONTINUOUS BEAMS 12 Hrs.

Introduction - statically indeterminate beams and frames. Fixed beam - Bending moment and Shear force diagram - Slope and Deflection - point load and UDL - Continuous beams - Theorem of three moments - Bending moment and shear force diagram.

UNIT 2 SLOPE DEFLECTION METHOD 12 Hrs.

Analysis of continuous beams with and without settlement - Rigid plane frames with and without sway.

UNIT 3 MOMENT DISTRIBUTION METHODS 12 Hrs.

Stiffness and carry over factors - Distribution and carryover of moments - Analysis of continuous Beams with and without settlement - Plane rigid frames with and without sway.

UNIT 4 ARCHES 12 Hrs.

Theoretical Arch - Eddy's theorem analysis of two and three hinged arches for parabolic and circular Settlement and Temperature effect.

UNIT 5 CABLES AND SUSPENSION BRIDGES 12 Hrs.

General Cable theorem - Analysis of cables under Concentrated and Uniformly Distributed Loads - Shape and Stresses due to self weight - Anchor Cables - Temperature effect - Suspension bridges with three hinged and two hinged stiffening girders.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Reddy C.S., "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 1996.
2. Punmia B C, Jain A K and Jain A K. "Strength of Materials and Theory of Structures" - Vol. 2, Laxmi Publications, New Delhi, 1992.
3. Rajasekharan & Sankarasubramanian.G., "Computational Structural Mechanics", Prentice Hall of India, 2001.
4. Sadhu Singh, "Strength of Materials", Khanna Publishers, 1988.
5. Vaidyanathan R., "Comprehensive Structural Analysis", Volume 1, Laxmi Publications, 2005

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1302	REINFORCED CONCRETE STRUCTURES I	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To introduce the various philosophies of R.C. design and to study in detail the limit state design of structural elements such as beams, columns and footings

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Be versed in the design codes and specifications
- CO 2 - Understand the principles of Elastic method, Ultimate load method and Limit state method
- CO 3 - Predict the section (balanced ,under reinforced, over reinforced) of RCC beams of rectangular section
- CO 4 - Analyze the RCC beams in flexure
- CO 5 - Design the structural elements such as beams ,slabs and columns and also footings
- CO 6 - Draw the reinforcement detailing of the structural elements and footings

UNIT 1 BASIC CONCEPTS

9 Hrs.

Properties of Reinforced concrete materials, Stress - Strain diagrams of concrete and steel, Design philosophies (Principles of Elastic method, ultimate load and limit state method) Design code and specification. Behaviour of RC beams in bond development length and Anchorage, Loading standard as per IS 875. Behavior of RC structural systems under gravity and lateral load.

UNIT 2 BEAMS

15 Hrs.

Flexure of RCC beams of rectangular section - Balanced, Under Reinforced and Over Reinforced Sections. Analysis and Design of Singly and Doubly Reinforced beams - Design of flanged Sections (T and L beams) and Continuous Beams - Analysis and design with and without shear reinforcement as per IS: 456.

UNIT 3 SLABS

12 Hrs.

Analysis and Design of one way and two way slab for uniformly distributed load, various Boundary conditions and corner effects. Design of continuous slabs - Using code Coefficient.

UNIT 4 COLUMNS

12 Hrs.

Behaviour of Columns, Types of columns, Design of Axially loaded and Eccentrically loaded columns - Using IS: 456 & SP-16.

UNIT 5 FOOTINGS

12 Hrs.

Types of footing, SBC of soil - Design loads - Design of axially and eccentric loaded rectangular footing Combined rectangular footing.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Varghese P.C., "Advanced Reinforced Concrete Design", Prentice Hall India, 2007.
2. Sinha N.C. and Roy S.K., "Fundamentals of Reinforced Concrete", S.Chand Company, 1998.
3. Ashok. K. Jain, "Reinforced Concrete Design", Nem Chand and Bros, 1993.
4. Krishnaraju N., "Design of Reinforced Concrete Structures ", Tata McGraw Hill, 2000.
5. Unnikrishnan Pillai S. & Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill, 2007.

CODE BOOK

1. IS 456 -2000 - Code of practice for plain and reinforced concrete.
2. SP 16 (1980) - Design Aids for Reinforced concrete.
3. SP 34(1987) - Hand book on Concrete reinforcement and Detailing.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1303	DESIGN OF STEEL STRUCTURES I	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn the design of steel Components and structures using Limit State Design method subjected to external loading.

Course Outcomes

On the end of the course, student will be able to:

- CO 1- Understand the codal provisions of Limit State method as per Indian Standards
- CO 2 - Identify the sectional properties of various rolled steel sections from Steel tables
- CO 3 - Design different types of bolted and Welded connections in steel structures
- CO 4 - Analyze and design simple and compound tension members
- CO 5 - design simple and compound compression members along with base plates.
- CO 6 - design the different types of bending members.

UNIT 1 INTRODUCTION

11 Hrs.

Material properties of steel - **Structural steel sections and their properties** - General design requirements Limit state design concepts - Loads on structures - Classification of sections.

UNIT 2 CONNECTIONS

15 Hrs.

Types of connections - Riveted, Bolted and Welded connections - Failure modes of bolts - **Design of ordinary and high strength friction grip bolts** - Types of welded connections and failure modes - **Design of welded connections** - Eccentric connections - Efficiency of joints.

UNIT 3 DESIGN OF TENSION MEMBERS

11 Hrs.

Types of Tension members - Net area - Net effective sections - concept of shear lag - **Design strength of simple and compound members** - Use of lug angles - Design of tension splices.

UNIT 4 DESIGN OF COMPRESSION MEMBERS

11 Hrs.

Types of compression members - Theory of columns - column curves - Effective length of compression members - Slenderness ratio - **Design of simple and compound section compression members** - Design of lacing and battened types of columns - Design of column bases and column splicing.

UNIT 5 DESIGN OF MEMBERS SUBJECTED TO BENDING

12 Hrs.

Effective span of beams - Design strength in bending - Laterally supported beams - Laterally unsupported beams - **Effective length for lateral torsional buckling** - Design for shear - Web crippling and web buckling - Members subjected to combined forces - Biaxial bending - Purlins and Girts.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Subramanian N., "Design of Steel Structures", Oxford University Press, 2008.
2. Dayaratnam P., "Design of Steel Structures", A.H. Wheeler & Co. Ltd., Allahabad, 1976.
3. Duggal S.K., "Limit State design of steel structures", Tata Mc Graw Hill publishing company, New delhi, 2010.
4. Punmia B.C., Ashok Kumar Jain & Arun Kumar Jain, "Design of Steel Structures", Vol. I and II, Arihant Publications, Mumbai, 1998.
5. Dowling P.J., Knowles P.R., Owens G.W., "Structural Steel Design", The Steel Construction Institute, Butterworths, London, 1988.
6. "Teaching Resources for structural Steel Design", Vol 1 & 2, INGDA, Calcutta.

CODE BOOK

1. IS: 800-2007, "Indian Standard for General Construction in Steel - Code of Practice" (Third Revision).
2. SP 6(1) - 1964 Hand book for Structures Engineers

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1304	SOIL MECHANICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To develop an understanding of the relationships between physical characteristics and mechanical properties of soils. To understand and experience experimental measurement of the physical and mechanical soil properties commonly used in engineering practice. To understand and be able to apply the modeling and analysis techniques used in soil mechanics: (a) Darcy's Law and flow-nets for seepage (b) consolidation models for load-time deformation responses of soils (c) Mohr's-Coulomb models for shear strength behavior of soils. To develop good technical reporting and data presentation skills.

Course Outcomes

On the end of the course, student will be able to:

- CO1 - Carry out soil characterization and classification
- CO2 - Solve any practical problems related to soil stresses estimation, permeability and see page including flow net diagram
- CO3 - Compute and analyze the consolidation settlements
- CO4 - Identify shear strength parameters for field conditions
- CO5 - State the concepts of slope stability and recommend slope protection measures
- CO6 - Identify the properties for good foundation sites and apply the knowledge in the selection of appropriate substructures.

UNIT 1 SOIL PROPERTIES

9 Hrs.

Objectives and Values of Geotechnical Engineering - Nature of soil, Formation of soil and functional relationships - types of soil and the soil properties - Phase relations - Index properties - Specific gravity using pycnometer and specific gravity bottle - Grain size analysis - sieve analysis and hydrometer analysis - Consistency of soils - Atterberg's limit - soil classification for Engineering purposes - Classification of coarse grained and fine grained soil as per BIS - Soil deposits in India.

UNIT 2 SOIL WATER AND WATER FLOW

7 Hrs.

Soil water - Various forms - Capillary rise - Suction - effective stress - total stress - pore pressure - pressure diagrams - Permeability - definition - Darcy's law - factors affecting permeability - laboratory determination - stratified soils - average permeability and seepage.

UNIT 3 COMPRESSIBILITY AND CONSOLIDATION

9 Hrs.

Compaction - Proctor test and Modified proctor test - Concept of OMC and maximum dry density - Zero air voids line - Factors influencing compaction - Effect of compaction in soil properties - Difference between consolidation and compaction - Definition - Concepts of coefficient of compressibility - Components of settlement Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory - Governing differential equation - Laboratory consolidation test - Field consolidation curve - Introduction to sand drain, radial drainage and vacuum consolidation - Problems on final and time rate settlement.

UNIT 4 STRESS DISTRIBUTION AND SHEAR STRENGTH

11 Hrs.

Stress distribution in soil media - Boussinesque's and Westergaard's equations for vertical pressure due to point loads and uniformly distributed loads - assumptions and limitations - pressure bulb - Newmark's influence chart - principle, construction and use - line loads and strip loads - Shear strength of cohesive and cohesionless soils Mohr's Coulomb failure theory - Saturated soil - Strength parameters - Measurement of shear strength, Direct shear, Triaxial compression, UCC and Vane shear tests - Types of shear tests based on drainage and their applicability Drained and undrained behaviour of clay and sand - Stress path for conventional triaxial test.

UNIT 5 SLOPE STABILITY

9 Hrs.

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes - Total and effective stress analysis - Stability analysis for purely cohesive and Cohesion less soils - Method of slices - Modified Bishop's method - Friction circle method - Stability number - problems - Slope protection measures.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Punmia B. C, "Soil mechanics and Foundations", Laxmi Publications, 1998.
2. Terzaghi K Pech. R. B "Soil mechanics in Engineering Practice", John Wiley Ltd.,2012
3. Lambe T. W & Whitman, "Soil mechanics", John Wiley Ltd.,1976.
4. Alam Singh, "Soil Engineering", Asia Publications, 2006
5. Murthy V.N.S, A text book of Soil Mechanics and Foundation Engineering", CBS Publishers & Distributors Pvt. Ltd., 2011

END SEMESTER EXAM QUESTION PAPER PATTERN**Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 questions of 2 marks each - No choice**20 Marks****PART B :** 2 Questions from each unit with internal choice, each carrying 12 marks**80 Marks**

SCI1305	WATER RESOURCES ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To build on the student's background in hydrology and hydraulics and understanding of water resources systems. To develop the skills in modeling of flood flows and flood routing. To develop skills in the ground water flow, type of aquifer and yield from the well. To provide the knowledge of design of reservoir, operation and sedimentation. To study the effect, causes and remedial measures of watershed management

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Know the occurrence & distribution of natural waters of the earth
- CO 2 - To know the flood flows and flood routing
- CO 3 - To gain knowledge on groundwater flow and aquifer
- CO 4 - The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- CO 5 - Implement and study the planning and management for single & multipurpose projects

UNIT 1 INTRODUCTION

8 Hrs.

Water resources projects - Introduction - Water resources of India - Range of water resources projects General planning philosophy - **Water allocation priorities - Irrigation - Flood control - Hydropower. Data requirement and data collection for different projects** - Water availability studies. **Environmental checklist for Water Resources projects.**

UNIT 2 BASIC CONCEPTS OF HYDROLOGY

10 Hrs.

Hydrologic cycle - **rainfall and its measurement** - computation of mean rainfall over a catchment area using arithmetic mean, Thiessen polygon and Isohyetal methods - Abstraction from rainfall - evaporation, factors affecting evaporation, measurement of evaporation – evapotranspiration - Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices. Runoff - components of runoff, factors affecting runoff, stream gauging, effective rainfall, separation of base flow.

UNIT 3 GROUNDWATER HYDROLOGY

10 Hrs.

Soil water zones, Soil moisture relations Specific retention, Specific yield. Occurrence of ground water - Types of aquifers - unconfined aquifer, confined aquifer, aquitard - Storage coefficients - coefficient of permeability and transmissibility, Steady radial flow into a well under confined and unconfined condition, pumping and recuperation tests, Tube wells and Open wells - yield from an open well.

UNIT 4 RESERVOIR PLANNING

7 Hrs.

Reservoir planning: Investigation - selection of site - storage zones in a reservoir - mass inflow curve - demand curve - **calculation of reservoir capacity** and safe yield from mass inflow curve - reservoir sedimentation reservoir sediment control. Single and multipurpose reservoirs.

UNIT 5 WATERSHED MANAGEMENT

9 Hrs.

Flood and Drought: Design flood - assessment and mitigation measures - causes - methods of flood control, flood forecasting - **Drought assessment and mitigation measures.** Levees and flood walls, Channel improvement. Delineation of basin boundary - **watershed management.** Remote sensing application to water resource engineering - case study.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw Hill Inc, 2009.
2. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009
3. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
4. Ven Te Chow, "Applied Hydrology", McGraw Hill Inc., 1990.
5. Subramanya, K., Engineering Hydrology, Tata McGraw Hill publishers, 2008.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

Marks 50% Theory & 50% Problematic Questions may be asked

Exam Duration : 3 Hrs.

20 Marks

80

SCI1306	ENVIRONMENTAL ENGINEERING II	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To implicate the importance of sewerage system and treatment of wastewater for the civil engineering students.

Course Outcomes

On the end of the course, student will be able to:

- To identify the type of unit operations and processes involved in wastewater treatment plants.
- To identify that sanitation is an important professional and ethical responsibility of civil and environmental engineer.
- Analyze the characteristics of wastewater.
- Practice the layout of wastewater treatment plants.
- Demonstrate ability in design of wastewater treatments units in a cost effective and sustainable way.
- Recognize the importance of wastewater treatment to protect the water resources which is facing a constant deprivation in water quality.

UNIT 1 SEWERAGE SYSTEM 9 Hrs.

Sewage, Sewerage - Classification - Quantity of sanitary sewage - Estimation of sanitary sewage and storm runoff - Fluctuations - Hydraulics of sewer - Shapes and materials of sewer - Design criteria for sewer system - Ventilation - Recent Methods on Cleaning of Sewers.

UNIT 2 LAYOUT OF SEWERAGE SYSTEM 9 Hrs.

Laying, jointing and testing of sewers - Sewer appurtenances, Principles governing the design for drainage in buildings - Plumbing systems for drainage - Layout of house Drainage - Pumps - Selection of pumps and pipe drainage.

UNIT 3 CHARACTERISTICS OF SEWAGE 8 Hrs.

Characteristics and composition of sewage - Method of sampling - Analysis of Sewage - Physical, Chemical (DO, COD and BOD and their significance) and Microbiological characteristics - Population equivalent, Relative stability - Decomposition of sewage - Nitrogen, Sulphur and Carbon cycles.

UNIT 4 TREATMENT OF SEWAGE 10 Hrs.

Objectives - Layout of treatment plants - Screening, grit chambers, skimming tanks, grease traps Sedimentation tank - Trickling filter Activated Sludge Process - UASB - Oxidation pond - Septic tank.

UNIT 5 DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9 Hrs.

Objectives, Methods, dilution and irrigation - Disposal standards for dilution and irrigation of sewage effluent self purification of streams - oxygen sag curve - Land disposal - Sewage farming - Soil dispersion system - Sludge Characterization - Sludge Digestion - Sludge conditioning and dewatering - Sludge disposal.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Garg. S. K, "Environmental Engineering", - Vol I and II, Khanna Publishers, 2010.
2. Punmia, B.C., Jain, A.K., and Jain.A., Environmental Engineering, Vol.II, lakshmi publications, Newsletter, 2005.
3. Birdie. G. S., and Birdie J. S., "Water supply and sanitary Engineering", Dhanpat Rai and Sons, New Delhi, 2013.
4. CPHEEO, "Manual on sewerage & Sewerage Treatment", Ministry of Urban Development, Govt of India, 2010.
5. Metcalf & Eddy, "Waste Water Engineering, Collection, Treatment & Disposal", Tata McGraw Hill, Inc., New York, 2013.
6. Shah. C. S, "Water Supply and Sanitation", Galgotia publishing company, New Delhi, 1998.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1307	STRUCTURAL ANALYSIS II	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn the influence lines and its uses in various applications like bridges arches. Also to learn advanced methods like matrix methods of structural analysis of structures, plastic theory.

Course Outcomes

On the end of the course, student will be able to:

- CO1 - Understand the position of rolling loads to get the maximum shear force and bending moment at given section of the beam and anywhere on the beam.
- CO2 - Determine the shear force and bending moment for determinate and indeterminate structure using graphical method.
- CO3 - Analyse the continuous beam, Rigid jointed frame and pin jointed plane frame using flexibility matrix method.
- CO4 - Analyse the continuous beam, Rigid jointed frame and pin jointed plane frame using flexibility matrix method.
- CO5 - Understand the concept of plastic theory; determine the shape factor of various shapes.
- CO6 - Analysis Indeterminate beams and frames using static and kinematic methods.

UNIT 1 ROLLING LOADS 12 Hrs.

Rolling loads - Single Concentrated load - Uniformly distributed load - Two Concentrated loads - System of moving loads - Curves of maximum B.M.D. and S.F.D. - Equivalent UDL.

UNIT 2 INFLUENCE LINE FOR STATICALLY DETERMINATE AND INDETERMINATE STRUCTURES 12 Hrs.

Influence line for Statically Determinate Beams for Bending moment and Shear force - Muller Breslau's Principles and its application to determine the influence lines of reactions. S.F and B.M at a section of continuous beams - proposed cantilevers - Qualitative influence lines for Horizontal thrust, reactions and moments for portal frames.

UNIT 3 FLEXIBILITY MATRIX METHOD 12 Hrs.

Definition and determination of Static and Kinematic Indeterminacy - Concepts co-ordinates - element transformation approach - **Applications to analysis of continuous beams and rigid jointed plane frames.**

UNIT 4 MATRIX STIFFNESS METHOD 12 Hrs.

Element and global stiffness matrices - Co-ordinate transformations - Rotation matrix - transformations of stiffness matrices - Analysis of Continuous Beams - and rigid jointed plane frames - Introduction to FEM.

UNIT 5 PLASTIC ANALYSIS OF STRUCTURES 12 Hrs.

Introduction - Ductility of steel - Beams in pure bending - Stages of bending in beams - **Plastic modulus Shape factor** - Load factor - Plastic hinge and mechanism - Upper and lower bound theorems - Static and Kinematic methods - Plastic analysis of indeterminate Beams and frames.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Rajasekaran, S., Sankarasubramanian, G., "Computational Structural Mechanics", Prentice Hall, New Delhi, 2001.
2. Bhavikatti, S.S., "Structural Analysis", Vol. 1 & Vol. 2, Vikas Publications, 2000.
3. Reddy C S, "Basic Structural Analysis", Tata McGraw Hill Publishing Co., 1996.
4. Bhatt P, "Problems in structural Analysis by Matrix Methods", Wheeler Publications, 1989.
5. Flemming, J.F., "Computer Analysis of Structural Systems", Tata McGraw Hill Publishing Company, 1989.
6. Menon .D, "Structural Analysis, Alpha Science" International, Limited, 2008.
7. Pandit .G.S, Gupta .S.P, "Structural Analysis, A Matrix Aproach", 2nd Edition, Tata McGraw Hill Education, 2010.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1308	REINFORCED CONCRETE STRUCTURES II	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn design of R.C staircase, Circular, flat slabs, Retaining walls, Water tanks, and concept of yield line theory

COURSE OUTCOME

On the end of the course, student will be able to:

- CO1 - identify and compute the main mechanical properties of concrete and steel. Learning about types of staircases. Identify and calculate the design loads and distribution.
- CO2 - Analyze the concept of yield line theory and the design of R.C. structural members. Understand the design of various types of slab.
- CO3 - Analyze and design of Reinforced concrete slabs.
- CO4 - Analyze and design of Retaining walls in limit state design and design of cantilever and counter fort walls type.
- CO5 - Analyze and design of rectangular, overhead and circular water tanks using elastic method

UNIT 1 STAIRCASES 11 Hrs.

Stair case, Components of stair case, Types of stair case - Limit state design of dog legged and open newel staircase.

UNIT 2 YIELD LINE THEORY 12 Hrs.

Concept of yield line theory - Determination of collapse load and design of rectangular, circular and triangular slabs (formulas only).

UNIT 3 CIRCULAR SLABS AND FLAT SLABS 13 Hrs.

Limit state design of circular slabs - Simply Supported and fixed with UDL. Design of flat slabs by direct design method according to IS code.

UNIT 4 RETAINING WALL 8 Hrs.

Limit state design of retaining walls, Design of Cantilever and Counter fort types.

UNIT 5 WATERTANKS 10 Hrs.

Types of water tanks - Design of water tanks using Elastic method - resting on ground - Underground rectangular - overhead circular and rectangular with staging.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Varghese P.C., "Advanced Reinforced Concrete Design", Prentice Hall India, 2007.
2. Sinha N.C. and Roy S.K., "Fundamentals of Reinforced Concrete", S.Chand Company, 1998.
3. Ashok.K.Jain, "Reinforced Concrete Design", Nem Chand and Bros, 1993.
4. Krishnaraju N., "Design of Reinforced Concrete Structures", Tata McGraw Hill, 2000.
5. Unnikrishnan Pillai S. & Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill, 2007.

CODE BOOK

1. Code of practice for Plain and Reinforced Concrete IS456-2000, BIS, New Delhi
2. Design Aids for Reinforced Concrete to IS 456, Special Publication (SP16), BIS New Delhi, 1980
3. "Code of practice for concrete Structures for the storage of liquids," - IS3370- 1965, (Part 1 to 4) - BIS, New Delhi
4. IS 456 - 2000 - Code of Practice for plain and reinforced concrete
5. SP 16(1980) - Design Aids for Reinforced Concrete
6. SP 34 (1987) - Hand book on concrete reinforcement and detailing
7. IS 3370 - 1965 Code of Practice for Concrete Structures for the storage of liquids.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1309	DESIGN OF STEEL STRUCTURES II	L	T	P	Credits	Total Marks
		3	1	0	4	100

COURSE OBJECTIVE

To learn the design of Plate girders, Industrial structures, water tanks, Bunkers, Silos and Light gauge sections

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understand the basic elements in plate girders with codal provisions of Limit State method as per Indian Standards
- CO 2 - Identify the sectional properties from Steel tables for designing the Roof trusses with several Loading condition.
- CO 3 - Design water tanks with different shapes with different levels.
- CO 4 - Analyze and design of Bunkers and Silos with current parameters.
- CO 5 - Designing the various light gauge steel members with different connections.

UNIT 1 PLATE GIRDERS

12 Hrs.

Introduction - types of sections - elements of plate girder - general considerations - end panel design - tension field action - [design of plate girders with solid webs](#) - flange splices - connection of flanges to web - stiffener design various types of stiffeners.

UNIT 2 ROOF TRUSSES AND INDUSTRIAL STRUCTURES

12 Hrs.

Roof trusses - Roof and side coverings - Design loads, [Design of purlin and elements of truss](#) - end bearing Design of gantry girder.

UNIT 3 WATER TANKS

12 Hrs.

Introduction - permissible stresses - thickness specifications - elevated tanks - circular tanks - rectangular tanks - [pressed steel tanks](#).

UNIT 4 BUNKERS AND SILOS

12 Hrs.

Introduction - Janssen's theory - Airy's theorem - Design parameters - Design criteria - [analysis of bins Hopper bottom](#) - design of bins.

UNIT 5 LIGHT GAUGE SECTIONS

12 Hrs.

[Design of light gauge steel members](#) - local and post buckling of thin elements - light gauge steel compression members - tension members - beams and connections.

Max. 60 Hours

TEXT / REFERENCE BOOKS

1. Subramanian N., "Design of Steel Structures", Oxford University Press, 2008.
2. Ramchandra S., & Virendra Ghelot, "Design of Steel of Structures", Volume 1, Scientific Publishers, 2009, New Delhi
3. Duggal S.K., "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, New Delhi, 1st Edt., 2010.
4. Punmia B.C., Ashok Kumar Jain & Arun Kumar Jain, "Design of Steel Structures", Vol. I and II, Arihant Publications, Mumbai, 1998.
5. Dowling P.J., Knowles P.R., Owens G.W., "Structural Steel Design", The Steel Construction Institute, Butterworth's, London, 1988.
6. "Teaching Resources for structural Steel Design", Vol 1 & 2, INGDA, Calcutta.

CODE BOOK

1. IS: 800-2007, "Indian Standard for General Construction in Steel - Code of Practice" (Third Revision).
2. IS: 801-1975, : Code of practice for use of cold - formed light gauge steel structural members in general building construction
3. SP 6(1) - 1964 Hand book for Structures Engineers
4. IS: 811 - 1987, "Specification for cold formed light gauge structural steel sections.
5. IS: 804-1998 Code of practice for rectangular pressed steel tanks.
6. IS: 805 - 1995 Code of practice for use of steel in gravity water tanks.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

PART A : 10 questions of 2 marks each - No choice

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

Exam Duration : 3 Hrs.

20 Marks

80 Marks

SCI1310	FOUNDATION ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To learn about types and purposes of different foundation systems and structures. To provide students with exposure to the systematic methods for designing foundations. To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior. To build the necessary theoretical background for design and construction of foundation systems.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understand how to evaluate the sub-surface conditions by taking samples by boring or by digging exploratory pits
- CO 2 - Understand that the extent of exploration depends on the importance of the structure, the complexity of the soil conditions and the budget available for exploration, and also about how to prepare a detailed soil exploration programme
- CO 3 - Estimate bearing capacity of soil which is basic requirement of foundation selection and also foundation design.
- CO 4 - Design shallow foundations including raft foundation.
- CO 5 - Understand the need of pile foundation, various types of pile foundation and also design of individual and group piles.
- CO 6 - understand the importance of earth pressure calculation in the design of retaining structures and also the slope stability factors and analysis.

UNIT 1 SOIL EXPLORATION AND SITE INVESTIGATION

9 Hrs.

Introduction - Planning and stages in sub-surface exploration - depth and spacing of exploration - **Methods of exploration** - Test pit - Trenches - Geophysical methods Seismic refraction and Electrical resistivity method - Boring Auger boring, Shell and Auger, Wash boring and Rotary drilling - Types of soil sample: disturbed and undisturbed soil samples - Features of sampler affecting soil disturbance - standard penetration test - static and dynamic cone penetration test - bore log report - selection of foundation and justification

UNIT 2 BEARING CAPACITY ON SETTLEMENT

9 Hrs.

Introduction - Bearing capacity - definition - types of shear failure - Bearing capacity of shallow foundation on homogeneous deposits - Methods: Terzaghi's, Skempton's and BIS methods - **Effect of water table on bearing capacity** - **Plate load test** - Bearing capacity from in-situ tests - SPT, SCPT and plate load test - methods of improving bearing capacity of soil - **Settlement**: total and differential settlements - causes and methods of minimizing settlement.

UNIT 3 SHALLOW FOUNDATION

9 Hrs.

Types of foundation - contact pressure distribution below isolated footing - types and proportioning of combined footing - types and application of mat foundation - floating foundation - shell foundation - spread footing

UNIT 4 DEEP FOUNDATION

9 Hrs.

Types and function of pile - factors influencing the selection of pile - carrying capacity of single pile in cohesionless and cohesive soil - static formula - dynamic formulae (Engineering News and Hileys) - Capacity from in-situ tests (SPT and SCPT) - Negative skin friction - **Carrying capacity of Pile group** - **Pile load test** - Under-reamed piles - well foundation

UNIT 5 EARTH PRESSURE AND STABILITY OF SLOPES

9 Hrs.

Earth pressure in soils: active and passive states - Lateral earth pressure Rankine's theory - stratified soil Cullman's Graphical method - Slopes - Infinite and finite slopes - types of failure - causes of failure - Procedure for slip circle method and method of slices - Diaphragm wall - modern methods of slope protection

TEXT / REFERENCE BOOKS

1. Bowles .J.E, "Foundation analysis and design", McGraw Hill, 2001.
2. Murthy .V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2009.
3. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2011.
4. Punmia .B.C, "Soil Mechanics and Foundations Engineering", Laxmi Publications Pvt. Ltd. New Delhi, 2005.
5. Das .B.M, "Principles of Foundation Engineering" (Fifth edition), Thomson Books, 2010.
6. Tomlinson. M. J, " Pile Design and Construction Practice" E & FN SPON, 2008

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

80 Marks

SCI1311	ESTIMATION, COSTING & VALUATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To understand the concepts types of estimation and types of contracts with valuation.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO1 - Prepare quantity estimates for Buildings, roads and canal structures as per specifications.
- CO 2 - Draft rate analysis for all works related to civil engineering projects.
- CO 3 - Ascertain the quantity of materials required for civil engineering work as per specifications.
- CO 4 - Prepare detailed specifications and tender documents for civil engineering projects.
- CO 5 - Prepare contract document and evaluate contracts in construction practice.
- CO 6 - Prepare cost estimate and valuation of civil engineering works.

UNIT 1 ESTIMATION

9 Hrs.

Introduction - Purpose - Methods of estimation - Types of estimates - Approximate estimates - Detailed estimate - [Estimation of quantities for buildings, roads, canals and hydraulic structures](#) - Check Dams using computer software - field study.

UNIT 2 RATE ANALYSIS AND COSTING

9 Hrs.

Standard Data - Rate analysis - [Schedule of rates](#) - study and analysis of rate escalation - costing - cost control - construction, machineries - Tools and techniques.

UNIT 3 SPECIFICATIONS AND TENDERS

9 Hrs.

Detailed and general specification - types of specification - Tender notices - types - [tender procedures](#) [Drafting model Tenders](#).

UNIT 4 CONTRACTS

9 Hrs.

Contract - Types of contracts - Formation of contract - Contract conditions - Contract for labour, material Earnest Money Deposit, Security Deposit, Measurement Book - Contract problems - Arbitration - [ISO documentation](#).

UNIT 5 VALUATION

9 Hrs.

Introduction - Types of valuation - Common terms used in valuation - Valuation methods - [Valuation of land](#) [Buildings, Fixation of rent](#) - problem - depreciation - mortgage - case study.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Dutta. B.N., "Estimating and Costing in Civil Engineering", S. Dutta & Company, UBS Publishers Distributors Pvt Ltd, Lucknow, 2004
2. Rangwala. S.C., "Estimating and Costing in Civil Engineering", Charotar Publishing House, 2006
3. Chakraborti M, "Estimation, Costing, Specification and Valuation in Civil Engineering (including Computer estimation)", 2001.
4. Birdie. G.S., "A Text book on Estimating and Costing", Dhanpat Rai and Sons, New Delhi, 2009

CODE BOOK

1. PWD Data Book
2. IS: 1200- 1968 - "Methods of measurements of Building and Civil Engineering".

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

80 Marks

SCI1401	IRRIGATION ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To introduce the students to the concept of soil - plant characteristics and their water requirements.

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Understand the concept of soil water plant characteristics
- CO 2 - Compute the Duty, Delta, Crop Water Requirement and Irrigation Demand
- CO 3 - Evaluate the performance of Irrigation system and its components
- CO 4 - Appraise and design of Diversion Head Works
- CO 5 - Understand the concept of Irrigation Water management with participatory approach
- CO 6 - Design and Implementation of Irrigation Projects

UNIT 1 IRRIGATION PRINCIPLES 9 Hrs.

Need for irrigation - Advantages and ill effects - Development of irrigation - Environmental effects - Physical & Chemical properties of soil that influence soil moisture characteristics - **Concept of soil water potential** and its components Retention of water in soils and concept of plant available water Quality of irrigation water - **Types of irrigation** - Limitation - Advantages.

UNIT 2 CROP WATER REQUIREMENTS 9 Hrs.

Water requirements of crops - Crop period - Base period - Duty and Delta - Factors affecting Duty - Methods of improving Duty - Consumptive use of water - Estimation of Consumptive use of water - Irrigation Efficiencies Irrigation requirement of crops. Methods of application of irrigation water, Water logging.

UNIT 3 IRRIGATION SYSTEM COMPONENTS 10 Hrs.

Components and functions of irrigation network - Canal regulators - Canal drop - Canal cross drainage works, Canal outlets - Canal lining - Concepts of Kennedy's and Lacey's formulae. Cross drainage works Introduction, types of cross drainage works and their selection, design aspects of aqueducts, siphon aqueducts, super passages, canal siphon and level crossings.

UNIT 4 DIVERSION HEADWORKS 10 Hrs.

Types of Weirs and Barrages - Bligh's theory - Limitations - Khosla's theory - Silt Excluders - Silt ejectors Divide wall - River training works. Water Logging - Causes of water logging - **Methods of reclaiming a water logged area** - Canal falls - Site selection - Types of canal falls - Design of Sarda type fall and Design of straight glacis fall Spillways - Types - Energy dissipaters - Discharge formula for Ogee Spillway.

UNIT 5 IRRIGATION WATER MANAGEMENT 7 Hrs.

Need for interdisciplinary approach - Irrigation beneficiaries - Irrigation scheduling - methods of irrigation scheduling - participatory approach: farmer's organization and turn over - **Water Users Association** - **Economical aspects of irrigation**

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Santhosh Kumar Garg, "Irrigation and Hydraulic Structures", 1st Edition Khanna Publishers, New Delhi, 2009.
2. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Company, 1994.
3. Dilip Kumar Mujumdar, "Irrigation Water Management - Principles and Practice", Prentice Hall of India, New Delhi, 2000.
4. Punmia B.C., Pande B., and Lal B., "Irrigation and Water Power Engg", 12th Edition Laxmi Publications (P) Ltd., 2006.
5. Asawa G.L., "Irrigation Engineering", New Age International Publishers, 2007.
6. Sathyanarayana Murthy, "Water Resources: Engineering Principles and Practices", New Age Publishers, 1997.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit with internal choice, each carrying 12 marks.

80

Marks 60% Theory & 40% Problematic Questions may be asked

SCI1402	PRESTRESSED CONCRETE STRUCTURES	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To analyse prestressed concrete sections and design of beams.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - To Understand the concept of prestressing and the behavior of prestressed concrete structures
- CO 2 - To Design prestressed concrete beams for flexure and shear
- CO 3 - To Understand the codal requirements based on IS: 1343-2012
- CO 4 - To Find deflection of prestressed concrete structures
- CO 5 - To Analyse and design composite beams
- CO 6 - To Design tension and compression members

UNIT 1 INTRODUCTION - THEORY AND BEHAVIOUR

9 Hrs.

Basic principles of prestressing - Classification and types - Advantages over ordinary reinforced concrete
Materials Required - [Methods of prestressing](#) - Freyssinet, Magnel, Lee-McCall and Gifford Udall anchorage systems
- Analysis of sections of stresses by stress concept, strength concept and load balancing concept - Losses of prestress in posttensioned and pretensioned members.

UNIT 2 DESIGN FOR FLEXURE AND SHEAR

9 Hrs.

Basic assumptions for calculating flexural stresses - Definition of Type I, II & III posttensioned and pretensioned beams - Permissible stresses in steel and concrete as per IS:1343 - 2012 Code - [Design of Rectangular, I & T section](#) - Check for strength limit based on IS:1343 - 2012 Code - Layout of cables in posttensioned beams - Location of wires in pretensioned beams - Design for shear based on IS:1343 - 2012 Code.

UNIT 3 DEFLECTION AND DESIGN OF ANCHORAGE ZONE

9 Hrs.

Factors influencing deflections - Short term deflections of uncracked members - Prediction of long term deflections due to creep and shrinkage - [Calculation of bearing stress and bursting tensile forces & reinforcement in anchorage zones based on IS:1343 - 2012](#) - [Codal requirements of limit state deflection](#) - Determination of anchorage zone stresses in posttensioned beams by Magnel's method, Guyon's method and IS:1343 - 2012 code design of anchorage zone reinforcement - Check for transfer bond length in pretensioned beams.

UNIT 4 COMPOSITE BEAMS AND CONTINUOUS BEAMS

9 Hrs.

Linear transformation Analysis and design of composite beams - Methods of achieving continuity in continuous beams - Assumptions in Elastic analysis - Pressure Line - Continuous beams - Analysis for secondary moments - Concordant cable and linear transformation - Calculation of stresses - Principles of design.

UNIT 5 MISCELLANEOUS STRUCTURES

9 Hrs.

[Design of tension and compression members](#) - Tanks, pipes and poles - Partial prestressing - Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Krishna Raju N., "Design of Prestressed Concrete Structures", Fourth Edition, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 1995.
2. Sinha & Roy, "Prestressed Concrete", S Chand & Company Ltd., New Delhi, 1994.
3. Ramamurtham S., "Prestressed Concrete", 3rd Edition, Dhanpat Rai & Sons, New Delhi, 1995.
4. Pandit G.S. and Gupta S.P., "Prestressed Concrete", CBS Publishers and Distributors Pvt. Ltd., 1993.
5. Lin T.Y. and Ned.H.Burns, Design of prestressed Concrete Structures, John Wiley and Sons, 1982.

6. RajagopalanN., Prestressed Concrete, Narosa Publishing House, 2002.
7. Arthur H.Nilson, Design of Prestressed Concrete, John Wiley and Sons, 1987.
8. Dayaratnam P., Prestressed Concrete Structures, Oxford and IBH, 1982.
9. IS 1343 - 2012, Code of practice for prestressed concrete

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A: 10 questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1403	CONSTRUCTION MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To study the basics of management related activities at the time of construction with software application.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO1 - Understand the project life cycle relating to construction industry
- CO2 - Apply knowledge, techniques, skills, and tools of the construction industry in construction activities
- CO3 - Analyze, evaluate, and select computer applications for the purpose of efficient and effective project management.
- CO4 - Implement generic and special Construction Project Management skills to a higher level
- CO5 - Understand the special management skills required in multidisciplinary and global Construction Industry
- CO6 - Integrate and apply theoretical concepts, ideas, tools and techniques to Construction practice.

UNIT 1 CONSTRUCTION PROJECT MANAGEMENT 7 Hrs.

Introduction - Project Life Cycle - Major Types of construction - Selection of professional services Construction contractors - Financing of constructed facilities - Legal and Regulatory requirements - Role of project managers.

UNIT 2 PROJECT PLANNING AND ORGANIZATION 8 Hrs.

Development of project plan, objective and conception - Programming - Scheduling - Project Organization Project budget fund flow statement - Controlling system.

UNIT 3 PROJECT FORMULATION 9 Hrs.

Project - Concepts - Capital investments - Generation and Screening of Project Ideas - Project identification Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Prefeasibility Report and its Clearance, Project Estimates and Techno - Economic Feasibility Report, Detailed Project Report.

UNIT 4 NETWORK ANALYSIS 11 Hrs.

Introduction - Basic concepts of network analysis - CPM and PERT - Use of CPM and PERT Techniques Problems, and prospects and applications of CPM and PERT - Crashing and Time/Cost Trade-off problems.

UNIT 5 SOFTWARE APPLICATIONS IN CONSTRUCTION MANAGEMENT 10 Hrs.

Scheduling, controlling and monitoring techniques - Software - MS project and Primavera - Simulation - Monte Carlo schedule problem - application of spreadsheet in simulation model - ERP systems - Database Information System - organizing information in database - application of MS access.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Prasanna Chandra, "Projects - Planning, Analysis, Selection, Implementation Review", Tata McGraw Hill Publishing Company Ltd., New Delhi, 8th Edition, 2014.
2. Kumar Neeraj Jha, "Construction Project Management: Theory and Practice", Pearson India, first edition, 2011.
3. Chitkara, K.K., "Construction Project Management", Tata McGraw Hill Publishing Co, Ltd., New Delhi, 2014.
4. Punmia B.C., "Project Planning and Control with PERT and CPM", Laxmi Publications, New Delhi, 4th Edition, 2011.
5. Srivastava, "Construction Planning & Management", Galgotia Publications, 3rd Edition, 2013.
6. Frederick Gould and Nancy Joyce, "Construction Project Management", Prentice Hall, 4th Edition, 2013.
7. McCarthy, J.F. and, McCarthy, E.J., "Construction Project Management - A Managerial Approach", Pareto, 1st Edition, 2011.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

80 Marks

SCI1601	AIR AND NOISE POLLUTION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To provide an awareness and importance of air and noise pollution for the students.

Course Outcomes

On the end of the course, student will be able to;

- CO 1 - Describe the sources and Classification of Air Pollutants with their characteristics.
- CO 2 - Categorize the Effects of Air pollution on human beings, animals, vegetation and Materials
- CO 3 - Distinguish and analyze the plume behavior and atmospheric diffusion theories.
- CO 4 - Apply the principles in removal of pollution in the form of particulate matter and gaseous matter.
- CO 5 - State their quality standards, legislation and enforcement.
- CO 6 - Understand the monitoring techniques, practice control of noise pollution at source level with legislation and enforcement.

UNIT 1 SOURCES AND EFFECTS OF AIR POLLUTANTS

9 Hrs.

Classification of Air Pollutants - Sources of Air pollution - Effects of Air pollution on human beings, animals, vegetation and Materials - Indoor Air Pollutants - Sampling and Analysis - Basic Principles of sampling - Analysis of pollutants - Principles.

UNIT 2 AIR POLLUTION METROLOGY

9 Hrs.

Elements of atmosphere - Wind Velocity - Wind Roses - Lapse rate - Atmospheric Stability - Inversions Mixing Height - Plume behaviour - Plume rise - Atmospheric diffusion theories - Gaussian Diffusion Model.

UNIT 3 AIR POLLUTION CONTROL

9 Hrs.

Principles of removal of particles - Principle - Selection criteria for equipment for particulate pollutants Principles of removal of gaseous constituents - Absorption, Adsorption, Catalytic Oxidation, Combustion Gravitational Settling chambers - Cyclone Separators - Fabric Filters - Electrostatic precipitators - Bag houses- Centrifugal spray scrubbers - Venturi scrubbers.

UNIT 4 AIR QUALITY MANAGEMENT

9 Hrs.

Air quality standards - Air quality monitoring - Air Pollution indices - Preventive measures - Air Pollution Control efforts - Zoning - Town Planning - Regulation for new Industries - Legislation and Enforcement Environmental Impact Assessment and Air quality.

UNIT 5 NOISE POLLUTION

9 Hrs.

Source of Noise pollution - Units and Measurement - Standards - Effects - monitoring Technique - Measures of Prevention and Control - Control legislation and standards.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Rao C.S., "Environmental Pollution Control Engineering", New Age International editors and publishers, 2003.
2. Rao M.N. and Rao H.V.N., "Air Pollution Control", Tata McGraw Hill, 1991
3. S.P. Singal, "Air Quality Monitoring and Control Strategy". Narosa Publishing House Pvt. Ltd. 2012.
4. Stern A.C., "Air Pollution", Academic Press, Vol. I and III, 1977.
5. Peavy H.S., Rowe D.R., and Tchobanoglous G., "Environmental Engineering", Tata McGraw Hill, Newyork, 1985.
6. Cunniff P.F., "Environmental Noise Pollution", John Wiley & Sons, 1977.
7. Anjaneyalu Y, "Air Pollution and Control Technologies", Allied Publishers, 2002.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1602	GROUNDWATER ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To know the types of aquifers .To understand the surface and subsurface investigation in detail .To integrate the fundamental and basic knowledge of ground water movement. To introduce the different model studies.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO1 - Understand the porous medium properties that control groundwater flow and transport, including porosity, hydraulic conductivity, and permeability.
- CO 2 - Apply groundwater flow equations to confined and unconfined aquifers.
- CO 3 - Analyze pump test data to determine aquifer properties.
- CO 4 - Design of well based on aquifer properties.
- CO 5 - To Understand the Importance of Artificial Recharge and Groundwater Quality Concepts.
- CO 6 - Students will able to understand Importance of Ground water management and Modeling of ground water flow.

UNIT 1 HYDROGEOLOGICAL PARAMETERS 10 Hrs.

Introduction - [Water bearing Properties of Rock](#) - Properties of aquifer - Transmissivity and storage coefficient - Problems in Specific yield - specific capacity -Darcy's law and permeability - Methods of Estimation - Ground water table fluctuation and its interpretations - Type of aquifers - Groundwater development and Potential in India - groundwater legislation, GEC norms.

UNIT 2 EVALUATION OF AQUIFER PROPERTIES 10 Hrs.

Darcy's equation - [governing equation of ground water flow](#) - steady and unsteady flow equations for confined and unconfined aquifer - water table aquifer - Dupit Forchheimer assumption - one dimensional flow - [well hydraulics](#) - hydrogeological boundaries - concept of image - image well - well theory - interference of wells - partial penetration of well.

UNIT 3 GROUNDWATER HYDRAULICS AND EXPLORATION 8 Hrs.

Geological methods - Geophysical - electrical resistivity - seismic refraction - water wells classification - drilling of deep wells - well design, [construction and maintenance](#) - well development. [Pumping test analysis](#) - well characteristics - draw down test - Tracer tests.

UNIT 4 GROUNDWATER QUALITY AND MOVEMENT 9 Hrs.

[Ground water chemistry](#) - Origin, movement and quality - Water quality standards - Remediation of saline intrusion - Remediation schemes - [Artificial recharge techniques](#) - Ground water Pollution and legislation.

UNIT 5 GROUNDWATER MANAGEMENT 8 Hrs.

[Need for management model](#) - database for groundwater management - protection zone delineation groundwater balance. Introduction to groundwater model - Types, model formulation, and boundary conditions - case study.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Todd D. K., "Ground water hydrology", John Wiley & Sons, 3rd Edition , 2005
2. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
3. Bouwer H., "Groundwater Hydrology", Tata Mc Graw Hill, Company Ltd, Indian Edition 1978
4. Health R. C. and Trainer F.W., "Introduction of Ground water Hydrology", John Wiley and sons, 1985.
5. Fitts R. Charles, "Groundwater Science". Elsevier, Academic Press, 2002.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

80

Marks 60% Theory & 40% Problematic Questions may be asked

SCI1603	SOLID WASTE MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To provide an idea, method and management for handling, transporting, reuse of solid waste.

Course Outcomes

It is intended that at the completion of this course, each student should be able

- CO 1 - To Define the Solid Waste Management and its importance for the protection of environment as well as for the benefit of public health.
- CO 2 - To understand the characteristics of solid wastes.
- CO 3 - To Identify routes of entry of different solid waste sources
- CO 4 - To be able to understand the implications of the production, resource management and environmental impact of solid waste management
- CO 5 - To Understand modern treatment technologies and regulations as well as sustainability of the chosen technology
- CO 6 - To Create safe technical solutions for solid waste management.

UNIT 1 INTRODUCTION

10 Hrs.

Need for solid waste management - solid waste generation (municipal & hazardous)- Quantity - Factors affecting generation of solid waste; Characteristics - **Methods of sampling and characterisation** - Effects of improper disposal of solid waste - Green House gases emission from solid wastes, Public health effects, Public awareness; **Salient features of Indian legislations on management & Role of NGOs.**

UNIT 2 ON-SITE STORAGE & PROCESSING

8 Hrs.

Solid waste segregation at source & On-site - On-site storage methods - Materials used for containers -Public health and economic aspects of storage - Options under Indian conditions - Critical Evaluation of Options.

UNIT 3 COLLECTION AND TRANSFER

9 Hrs.

Selection of collection points & routes - Collection methods - Types of vehicles - Manpower requirement- Transfer stations - **Selection of location, operation and maintenance** - Transportation Procedures - Options under Indian conditions.

UNIT 4 OFF-SITE PROCESSING

9 Hrs.

Processing techniques and Equipments, Segregation - Resource recovery from solid waste - Biogas Generation - Pyrolysis, Incineration - Options under Indian conditions - Methods of composting - Vermicomposting.

UNIT 5 DISPOSAL METHODS

9 Hrs.

Open dumping - Ocean disposal with Treatment - Classification, types and methods - **Site selection for disposal** - Design of Secured landfills, Design of Leachate collection and treatment methods - **management of biomedical waste.**

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. George Tchobanoglous et. al., "Integrated Solid Waste Management", Tata McGraw Hill Publishers, 1993.
2. Bilitewski B., HardHe G., Marek K., Weissbach A. and Boeddicker H., "Waste Management", Springer, 1994.
3. "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000.
4. Sasi Kumar K., "Solid Waste Management", PHI publishers, 2009.
5. Ramachandran T.V, "Management of Municipal Solid Waste", Teri Publishers, 2009.
6. Jayarama Reddy P., "Municipal Solid Waste Management : Processing - Energy Recovery - Global Examples", CRC press, 2011.
7. Landreth R.E. and Rebers P.A, "Municipal Solid Wastes - Problems and Solutions", Lewis Publishers, 1997.
8. Bhide A.D. and Sundaresan B.B, "Solid Waste Management in Developing Countries", INSDOC, 1993.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80 Marks

SCI1609	TRAFFIC ENGINEERING	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To give an overview of Traffic engineering, various surveys to be conducted, traffic regulation, management and traffic safety.

Course Outcomes

On the end of the course, student will be able to:

- Remembering - Define traffic engineering and planning, traffic problems and forecasting.
- Understand - Determine the characteristics of traffic and its components by studying traffic surveys.
- Apply - Examine the traffic regulatory measures and categorize various types of intersections.
- Analysis - Integrate human and vehicle factors on causes of road accidents.
- Evaluate - Assess the road user safety and the elements of safety audit.
- Create - Develop intelligence in traffic system management and demand management measures with case studies.

UNIT 1 INTRODUCTION

9 Hrs.

Significance and scope of Traffic Engineering - Components of Traffic Engineering - Organizational Structure of Traffic Engineering Department - Traffic Characteristics: Vehicles, Road User and Road -- Land Use Characteristics - Fundamentals of Traffic Flow - [Traffic forecasting](#), Need, Methods and limitations - [Traffic problems in India](#).

UNIT 2 TRAFFIC SURVEYS

11 Hrs.

Types of [traffic Survey](#) speed, journey time and delay surveys - Volume count Survey - Origin and Destination Survey - Parking Survey - Photographic Techniques - Capacity Studies - Statistical applications in traffic studies Level of Services - Concept, application and significance.

UNIT 3 TRAFFIC CONTROL MEASURES

9 Hrs.

Traffic signs - Road marking - Traffic signals - Design of Traffic signal and Signal Co-ordination Channelization - [Principles and Elements of Intersection Design](#) - Types and layout of at-grade and grade separated intersections - Conflicts at Intersections - Design of Rotary intersection - Criteria for recommending Grade Separated Intersection - Miscellaneous Traffic control Aids - Street Furniture - Design of parking facility - Demonstration of Signal design software.

UNIT 4 TRAFFIC SAFETY

8 Hrs.

Accident Studies - Causes of Road accidents - Human factors - Vehicles - Road and its condition Environmental Studies - Street lighting - Accident Analysis - Safety Measures - Need for Safety Audit - Concept and Elements of Safety Audit - Safety Audit for existing roads.

UNIT 5 TRAFFIC MANAGEMENT

8 Hrs.

Scope of Traffic Management Measures - One way street system, exclusive traffic lanes, tidal flow operation, staggering of work hours and road pricing, Cycle tracks and Exclusive bus lanes - [Traffic System Management \(TSM\) and Travel Demand Management \(TDM\)](#) -- Introduction to Intelligence Transport System (ITS), RTS (BRTS and MRTS) - Principles of ATIS - Introduction to Software Applications in Traffic Engineering - Case studies.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Kadiyali L.R., "Traffic Engineering and Transport Planning", 7th Edition, Khanna Technical Publications, 2011.
2. Khanna K and Justo C.E.G., "Highway Engineering", 10th Edition, Khanna Publishers, 2014.
3. Hobbs F.D. and Richardson P.R. "Traffic Engineering", Pergamon Press, Vol. I and II, 1997.
4. Guidelines of Ministry of Road Transport and Highways, Government of India, 2001.
5. Indian Roads Congress: "Guidelines and special publications on Traffic Planning and Management", IRC: 102 - 1988
6. Bindra S.P., "A course in Highway Engineering", Dhanpat Rai & Sons, 2001.
7. Subhash Saxena, "A Course in Traffic Planning and Design", 7th Edition, Dhanpat Rai Publications, 2009.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 Questions from each unit with internal choice, each carrying 12 marks

80

Marks 90 % Theory & 10% Problematic Questions may be asked

SCI1610	HIGHWAY PAVEMENT DESIGN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To gain knowledge on various IRC guidelines for designing rigid and flexible pavements and also to have the awareness in assessing quality and serviceability conditions of roads.

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Understand the principles of pavement design
- CO 2 - Identify the pavement components and design bituminous mixes of Flexible pavement
- CO 3 - Understand the design procedure and stress computation in Rigid Pavement
- CO 4 - Evaluate the structural condition of Pavement
- CO 5 - Learn the Systematic approach of maintenance of Pavements, Bridges or Road Structures

UNIT 1 PRINCIPLES OF PAVEMENT DESIGN 9 Hrs.

Components of a road - function - Factors affecting pavement stability - Equivalent single wheel load - load Calculation - vehicle and traffic vectors - moisture factors - climatic factors - soil stability - stress distribution in different condition - remedies.

UNIT 2 FLEXIBLE PAVEMENT DESIGN 11 Hrs.

Bitumen characteristics - Test in bitumen - Aggregate gradation - principles of bituminous mix design - IRC Asphalt Institute method - AASTHO - Burmister method - Super - pave mix design - construction of Flexible pavement, defects and maintenance - Demonstration of Pavement Design Software.

UNIT 3 RIGID PAVEMENT DESIGN 9 Hrs.

Stress in Concrete Pavements - IRC Method - Design of Steel Reinforced - Design of Different Joints in Concrete Pavements and their Function - Construction of Concrete Pavements and their Maintenance.

UNIT 4 PAVEMENT EVALUATION AND STRENGTHENING 9 Hrs.

Structural Evaluation of Flexible & Rigid Pavement - Distresses in flexible & rigid pavements - Serviceability index - Evaluation by deflection measurements - Strengthening of pavements - Flexible overlays - Rigid overlays Demonstration of Evaluation Procedures.

UNIT 5 HIGHWAY MAINTENANCE 7 Hrs.

Strengthening of Shoulders and Drainage System in flexible and rigid pavements - Maintenance of Bridges and Road Structures - Pavement Management System.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. Kadiyali L.R "Principles and practices of Highway Engineering" 4th Edition, Khanna Publishers, 2005.
2. Khanna S.K and Justo C.E.G, Highway Engineering, 8th Edition, Nemchand brothers, Roorkee, 2003.
3. IRC: 37 - 2002, "Guidelines for the Design of Flexible Pavements", The Indian Roads Congress.
4. IRC: 58-1998, "Guideline for the Design of Rigid Pavements for Highways", The Indian Roads Congress, New Delhi.
5. Yoder R.J and Witczak M.W., "Principles of Pavement Design", John Wiley, 1975.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks

80 Marks

SCI1614	QUALITY CONTROL AND SAFETY MANAGEMENT	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVE

To study the concept of quality, assurance and control techniques in construction. To study and understand the various safety concepts and requirements applicable to construction projects.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understand the concept of quality control and safety management
- CO 2 - Aware of the codal provisions of ISO 9000, IS 9001 and 9004
- CO 3 - Apply Quality Management system in construction projects
- CO 4 - Differentiate between quality assurance and quality control
- CO 5 - Analyze the critical and major failure modes and accidents
- CO 6 - Implement safety provisions in construction projects.

UNIT 1 CONSTRUCTION ORGANIZATION 9 Hrs.

Introduction - Definitions and Objectives - Types of organizations - Inspection. control and enforcement Quality Management Systems and method - Responsibilities and authorities In quality assurances and quality Control - Architects, engineers, contractors, and special consultants, Quality circle.

UNIT 2 QUALITY POLICY 9 Hrs.

Quality policy - Objectives and methods in Construction Industry - Consumers satisfaction, Economics - Time of Completion - Statistical tolerance - Taguchi's concept of quality - Codes and Standards - Documents - Contract and construction programming - Inspection procedures - Processes and products - Total QA / QC program and cost implication.

UNIT 3 QUALITY ASSURANCE AND QUALITY CONTROL 9 Hrs.

Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors Influencing construction quality.

UNIT 4 SAFETY AND FAILURE ASPECT IN CONSTRUCTION 9 Hrs.

Critical, major failure aspects and failure mode analysis - Stability methods and tools. Construction Accidents - Injury and Accidents. Definitions - Unsafe Acts - Unsafe Condition - Causes, Investigations and Prevention Of Accidents, Hazards, Type Of Industrial Hazards - Natural, causes and control measures, Hazard identifications and control techniques - HAZOP, FMEA, FMECA - Cost of Construction Injuries - Legal Implications Compensation - basics and types.

UNIT 5 SAFETY MANAGEMENT IN CONSTRUCTION 9 Hrs.

Introduction to the Concept of Safety - Needs - Safety Provisions in the Factory Act - Laws related to the Industrial Safety - Measurement Of Safety Performance, Safety Audit, Problem Areas In Construction Safety Elements of an Effective and Safety Programme - Job site Safety assessment - Safety Meetings - Safety Incentives.

Max. 45 Hours

TEXT / REFERENCE BOOKS

1. James Jerone o'Brien. "Construction Inspection Handbook - Total Quality Control", Chapman & Hall, New York 1997.
2. Kwaku A., Tenah and Jose M. Guevera, "Fundamental of Construction Management and Organization", Prentice Hall of India, 1995.
3. Richard J. Cobel, Jimmie Hinze and Theo C. Haupt, "Construction Safety and Health Management", Prentice Hall Inc., 2001.
4. Juran Frank, J.M. and Gryna, F.M. "Quality planning and Analysis", Tata McGraw Hill, 1993.
5. Hutchins. G., "ISO 9000", Viva Books, New Delhi, 1993.

END SEMESTER EXAM QUESTION PAPER PATTERN

Max. Marks : 100

Exam Duration : 3 Hrs.

PART A : 10 questions of 2 marks each - No choice

20 Marks

PART B : 2 questions from each unit of internal choice, each carrying 12 marks .

80 Marks

SPR1307	RESOURCE MANAGEMENT TECHNIQUES (Common to Mech, M&P, Aero & Auto)	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OUTCOMES:

On completion of the course, student will be able to

- CO1: Conduct an investigation on the given decision making problem using linear programming problem techniques to obtain the optimum solution.
- CO2: Allocate the resources optimally for the given problem by formulating the transportation and assignment matrix.
- CO3: Recommend the critical path and the associated time-cost tradeoffs for a specific project case study through CPM and PERT methods.
- CO4: Predict the economic order quantity by considering the associated costs in purchase/ manufacturing using inventory models.
- CO5: Determine the queuing time for the stated Poisson arrivals and exponential service queuing problem.
- CO6: Predict the replacement time for the stated individual/ group policies.

UNIT 1 INTRODUCTION AND LINEAR PROGRAMMING**9 Hrs.**

Operations Research(OR)-Nature-Characteristics-Phases.-Role of OR in Decision making- Outline of OR Models **Linear Programming – Formulation of L.P.problems –Solution by graphical method, simplex method,** Two Phase Method, Big M methods, Dual Simplex method

UNIT 2 TRANSPORTATION AND ASSIGNMENT MODEL**9 Hrs.**

Transportation problem – Initial Basic feasible solution- Northwest corner method, Least Cost method, Vogel's approximation method – **Test for optimality-MODI method.** Assignment problems- Hungarian assignment models- Travelling salesman problems

UNIT 3 RESOURCE SCHEDULING AND NETWORK ANALYSIS**9 Hrs.**

Problem of Sequencing – Problem with N jobs and 2 machines N Jobs 3 machines N Jobs and m machines and 2 Jobs m machines (Graphical method). Project Management -Basic concepts–Network construction and scheduling **Critical Path Method (CPM) & Program evaluation review technique (PERT) and resource leveling by network techniques,** time – Cost trade off.

UNIT 4 INVENTORY CONTROL**9 Hrs.**

Inventory Control – Various Types of inventory models – deterministic inventory models – Production model, Purchase model– with and without shortage- Economic Order Quantity (EOQ) – Buffer stock – Shortage quantity, Probabilistic inventory models – Quantity Discount and Price Breaks

UNIT 5 QUEUEING THEORY AND REPLACEMENT MODELS**9 Hrs.**

Queueing theory – Poisson arrivals and exponential service times, Single channel models only, Replacement policy for items whose maintenance cost increases with time- Consideration of time value of money - Replacement policy- Individual, Group replacement of items that fail completely and suddenly.

Max.45 Hrs.**TEXT / REFERENCE BOOKS**

1. Panneerselvam R, "Operations research", 2nd Edition, Prentice Hall, 2001.
2. Sharma S D, "Operation research Theory, Methods and Application", 17th Edition, Kedar Nath Ram Nath Publication, 2010.
3. Nita H Shah, Ravi M Gor & Hardik Soni, "Operation research", 4th Edition, PHI, 2010.
4. Hamdy A.Taha, " Operation Research", 8th Edition, PHI, 2008
5. Hiller & Liberman., Introduction to Operations Research, 5th Edition, McGraw Hill, 2001
6. Ravindran, Phillips & Solberg, "Operations Research: principles and practice", 2nd Edition, Wiley India Ltd, 2007
7. Ronald L. Rardin, " Optimization in Operations Research", Prentice Hall, 1998

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 2 Questions each from CO1-CO4, 1 question each from CO5 and CO6 – No choice**20 Marks****PART B:** 4 Questions each with internal choice from CO1-CO4, 1 question from CO5 and CO6 with internal choice, each carrying 16 marks**80 Marks**

SCI4052	MATERIAL TESTING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To study the properties of materials when subjected to different types of loading, to develop knowledge of conventional and new materials of construction.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Gain knowledge in properties of materials
- CO2 - Gain knowledge in components of structural elements

SUGGESTED LIST OF EXPERIMENTS

1. By conducting tension test, draw the stress-strain curve on mild steel, thin wire and twisted rod.
2. Compression Test on bricks and Concrete blocks.
3. Deflection Test - Verification of Maxwell theorem
4. Determination of hardness values of Steel, Copper and Aluminum by using Brinell and Rockwell hardness testing machines.
5. Test on springs under tension and compression.
6. Estimation of notch toughness of steel by using a Charpy/Izod impact testing machine.
7. Shear test on metal specimen by using U.T.M.
8. Hardness values of Steel, Copper and Aluminum by Vicker's hardness tester.

SCI4053	SURVEYING LAB I	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To understand the method of using surveying instrument for various civil engineering purpose.

Course Outcomes

On the end of the course, student will be able to:

- CO1 - Find out the area of land and the obstacle length using suitable survey equipment.
- CO2 - Determine the area of large size land using suitable survey equipment.
- CO3 - Test the levels of various points with respect to a given mean sea level.
- CO4 - Compare the various methods of setting out of a simple curve.
- CO5 - Select your suitable location using two or three well defined points to proceed with your land survey.
- CO6 - Develop a plan of the longitudinal section and cross sections at uniform distance along a road.

SUGGESTED LIST OF EXPERIMENTS

A) Chain Surveying

1. (a) Determination of Area by taking Perpendicular Offsets
(b) Determination of Area by taking Oblique Offsets
2. Determination of Obstacle Length

B) Compass Surveying

1. Compass traverse - Plotting and Adjustments of Traverse and Distance between Two Inaccessible Points

C) Plane Table Surveying

1. (a) Radiation method of plane table survey
(b) Intersection method of plane table survey
2. Two Point Problem and Three Points Problem - Trial and error method

D) Leveling

1. Simple Leveling (Including an inverted staff reading)
2. Longitudinal sectioning and Cross Sectioning

E) Theodolite Method

1. Setting out simple curve using offsets from long chord
2. Setting out simple curve using Single Theodolite method (Rankine's Method)
3. Setting out simple curve using Double Theodolite method

SCI4055	SURVEYING LAB II	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To understand the various Angular measurements, with modern equipment operation.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understand the basic horizontal and vertical measurements by single plane method and double plane method.
- CO 2 - Determining the various height of an object by stadia tacheometry with horizontal, elevated and depression method with various level in hilly regions and forming the contour levels.
- CO 3 - Understanding the basic element of total station and finding out the horizontal and vertical Measurements, slopes, traverse and distance with given location using total station.
- CO 4 - Understanding the basic of GPS and locating the various points on the ground.
- CO 5 - Studying the movement of sun path with total station by azimuth calculation

SUGGESTED LIST OF EXPERIMENTS

1. Measurement of vertical angles and determination of height of an object
2. Height and distances - Single plane method
3. Height and distances - Double plane method
4. **Stadia Tachometry(Combination of all three)**
 - (a) when the line of sight is horizontal with staff held vertical
 - (b) when the line of sight is inclined with staff held vertical
 - Angle of elevation
 - Angle of depression
5. **Tangential Tachometry (Combination of all three)**
 - a. when both angles of target are angles of elevation with staff held vertical
 - b. when both angles of target are angles of depression with staff held vertical
 - c. when one angle is that of elevation and the other that of depression, with staff held vertical
6. **Tacheometric contouring - Radial method**
7. **Horizontal and vertical distance using Total Station**
8. **Traversing and area calculation using Total Station**
9. **Slope distance using Total Station**
10. **GPS Surveying - Co-ordinate Measurements**
11. Astronomical survey - Demonstration on Azimuth of a survey line by observations on the sun.

SCI4056	HYDRAULIC ENGINEERING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

Students should be able to verify the principles studied in theory by performing the experiments in lab.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO1 - To provide the students with a solid foundation in fluid flow principles
- CO2 - To provide the students knowledge in calculating performance analysis in turbines and pumps and can be used in power plants
- CO3 - To impart knowledge in measuring pressure, discharge and velocity of fluid flow
- CO4 - Students can able to understand to analyze practical problems in all power plants
- CO5 - Analyze a variety of practical fluid-flow devices and utilize fluid mechanics principles in design
- CO6 - Given the required flow rate and pressure rise, select the proper pump to optimize the pumping efficiency

SUGGESTED LIST OF EXPERIMENTS

A) Flow Measurement

1. Determination of coefficient of flow through Venturimeter
2. Determination of coefficient of flow through Orifice meter
3. Determination of coefficient of flow through Orifice and Mouthpiece -Constant and variable head method.
4. Determination of coefficient of flow through Notches (V notch)

B) Losses in Pipes

1. Determination of friction coefficient in pipes
2. Determination of Manning's and Chezy's coefficients

C) Determination of Metacentric height

1. Determination of Metacentric height of ship model (War ship/ Cargo ship)

D) Pumps

1. Characteristics test on a Reciprocating pump
2. Characteristics test on Centrifugal pump.
3. Characteristics test on multistage Centrifugal pump.
4. Characteristics test on Submersible pump
5. Characteristics test on Gear oil pump

E) Turbines

1. Load test on Pelton wheel turbine
2. Load test on Francis turbine
3. Load test on Kaplan turbine

SCI4057	CONCRETE TECHNOLOGY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To understand and perform various tests on cement, aggregates and concrete.

Course Outcomes

On the end of the course, student will be able to:

- CO 1 - Identify the quality of cement
- CO 2 - Compute the Fineness modulus of fine and coarse aggregate
- CO 3 - Identify the Nature of coarse and Fine aggregate
- CO 4 - Finding the Impact and crushing strength of aggregates
- CO 5 - Know the procedure for concrete mix proportions
- CO 6 - Determine the property of concrete in Fresh and hardened state.

SUGGESTED LIST OF EXPERIMENTS

A) Tests on Cement

1. Standard consistency of cement
2. Initial and final setting time of cement
3. Compressive strength of cement
4. Fineness of cement

B) Tests on Aggregates (Fine Aggregate & Coarse Aggregate)

1. Particle size distribution
2. Fineness modulus, bulk density, void ratio
3. Bulking of fine aggregate
4. Specific gravity of aggregate
5. Impact Value
6. Crushing Strength

C) Tests on Fresh Concrete

1. Mix design
2. Slump test
3. Compaction factor test
4. Flow test

D) Tests on Hardened Concrete

1. Compressive strength of concrete
2. Modulus of elasticity of concrete
3. Flexural and split tensile strength of concrete
4. Rebound hammer test

SCI4058	ENVIRONMENTAL ENGINEERING LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To perform the various test on water and waste water sample.

Course Outcomes

It is intended that at the completion of this course, each student should be able

- CO 1 - To Determine physical, chemical and biological characteristics of water and wastewater .
- CO 2 - To Determine optimum dosage of coagulant.
- CO 3 - To analyze the survival conditions for the microorganism and its growth rate.
- CO 4 - To assess the quality of water and wastewater.
- CO 5 - To recommend the degree of treatment required for the water and wastewater.
- CO 6 - To characterize wastewater and conduct treatability studies.

SUGGESTED LIST OF EXPERIMENTS

1. Determination of pH
2. Determination of Conductivity
3. Determination of Alkalinity
4. Determination of Chlorides (Mohr's method)
5. Determination of Hardness (EDTA method)
6. Determination of Turbidity (NTU)
7. Determination of Total Solids
8. Determination of Total Dissolved Solids
9. Determination of Residual Chlorine
10. Determination of Optimum dosage of Coagulant (Jar Test)
11. Determination of Dissolved Oxygen (Winkler Method)
12. Determination of Biochemical Oxygen Demand (BOD₅)
13. Determination of Chemical Oxygen Demand (COD)
14. Determination of Total Organic Carbon (TOC)

SCI4059	SOIL MECHANICS LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To provide exposures to students on the advanced theories and procedures in performing standard laboratory and field tests for soil for various civil engineering purposes, to acquire the understanding of basic physical and mechanical properties of soil and also the necessary skill in performing standard laboratory and field tests.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understand the concept of basic properties of soil like specific gravity, particle size distribution, field density.
- CO 2 - Acquire basic knowledge about the Atterberg limits and field density methods.
- CO 3 - To learn about other engineering properties like permeability, compressibility
- CO 4 - To gain skills in doing shear tests on soil like direct, triaxial, unconfined and vane shear tests.

SUGGESTED LIST OF EXPERIMENTS

1. Determination of Specific gravity of soil
2. Determination of Sieve analysis for Coarse-grained soil
3. Determination of Hydrometer analysis for Fine-grained soil
4. Determination of Liquid Limit and Plastic limit
5. Determination of Shrinkage limit
6. Determination of Standard Proctor Compaction test
7. Determination of Field density of soil by Core Cutter method
8. Determination of Field density of soil by Sand Replacement method
9. Determination of permeability of soil by constant head method
10. Determination of permeability of soil by variable head method
11. Determination of compressibility characteristics
12. Determination of shear parameter by Direct Shear test on sand
13. Determination of shear parameter by Unconfined Compression test for cohesive soil
14. Determination of shear parameter by Triaxial Compression test for cohesive soil
15. Determination of shear parameter by Vane shear test.

SCI4060	HIGHWAY LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

To give the students to hands on experience on the various testing procedures of pavement materials as per the IRC standards.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Assess the quality of aggregates used in the road construction
- CO2 - Interpret the test results with the recommended values for predicting the characteristics of bitumen
- CO3 - Understand the method adopted to determine the optimum bitumen content in Bituminous mix
- CO4 - Learn the procedure to test the bearing capacity of subgrade soil
- CO5 - Understand the structural evaluation technique used to envisage the deflection of existing pavement

SUGGESTED LIST OF EXPERIMENTS

A) Test on Aggregate

1. Shape test
2. Los Angeles Abrasion test

B) Test on Bitumen

1. Penetration Test on Bitumen
2. Ductility test on bitumen
3. Softening point test on bitumen / tar
4. Flash and fire point test on bitumen - tar bitumen
5. Specific gravity test
6. Viscosity test on tar
7. Marshall Stability Test for bitumen with design consideration
8. Bitumen content in bituminous mix using centrifuge extractor
9. Stripping test

C) Test on Subgrade Soil

1. California Bearing Ratio Test

D) Test on Pavement Evaluation

1. Benkelman Beam Method
2. Merlin
3. Bump Integrator

SCI4061	COMPUTER AIDED DESIGN AND DRAFTING LABI	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

The overall idea of implementing a computer aided design drawings using Software tools and to learn about E-TABS, Rivet, ARCGIS, MAP INFO, SWAT, AND VISUAL MODFLOW, plumbing software's.

COURSE OUTCOME

On the end of the course, student will be able to:

- CO 1 - Understands the concept of drawing of buildings using AutoCAD commands.
- CO 2 - Explores basic knowledge about the function keys, shortcut keys and commands to draw the sketches in software.
- CO 3 - To learn about other software like E-TABS, Rivet, ARCGIS, MAP INFO, SWAT, AND VISUAL MODFLOW manually.
- CO 4 - Upgrading on the other software available in the market for enhancing their wide knowledge.

SUGGESTED LIST OF DRAWINGS USING AUTOCAD SOFTWARE

1. Section of Arches
2. Section of load bearing wall From parapet to foundation partly showing all the details across the section (single storey)
3. Section of Spread Footing Foundation
4. Elevation of door partly paneled & Partly glazed
5. Section of Lean - To - Roof
6. Plan, Section and Elevation Of Canteen Building
7. Plan of single bed roomed R.C.C Roof
8. Plan of single bed roomed R.C.C Curved roof
9. To fix the drawing in the standard size of the paper
10. Plotting drawing
11. Demonstration of Application Software - E-TABS, Rivet, ARCGIS, MAP INFO, SWAT, AND VISUAL MODFLOW, plumbing software's

SCI4062	COMPUTER AIDED DESIGN AND DRAFTING LAB II	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVE

The overall idea of implementing a computer aided design drawings using Software tools, to learn about design using Staad-Pro Software.

Course Outcomes

On the end of the course, student will be able to:

- Draft the detailing of various reinforced concrete elements using AUTOCAD software.
- Apply dead, live and wind loads on the structure using the software.
- Incorporate design parameters from Indian Standard Codes into Staadpro
- Analyze the reinforced concrete as well as steel structures using Staad.pro software.
- Design the reinforced concrete as well as steel structures using Staad.pro software.
- Generate various reports from the software.

SUGGESTED LIST OF EXERCISES

A) AutoCADD

Introduction to AutoCADD Commands

1. Foundation Reinforcement Detailing
2. Pile Foundation Reinforcement Detailing
3. Pile Cap Reinforcement Detailing
4. Longitudinal Section of RCC Beam Reinforcement Detailing
5. Slab Reinforcement Detailing - flatslab
6. Beam column joints -detailing
7. Staircase Reinforcement Detailing

B) STAAD.Pro

Introduction to STAAD - Pro., STAAD - Pre creation of input files by using the Text Editor and Graphical input Generator, STAAD - Post Graphical Post processing, Viewing and Printing the output files

1. Analysis and Design of Continuous beam with fixed at both ends
2. Analysis and Design of Continuous beam with simply supported ends
3. Analysis and Design of Continuous beam with over hangings
4. Analysis and Design of Propped cantilever beam with different materials
5. Analysis and Design of Continuous beam with member moment
6. Analysis and Design of Plane frames
 - (a) Analysis and Design of Portal Frame type I
 - (b) Analysis and Design of Portal Frame type II
 - (c) Analysis and Design of Portal Frame type III
 - (d) Analysis and Design of Portal Frame type IV
 - (e) Analysis and Design of Portal Frame type V
7. Analysis and Design of Trusses
8. Analysis and Design of Reinforced Concrete Building (G+2)
9. Analysis and Design of Steel Building (G+2)

SCIX1021	CONCRETE TECHNOLOGY	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT I CONCRETE MAKING MATERIALS**10 hrs.**

Cement – Manufacture – Types of cement – OPC, PPC, GBFSC – Grades of Cement, 33,43 & 53 – Hydration process – Aggregates – Classification – Sources – Bulking of sand – Measurement of moisture content – Thermal properties – Qualities of water for concreting.

UNIT II PROPERTIES OF CONCRETE**10 hrs.**

Fresh concrete – Workability – Factors affecting workability – Measurement of workability – Segregation – Bleeding – Concrete manufacturing – Convention – Ready mix and Advantage of Ready mix – Finishing. Compaction – Curing – Strength of concrete – Elasticity – Creep – Shrinkage – Durability of concrete – Factors affecting strength of concrete and Durability of concrete – Cracks in concrete – Chemical attacks carbonation.

UNIT III ADMIXTURES**10 hrs.**

Chemical admixtures – Mineral admixtures – Plasticizers – Retarders – Accelerators – Air Entraining admixtures – Construction chemicals – Water proofing – Colouring agents – Workability agents

UNIT IV CONCRETE TESTING**10 hrs.**

Tests of cement, Fine aggregate, Coarse aggregate and Quality control at batching plant and Quality control at site – Water-Fresh concrete testing – Hardened concrete testing – Durability testing – Maturity of concrete

UNIT V SPECIAL CONCRETE**10 hrs.**

Light weight concrete – High density concrete – Self compacting concrete – High pressure concrete – No fines concrete – Hot weather concreting, Under water converting – Heavy weather concreting – Vacuum concrete – Fibre-reinforced concrete, Ferro cement – Polymer concrete, High strength and High performance concrete – Shotcrete process

TEXT BOOKS:

1. Shetty M.S., "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003.
2. Neville. A.M., "Properties of Concrete", Tata McGraw Hill publishers, 2003

REFERENCES:

1. Santhakumar, A.R., "Concrete Technology", Oxford University Press, New Delhi, 2007.
2. Ghambir, "Concrete Technology", Tata MC Graw Hill, 2002.
3. Kumar Mehta P and Monteiro "Concrete –Micro structure, properties and materials" Indian concrete institute- First edition-2005.
4. Rafat siddique "Special structural concrete" Galgotia Publication, I Edition-2000.
5. Neville. A.M., "Concrete Technology", 2003.

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hours

PART A : 2 Questions from each unit, each carrying 2 marks

20 marks

Part B: 80% Theory & 20% Problematic Questions may be asked

2 Questions from each unit with internal choice, each carrying 12 marks

60 marks

SCIX1025	DESIGN OF STEEL STRUCTURES	L	T	P	Credits	Total Marks
		3	0	0	3	100

UNIT I INTRODUCTION**10 hrs.**

Material properties of steel – Hot Rolled structural steel sections and their properties – General design requirements – Limit state design concepts – Loads on structures – Local buckling and classification of sections.

UNIT II CONNECTIONS**10 hrs.**

Types of connections – Riveted, Bolted and Welded connections – Failure modes of bolts – Design of ordinary and high strength friction grip bolts – Types of welded connections and failure modes – Design of welded connections – Eccentric connections – Efficiency of joints.

UNIT III DESIGN OF TENSION MEMBERS**10 hrs.**

Types of Tension members – Net area – Net effective sections – concept of shear lag – Design strength of simple and compound members – Use of lug angles – Design of tension splices.

UNIT IV DESIGN OF COMPRESSION MEMBERS**10 hrs.**

Types of compression members – Theory of columns – Column curves – Effective length of compression members – Slenderness ratio – Design of simple and compound section compression members – Design of lacing and battened types of columns – Design of column bases and column splicing.

UNIT V DESIGN OF MEMBERS SUBJECTED TO BENDING**10 hrs.**

Effective span of beams – Design strength in bending – Laterally supported beams – Laterally unsupported beams – Effective length for lateral torsional buckling – Design for shear – Web crippling and web buckling – Members subjected to combined forces – Biaxial bending – Purlins and Girts.

TEXT BOOKS:

1. Subramanian N., "Design of Steel Structures", Oxford University Press, 2008.
2. Dayaratnam P., "Design of Steel Structures", A.H. Wheeler & Co. Ltd., Allahabad, 1976.
3. Arya & Ajmani, "Design of Steel Structures", NemChand Brothers, Roorke Dely.

REFERENCES:

1. Punmia B.C., Ashok Kumar Jain & Arun Kumar Jain, "Design of Steel Structures", Vol. I and II, Arihant Publications, Mumbai, 1998.
2. Dowling P.J., Knowles P.R., Owens G.W., "Structural Steel Design", The Steel Construction Institute, Butterworths, London, 1988.
3. IS: 800-2007, "Indian Standard for General Construction in Steel – Code of Practice" (Third Revision).
4. "Teaching Resources for structural Steel Design", Vol 1 & 2, INGDAG, Calcutta.

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hours

PART A : 2 Questions from each unit, each carrying 2 marks

20 marks

PART B: 80% Theory & 20% Problematic Questions may be asked.

2 Questions from each unit with internal choice, each carrying 12 marks

60 marks

SCIX1028	DESIGN & DRAWING (R.C.C. & STEEL)	L	T	P	Credits	Total Marks
		3	0	0	3	100

R.C.C**25 hrs.**

Detailed Design and Drawing of the following Reinforced Concrete Structures

1. Typical Building Floors consisting of Slabs and Beams
2. Isolated and Combined footing
3. Cantilever and Counterfort retaining walls
4. Rectangular & Circular Overhead water tanks

STEEL**25 hrs**

Detailed design and drawing of the following steel structures

1. Rectangular and circular overhead steel tank
2. Design of steel chimneys
3. Gantry Girder
4. Steel roof truss

TEXT BOOKS:

1. Krishnaraju N., "Design and Drawing", CBS Publishers and Distributors, 2nd edition, 2004.
2. Krishnamurthy D., "Structural Design and Drawing", Volume I,II and III, CBS Publishers and Distributors, 1st edition, 1985.

REFERENCES:

1. Ramachandra, "Design of Steel Structures", Volume I and II, Rajinder kumar jain Publications, 7th edition, 2006.
2. Duggal S.K., "Design of Steel Structure", Tata McGraw Hill Publishing company limited, 2nd edition, 2000.
3. Ramamrutham S. and Narayan R., "Design of R.C. Structures" K K Kapur Publications, 15th edition, 2002.
4. Negi L.S., "Design of Steel Structures", Tata McGraw Hill Publishing company limited, 2nd edition, 1986.

UNIVERSITY EXAM QUESTION PAPER PATTERN

Max. Marks: 80

Exam Duration: 3 Hours

PART A : 2 Questions from each unit, each carrying 2 marks

20 marks

PART B :100% Design & Drawing question may be asked

2 Questions from each unit with internal choice, each carrying 12 marks

60 marks