

COURSE OBJECTIVES

- To prepare assembly drawings both manually and using standard CAD packages
- To familiarize the students with Indian Standards on drawing practices and standard components
- To gain practical experience in handling 2D drafting and 3D modeling software systems.
- To make the students understand and interpret drawings of machine components.

List of Exercises using software capable of Drafting

1. Study of capabilities of software for Drafting and Modeling -
Coordinate systems (absolute, relative, polar, etc.) - Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, ellipse, hyperbola spiral, involute using B-Spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixer, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3D model.
11. Development of prism, pyramid, cylinder, cone, etc, in 2-Dimensional

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

TOTAL: 30 PERIODS

COURSE OUTCOMES

At the end of the course the student will be able to

- Develop competency in basic drafting, enabling them to pursue careers in engineering, professional arenas, or to further their academic pursuits.
- Follow the drawing standards, Fits and Tolerances
- Re-create part drawings, sectional views and assembly drawings as per standards
- Draw 2 D and drawing using CAD software.

CO - PO Mapping

Mapping of Course Outcomes with Programme Outcomes (1/2/3 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes(POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO2	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO3	3	3	3	3	3	1	-	-	-	-	1	1	2	1
CO4	3	3	3	3	3	1	-	-	-	-	1	1	2	1



COURSE OBJECTIVES

- To describe weathering process and mass movements
- To gain knowledge about various properties of minerals and their engineering significance.
- To acquire knowledge of various classification of rocks.
- To interpret the importance of different geological features and their effects.
- To apply the principles of geological investigations in civil engineering structures.

UNIT I PHYSICAL GEOLOGY**9**

Geology in civil engineering – branches of geology; structure of earth and its composition; weathering of rocks – scale of weathering; soils landforms and processes associated with river, wind, groundwater and sea; relevance to civil engineering; Plate tectonics.

UNIT II MINEROLOGY**9**

Physical properties of minerals – Quartz group, Feldspar group; Pyroxene - hypersthene and augite, Amphibole, hornblende; Mica – muscovite and biotite, Calcite, Gypsum and Clay minerals.

UNIT III PETROLOGY**9**

Classification of rocks - distinction between Igneous, Sedimentary and Metamorphic rocks ; Engineering properties of rocks-Description, occurrence, engineering properties, distribution and uses of Granite, Dolerite, Basalt, Sandstone, Limestone, Laterite, Shale, Quartzite, Marble, Slate, Gneiss and Schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD**9**

Geological maps – attitude of beds, study of structures; folds, faults and joints – relevance to civil engineering; Geophysical methods – Seismic and electrical methods for subsurface investigations.

UNIT V GEOLOGICAL INVESTIGATION**9**

Remote sensing for civil engineering applications; Geological conditions necessary for design and construction of Dams, Reservoirs, Tunnels, and Road cuttings; Coastal protection structures; Investigation of Landslides and earthquakes - causes and mitigation ; seismic zonation – seismic zones of India.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- classify the various geological agents and processes involved.
- identify the available minerals by their properties and behavior.
- classify and identify the available rock in the construction site.
- interpret the different geological features and their engineering importance.
- apply the geological concepts in civil engineering projects.

TEXT BOOKS

1. Parbin Singh, "Engineering and General Geology", S.K.Kataria & Sons, 2008.
2. Venkatareddy. D. Engineering Geology, Vikas Publishing House Pvt. Ltd. 2010.

REFERENCES

1. Muthiayya, V.D.(1969), "A Text of Geology", Oxford IBH Publications, Calcutta.
2. Blyth F.G.H. and de Freitas M.H., Geology for Engineers, Edward Arnold, London, 2010.
3. F.G.Bell. Fundamentals of Engineering Geology, B.S. Publications. Hyderabad 2011.
4. Dobrin, M.B An introduction to geophysical prospecting, McGraw-Hill, New Delhi, 1988
5. Varghese, P.C., Engineering Geology for Civil Engineering PHI Learning Private Limited, New Delhi, 2012.
6. Marland P. Billings, "Structural Geology", PHI Learning Pvt. Ltd. New Delhi, 2012

WEB LINKS

1. <http://studentsuvidha.com/forum/Forum-Engineering-Geology-btech-Notes-study-material>
2. <https://www.examrace.com/IES/IES-Free-Study-Material/Civil-Engineering/Engineering-Geology>

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	2	2	-	-	-	-	-	2	-
CO2	2	-	-	2	2	-	-	-	2	-	-	-	2	-
CO3	2	2	1	2	-	-	-	-	2	-	-	-	2	-
CO4	2	2	-	2	2	2	2	2	-	-	2	2	2	-
CO5	-	-	2	2	-	2	2	2	2	-	2	2	2	-



COURSE OBJECTIVES

- To identify the characteristics of various building materials.
- To analyse various materials commonly used in civil engineering construction and their properties
- To gain knowledge about various processes involved in the manufacturing of concrete
- To study the importance and benefits of timber and other products
- To gain knowledge of various modern materials used in construction.

UNIT I STONES – BRICKS – CONCRETE BLOCKS**9**

Stones as building material – Criteria for selection - Test on stones – Deterioration and preservation of stone work; Bricks – Classification – Manufacturing of clay bricks – Test on bricks – Compressive strength – Water Adsorption – Efflorescence – Bricks for special use – Refractory bricks ; Cement Concrete blocks –Light weight concrete blocks.

UNIT II LIME – CEMENT – AGGREGATES – MORTAR**9**

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 – Industrial by products – Fly ash; Aggregates – Natural stone aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading – Sand Bulking.

UNIT III CONCRETE**9**

Concrete – Ingredients – Manufacturing process – Batching plants – RMC – Properties of fresh concrete – Slump – Flow and compaction factor – Properties of hardened concrete – Compressive, Tensile and shear strength – Modulus of rupture - Tests - High strength concrete and HPC – Self compacting concrete – Other types of concrete – Durability of Concrete.

UNIT IV TIMBER AND OTHER MATERIALS**9**

Timber - Market forms – Industrial timber – Plywood –Veneer – Thermacole – Panels of laminates; Steel - Aluminum and Other metallic materials – Composition – Aluminum composite panel – Uses – Market forms - Mechanical treatment; **Paints – Vanishes – Distempers; Bitumen's.**

UNIT V MODERN MATERIALS**9**

Glass – Ceramics – Sealants for joints – Fibre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fibre textiles – Geomembranes and Geotextiles for earth reinforcement.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- identify the various construction materials
- familiarize themselves with the characteristics of basic building materials
- understand the behavior and manufacture of cement and concrete.
- identify the timber materials.
- understand and conserve the modern materials.

TEXT BOOKS

1. Varghese.P.C, “Building Materials”, PHI Learning Pvt. Ltd, New Delhi, 2012.
2. Rajput. R.K., “Engineering Materials”, S. Chand and Company Ltd., 2008.

REFERENCES

1. Jagadish.K.S, “Alternative Building Materials Technology”, New Age International, 2007.
2. Gambhir. M.L., &NehaJamwal., “Building Materials, products, properties and systems”, Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.
3. Shetty.M.S., “Concrete Technology (Theory and Practice)”, S. Chand and Company Ltd.,2008.
4. Gambhir.M.L., “Concrete Technology”, 3rd Edition, Tata McGraw Hill Education, 2004
5. Duggal.S.K., “Building Materials”, 4th Edition, New Age International, 2008.

WEB LINKS

1. <http://ceae.colorado.edu/~saouma/Lecture-Notes/s4a.pdf>
2. <http://pareto.uab.es/xmg/Docencia/IO-en/IO-Introduction.pdf>

CO PO Mapping

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CO2	3	-	3	-	1	-	1	-	-	-	-	-	3	-
CO3	3	-	-	-	-	-	-	-	2	1	-	-	3	3
CO4	3	-	-	-	-	-	-	-	-	-	2	-	3	-
CO5	2	-	-	2	-	-	-	2	-	-	-	1	3	2



COURSE OBJECTIVES

- To understand the fundamental concepts of stress, strain and deformation of solids with applications to bars, beams and thin shells.
- To analyze the truss elements under complex state of stress by means of analytical methods.
- To acquire knowledge about shear force and bending moment for all statically determinate beams by recognizing the beam type and loading.
- To know the behavior of members subjected to pure torsion and also to develop knowledge about springs.
- To find deflection of beam with different load and different method and to provide exposure of the concepts of internal stress in beams of various cross sections.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS**9**

Rigid and deformable bodies – Stability, strength and stiffness - Axial and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Biaxial state of stress – Elastic Constants; Stresses and deformation of thin cylindrical and spherical shells; Stresses at a point – Stresses on inclined planes - Principal stresses and principal planes – Mohr's circle of stress

UNIT II ANALYSIS OF PLANE TRUSSES**9**

Stability and equilibrium of plane frames – Perfect frames - Types of trusses – Analysis of forces in truss members – Method of joints – Method of tension co-efficient – Method of sections.

UNIT III BENDING OF BEAMS**9**

Beams – Types and transverse loading on beams – Shear force and bending moment in beams – Cantilever beams – Simply supported beams and over-hanging beams; Theory of simple bending – Bending stress distribution – Load carrying capacity – Proportioning of sections; Leaf springs; Flitched beams – Shear stress distribution.

UNIT IV TORSION**9**

Theory of simple torsion - Stresses and deformation in circular and hollow shafts – Stepped shafts – Shafts fixed at both ends; Stresses and deflection in helical springs- introduction to torsion of rectangular sections- Warping.

UNIT V DEFLECTION OF BEAMS**9**

Double Integration method – Macaulay's method – Area moment method – Conjugate beam method for computation of slopes and deflections in determinate beams- deflection due to shear.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- understand the fundamental concepts of stresses and strains in one and two dimensional states.
- analyse determinate beams and plane trusses.
- understand the bending of different types of beams.
- get sufficient knowledge about designing shafts to transmit required power and also springs for its maximum energy storage capacities.
- find the deflection of beams.

TEXT BOOKS

1. Bansal R.K, Strength of Materials (Mechanics of Solids), Laxmi publishing PvtLtd, New Delhi, 2012
2. Rajput.R.K. Strength of Materials, S.Chand& Company Ltd., New Delhi 2014.

REFERENCES

1. Irwing H.Shames, James M.Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 2002
2. Punmia B.C, Ashok K. Jain and Arun K. Jain, Theory of Structures (SMTS II), Laxmi publishing Pvt Ltd, New Delhi, 2004.
3. Punmia B.C, Ashok K. Jain and Arun K. Jain, Mechanics of Structures (SMTS I), Laxmi publishing pvt Ltd, New Delhi, 2011
4. Vazirani.V.N, Ratwani.M.M, Duggal .S.K Analysis of Structures: Analysis, Design and Detailing of Structures-Vol.1, Khanna Publishers, New Delhi 2014

WEB LINK

1. <http://www.esm.psu.edu/courses/emch213d/tutorials/animations>.

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
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CO1	2	3	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	3	-	2	-	-	-	-	-	-	-	1	2	1
CO3	2	3	2	2	-	-	-	-	-	-	-	1	1	1
CO4	2	3	2	2	-	-	-	-	-	-	-	1	2	1
CO5	2	3	2	2	-	-	-	-	-	-	-	1	1	1



COURSE OBJECTIVES

- To understand the importance, application and inter-relationship of various properties of fluid.
- To obtain knowledge in kinematic and dynamics flow of fluid and various devices used to measure the velocity and discharge of fluid.
- To gain knowledge of dimensional analysis of fluid.
- To interpret the applications of the conservation laws to flow through pipes (both laminar and turbulent)
- To gain knowledge about boundary layers

UNIT I FLUIDS PROPERTIES AND FLUID STATICS 9

Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas, vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II BASIC CONCEPTS OF FLUID FLOW 9

(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler's equation of motion along a stream line - Bernoulli's equation - Applications to velocity and discharge measurements - Linear momentum equation and moment – of – momentum equations and their applications.

UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 9

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

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 9

Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment – Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V BOUNDARY LAYERS AND TRANSPORT BY ADVECTION AND DIFFUSION 9

Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation – Steady molecular diffusion and conduction – Turbulent transport equations – Channel diffusion and Dispersions and Applications.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- attain a thorough knowledge about various fundamental properties of fluids.
- apply the continuity, energy and momentum equations to fluid flow.
- gain knowledge about various dimensional analysis of fluid.
- distinguish laminar and turbulent flow through pipes and compute the energy losses in pipe flow.
- select appropriate model to provide solution to a real time problem related to hydraulics.

TEXT BOOKS

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 9th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2017.
2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi, 20th edition, 2015.

REFERENCES

1. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010
2. R.K.Rajput., "A text book of Fluid Mechanics", S.Chand and Company, NewDelhi, 2007.
3. Roberson J.A and Crowe C.T., Engineering Fluid Mechanics. Jaico Books Mumbai, 2000.
4. Streeter, V.L. Wylie, E. B. and Bedford K.W, Fluid Mechanics. (9th ed) Tata McGraw Hill, New Delhi, 1998

WEB LINKS

1. <http://bookboon.com/en/engineering-fluid-mechanics-ebook>
2. http://www.engineeringtoolbox.com/fluid-mechanics-t_21.html
3. <http://www.efunda.com/formulae/fluids/overview.cfm>
4. <http://nptel.ac.in/courses/105101082/>
5. <http://nptel.ac.in/courses/105103095/>

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	1	-	-	-	-	-	-	1	3	-
CO2	2	1	1	-	1	-	-	-	-	-	-	1	3	-
CO3	2	2	2	-	1	-	-	-	-	-	1	1	3	1
CO4	2	2	2	-	1	-	-	-	-	-	1	1	3	1
CO5	2	3	2	-	1	-	-	-	-	-	1	1	3	1



COURSE OBJECTIVES

- To understand the importance of surveying in the field of civil engineering
- To gain knowledge of chain surveying, compass surveying and plane table surveying.
- To find the elevation of points by using various leveling methods.
- To use the basics of leveling application in civil engineering field
- To gain knowledge about theodolite survey in elevation and angular measurements.

UNIT I FUNDAMENTALS AND CHAIN SURVEYING 9

Definition- Classifications - **Basic principles-Equipment and accessories for ranging and chaining** – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing - Plotting – applications- enlarging the reducing the figures – Areas enclosed by straight line irregular figures- digital planimetre.

UNIT II COMPASS AND PLANE TABLE SURVEYING 9

Compass – **Basic principles - Types - Bearing - Systems and conversions- Sources of errors- Local attraction - Magnetic declination – Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation -Intersection - Resection – Traversing- sources of errors – applications.**

UNIT III LEVELLING 9

Level line - Horizontal line - Datum - Bench marks -Levels and staves - **temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling** - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in leveling - Precise levelling - Types of instruments - Adjustments - Field procedure

UNIT IV LEVELLING APPLICATIONS 9

Longitudinal and Cross-section-Plotting - Contouring - Methods - Characteristics and uses of contours – Plotting – Methods of interpolating contours – Computations of cross sectional area and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams.

UNIT V THEODOLITE SURVEYING 9

Theodolite - Types - Description - **Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances**– Tangential and Stadia Tacheometry – Subtense method - Stadia constants - Anallactic lens.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- understand the working principles of survey instruments.
- calculate included angles and bearings by using compass, plotting and adjustment of traverse by plane table survey.
- describe the uses of levelling instruments
- interpret survey data and compute areas and volumes.
- calculate horizontal angles and vertical angles by using tacheometer.

TEXT BOOKS

1. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 2010.
2. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2013.

REFERENCES

1. Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.
2. Arora, K. R. Surveying Vol. I and II, Standard Book House, 2008.
3. Alak De, "Plane Surveying", S. Chand & Company Ltd., 2014.
4. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
5. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
6. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2011.

WEB LINKS

1. nptel.ac.in/courses/105104101/1
2. <https://sites.google.com/a/mitr.iitm.ac.in/iitmcivil/ce2080>

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	1	2	-	-	-	2	1	-	1	2	1
CO2	1	1	1	1	1	-	-	-	1	1	-	1	1	1
CO3	2	2	1	2	2	-	-	-	1	1	-	1	2	1
CO4	2	2	1	2	1	-	-	-	2	1	-	1	2	1
CO5	1	1	1	1	2	-	-	-	2	1	-	1	2	1



COURSE OBJECTIVES

- To impart knowledge about measuring area and offset by using chain surveying.
- To familiarize themselves with the concepts of bearing and area measurement using different compass.
- To provide training in different methods of plane table surveying.
- To acquire the knowledge of finding the reduced levels using different methods of leveling.

LIST OF EXPERIMENTS

1. Study of chains and its accessories
2. Aligning, Ranging and Chaining
3. Chain Traversing
4. Compass Traversing
5. Plane table surveying: Radiation
6. Plane table surveying: Intersection
7. Plane table surveying: Traversing
8. Plane table surveying: Resection – Three point problem
9. Plane table surveying: Resection – Two point problem
10. Study of levels and levelling staff
11. Fly levelling using Dumpy level
12. Fly levelling using tilting level
13. Check leveling
14. LS and CS
15. Contouring

TOTAL PERIODS 60**COURSE OUTCOMES**

At the end of this course, students will be able to

- handle the conventional surveying instruments such as chain/tape, compass, plane table, and theodolite in the field of civil engineering.
- undergo traverse using various instruments
- prepare contour using levelling instrument.
- use the theodolite effectively for various applications

**CO PO Mapping**

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	-	-	2	1	-	-	2	1	-	1	2	-
CO2	2	1	-	-	2	2	-	-	2	1	-	1	3	-
CO3	2	2	-	-	2	-	-	-	2	1	-	2	2	1
CO4	2	2	-	-	3	2	-	-	2	1	-	2	2	2

COURSE OBJECTIVES

- To understand the technical concepts and ways to solve engineering problems through theoretical calculations by conducting experiments.
- To apply the concepts of mechanics of materials to determine the behaviour of materials under load.
- provide the skill sets required to perform experiments and write lab reports.
- obtain practical knowledge on double shear test and impact test on metal.

LIST OF EXPERIMENTS

1. Tension test on mild steel rod
2. Double shear test on metal
3. Torsion test on mild steel rod
4. Impact test on metal specimen (Izod and Charpy)
5. Hardness test on metals (Rockwell and Brinell Hardness Tests)
6. Deflection test on metal beam
7. Compression test on helical spring
8. Tension test on helical spring
9. Compression test on wood

TOTAL PERIODS**60****COURSE OUTCOMES**

At the end of this course, students will be able to

- apply the concepts of mechanics for determining stresses and strains from the member forces.
- determine the behavior of structural elements such as bars, beams and columns subjected to tension, compression, shear, bending and torsion by means of experiments.
- understand the behavior of materials under various loading conditions.
- calculate the double shear and impact strength on metal.

CO PO Mapping

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CO3	2	2	-	-	1	-	-	-	1	-	-	1	1	1
CO4	2	2	-	-	1	-	-	-	1	-	-	1	1	1



COURSE OBJECTIVES

- To provide knowledge of different views of components of a building.
- To familiarize the students with creating, modifying and annotating commands using software.
- To create plan, section and elevation of buildings using drafting software.
- Transfer design into drawings as per IS codes

LIST OF EXPERIMENTS

1. Principles of planning, orientation and complete joinery details (Paneled and Glazed Doors and Windows)
2. Buildings with load bearing walls
3. Buildings with sloping roof
4. R.C.C. framed structures
5. Industrial buildings – North light roof structures
6. Perspective view of single storey building

TOTAL PERIODS**60****COURSE OUTCOMES**

At the end of this course, students will be able to

- have fundamental understanding of 2D and 3D views of buildings and understand the different views of the components of a building.
- use, create, modify and annotation commands.
- create plan, section and elevation of different buildings and take the print out.
- draw the detailing of R.C.C structures.

TEXT BOOKS

1. Sikka V.B., A Course in Civil Engineering Drawing, 4TH Edition, S.K.Kataria and Sons, 2015.
2. George Omura, Mastering in Autocad 2005 and Autocad LT 2005– BPB Publications, 2008

REFERENCES

1. Shah.M.G.,Kale.C.M. andPatki.S.Y., Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishers Limited, 2007.
2. Verma.B.P., Civil Engineering Drawing and House Planning, Khanna Publishers, 2010.
3. Marimuthu V.M., Murugesan R. and Padmini S., Civil Engineering Drawing-I, Pratheeba Publishers, 2008.

WEB LINKS

1. www.iitk.ac.in/cad/
2. www.cadl.iiscx.ernet.in/

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Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	1	3	-	-	-	-	-	-	2	2	3
CO2	2	2	3	1	3	-	-	-	-	-	-	2	2	3
CO3	2	2	3	1	3	-	-	-	-	-	-	2	2	3
CO4	2	2	3	1	3	-	-	-	-	-	-	2	2	3



SEMESTER IV					
NUMERICAL METHODS					
MA16404	(COMMON TO AERO,CIVIL,EEE,MECH & MCT)	3	2	0	4

COURSE OBJECTIVES

- To analyse different methods to find solution for a large system of linear equations
- To find the intermediate values for a series of given data
- To develop efficient algorithms for solving problems in science, engineering and technology
- To solve the non linear differential equations that cannot be solved by regular conventional method.
- To apply finite element method to increase the accuracy of second order differential equations

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 15

Solution of equation – Iteration method : Newton Raphson method – Solution of linear system by Gaussian elimination and Gauss - Jordan method – Iterative method – Gauss-Seidel method – Inverse of a matrix by Gauss Jordan method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION AND APPROXIMATION 15

Lagrangian Polynomials – Divided differences – Newton's Divided Difference, Hermite Interpolation Polynomial and **Interpolating with a cubic spline** – Newton's forward and backward difference formulas.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 15

Differentiation using interpolation formulae – Numerical integration by trapezoidal and Simpson's 1/3– Rombertg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons' rule.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 15

Single step methods: Taylor series method – Modified Euler method for first order equation – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 15

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – **One dimensional wave equation and two dimensional Laplace and Poisson equations.**

TOTAL PERIODS 75

COURSE OUTCOMES

At the end of this course, students will be able to

- comprehend the basics of linear equations.
- apply the interpolation methods for constructing approximate polynomials
- demonstrate the knowledge of numerical differential equations in computational and simulation process
- utilize the concept of initial value problems in the field of science and engineering
- describe the computational procedure of the amount of heat emitted or transferred from an object

TEXT BOOKS

1. Erwin Kreyszig, “Advanced Engineering Mathematics” 10th edition, Wiley Publications, 2010.
2. T. Veerarajan. and T .Ramachandran, “Numerical Methods with programming in C”, 2nd ed., Tata McGraw-Hill, 2006.
3. Sankar Rao K “ Numerical Methods For Scientists And Engineers –3rd Edition Princtice Hall of India Private, New Delhi, 2007.

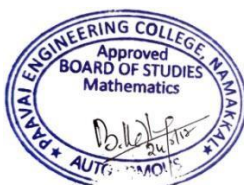
REFERENCES

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, “Numerical Methods”, S.Chand Co. Ltd., New Delhi, 2003
2. Gerald C.F. and Wheatley, P.O., “Applied Numerical Analysis” 6th Edition, Pearson Education Asia, New Delhi, 2002.
3. M.K.Jain , S.R.K. Iyengar , R.K.Jain , “Numerical Methods For Scientific & Engineering Computation”
4. New Age International (P) Ltd , New Delhi , 2005.
5. M.B.K. Moorthy and P.Geetha, “Numerical Methods” , Tata McGraw Hill Publications company, New Delhi, 2011.

WEB LINKS

1. <https://www.youtube.com/watch?v=QTQ8bO1F-Dg>
2. <https://www.youtube.com/watch?v=AT7Olelic8U>
3. <https://www.youtube.com/watch?v=TH06N7Q7FJw>
4. <https://www.youtube.com/watch?v=DnBJLpdVHCY>
5. <https://www.youtube.com/watch?v=5TccPEz2nB8>

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CO2	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO3	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO4	3	3	2	3	-	-	-	-	-	-	-	1	3	2
CO5	3	3	3	2	-	-	-	-	-	-	-	1	3	2



COURSE OBJECTIVES

- To understand the trigonometrical levelling.
- To adjust the errors encountered during surveying
- To work with total station
- To understand the concept of GPS
- To know the various types of advanced surveying methods.

UNIT I CONTROL SURVEYING 9

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals - Base line - Instruments and accessories - Corrections - Satellite station - Reduction to centre – Trigonometrical leveling-Single and reciprocal observations - Modern trends – Bench marking

UNIT II SURVEY ADJUSTMENT 9

Errors Sources- precautions and corrections – classification of errors – true and most probable values - weighed observations – method of equal shifts – principle of least squares - normal equation – correlates - level nets- adjustment of simple triangulation networks.

UNIT III TOTAL STATION SURVEYING 9

Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principles, Sources of Error, Infrared and Laser Total Station instruments. Microwave system:Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

UNIT IV GPS SURVEYING 9

Basic Concepts - Different segments - space, control and user segments - satellite configuration -signal structure - Orbit determination and representation - anti spoofing and selective availability- Task of control segment – Hand Held and Geodetic receivers –data processing - Traversing and triangulation.

UNIT V ADVANCED TOPICS IN SURVEYING 9

Route Surveying-Reconnaissance- Route surveys for highways, railways and waterways- Curve ranging - Horizontal and vertical curves - Simple curves - Setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements. Hydrographic surveying- Tides-MSL- Sounding methods- Three-point problem- Strength of fix-Sextants and station pointer- Astronomical Surveying-field observations and determination of Azimuth by altitude and hour angle methods- fundamentals of Photogrammetry and Remote sensing.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- distinguish between the stations calculated by single and reciprocal levelling.
- identify the errors and adjust them in the real time applications.
- gain knowledge about principles and methods of measurement using total station.

- understand the working principle of GPS, its components, signal structure, processing techniques used in GPS observations and error sources.
- demonstrate methods of survey in water bodies by hydrographic surveying, basic concepts adopted in photogrammetry.

TEXT BOOKS

1. Punmia, B.C. Surveying Vol.I and II, Standard Publishers, 2010.
2. Duggal, S.K. Surveying Vol. I and II, Tata McGraw Hill, 2013.

REFERENCES

1. Chandra A.M., "Plane Surveying", New Age International Publishers, 2015.
2. Arora, K. R. Surveying Vol. I and II, Standard Book House, 2008.
3. Alak De, "Plane Surveying", S. Chand & Company Ltd., 2014.
4. James M. Anderson and Edward M. Mikhail, "Surveying, Theory and Practice", 7th Edition, McGraw Hill, 2001.
5. Bannister and S. Raymond, "Surveying", 7th Edition, Longman 2004.
6. Roy S.K., "Fundamentals of Surveying", 2nd Edition, Prentice Hall of India, 2011.
7. Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2004.

WEB LINKS

1. nptel.ac.in/courses/105107122/
2. <http://nptel.ac.in/courses/105107122/20>

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
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CO3	1	2	1	1	2	-	-	-	1	-	-	2	2	1
CO4	1	2	1	1	2	-	-	-	2	-	-	2	2	1
CO5	1	2	1	1	2	-	-	-	2	-	-	2	2	1



COURSE OBJECTIVES

- To identify the characteristics uniform flow
- To analyse gradually varied flow and their properties
- To gain knowledge about rapidly varied flow and hydraulic depth
- To understand about the pumps and its characteristics.
- To study the types and characteristics of turbine

UNIT I UNIFORM FLOW**9**

Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II VARIED FLOWS**9**

Dynamic equations of gradually varied and spatially varied flows - Water surface flow profile classifications: Hydraulic Slope, Hydraulic Curve - Profile determination by Numerical method: Direct step method and Standard step method – Applications

UNIT III RAPIDLY VARIED FLOWS**9**

Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types Energy dissipation - Surges.

UNIT IV PUMPS**9**

Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Rotary pumps: Gear pump.

UNIT V TURBINES**9**

Turbines - Classification - Reaction turbines - Francis turbine, Radial flow turbines, draft tube and cavitation - Propeller and Kaplan turbines - Impulse turbine - Performance of turbine - Specific speed - Runaway speed - Similarity laws.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- know about the uniform flow and its computation
- familiarize themselves with the characteristics varied flow
- understand the behavior of rapidly varied flow
- understand the various type of pumps and its characteristics
- identify the turbine and its characteristics

TEXT BOOKS

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", 9th edition, Laxmi Publications Pvt. Ltd, New Delhi, 2017.
2. Subramanya K., Flow in open channels, Tata McGraw Hill, New Delhi, 2000

REFERENCES

1. Jain A. K. "Fluid Mechanics", Khanna Publishers, 2010
2. Modi P.N and Seth Hydraulics and Fluid Mechanics including Hydraulic Machines, Standard Book House New Delhi, 20th edition, 2015.
3. Rajesh Srivastava, Flow through open channels, Oxford University Press, New Delhi, 2008

WEB LINKS

1. <http://nptel.ac.in/courses/105103021/>
2. <http://nptel.ac.in/courses/105107059/>
3. ebookbrowse.net > ap > applied-hydraulic-engineering

CO PO Mapping

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CO3	2	2	2	1	1	-	-	-	-	-	-	1	3	1
CO4	2	2	2	1	1	-	-	-	-	-	-	1	3	1
CO5	2	2	2	1	1	-	-	-	-	-	-	1	3	1



COURSE OBJECTIVES

- To study the properties, testing and handling of concrete for the construction projects.
- To know the appropriate techniques and practices used in the construction according to the current scenario.
- To gain knowledge about various constructions methodology adopted for substructure construction.
- To acquire emerging ideas in the field of Super structure construction.
- To create awareness about the new construction equipment and its usage in the project.

UNIT I CONCRETE TECHNOLOGY**9**

Cements – **Grade of cements - concrete chemicals and Applications** – Grade of concrete manufacturing of concrete – Batching – mixing – transporting – placing – compaction of concrete – curing and finishing - Testing of fresh and hardened concrete – quality of concrete – Extreme Weather Concreting - Ready Mix Concrete - Non-destructive testing.

UNIT II CONSTRUCTION PRACTICES**9**

Specifications, details and sequence of activities and construction co-ordination – Site Clearance –Marking – Earthwork - masonry – stone masonry – Bond in masonry - concrete hollow block masonry – flooring – damp proof courses – construction joints – movement and expansion joints –pre cast pavements – Building foundations – basements – temporary shed – centering and shuttering – slip forms – scaffoldings – de-shuttering forms – Fabrication and erection of steel trusses – frames – braced domes – laying brick – weather and water proof – roof finishes –acoustic and fire protection.

UNIT III SUB STRUCTURE CONSTRUCTION**9**

Techniques of Box jacking – **Pipe Jacking -under water construction of diaphragm walls** and basement-Tunneling techniques – Piling techniques - well and caisson - sinking cofferdam – cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting - well points-Dewatering and stand by Plant equipment for underground open excavation.

UNIT IV SUPER STRUCTURE CONSTRUCTION**9**

Launching girders, bridge decks, off shore platforms – special forms for shells - **techniques for heavy decks** – in-situ pre-stressing in high rise structures, Material handling - erecting light weight components on tall structures - Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks.

UNIT V CONSTRUCTION EQUIPMENT**9**

Selection of equipment for earth work - **earth moving operations – types of earthwork equipment tractors, motor graders, scrapers, front end loaders, earth movers** – Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, students will be able to

- understand the material properties, strength and durability of concrete.
- use suitable construction techniques and practices for the particular project.
- gain exposure in the modern construction techniques adopted in the construction projects.
- use advanced techniques towards speedy and guaranteed projects.
- acquire knowledge about the usage & suitability of new construction equipment in large projects.

TEXT BOOKS

1. Varghese, P.C. "Building construction", Eastern Economy Edition, Second Edition, 2016
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997

REFERENCES

1. Jha J and Sinha S.K., "Construction and Foundation Engineering", Khanna Publishers, 1999.
2. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2002
3. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
4. Dr. Mahesh Varma, "Construction Equipment and its Planning and Application", Metropolitan Book Company, New Delhi, 1983.
5. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004

WEB LINKS

1. <https://www.youtube.com/watch?v=bA3OsOsrRgc>
2. <http://www.youtube.com/watch?v=-srRW8Gfvnk>

CO PO Mapping

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
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CO1	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO2	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO3	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO4	2	-	-	-	1	-	-	-	1	-	-	1	1	1
CO5	2	-	-	-	1	-	-	-	1	-	-	1	1	1



COURSE OBJECTIVES

- To describe the various compositions of concrete
- To understand the usage of admixtures
- To gain knowledge about types of concrete
- To evaluate the quality of concrete
- To know about the uses of modern concrete

UNIT I CONSTITUENT MATERIALS 9

Cement-Different types-**Chemical composition and Properties -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 II CHEMICAL AND MINERAL ADMIXTURES 9

Accelerators-Retarders- Plasticizers- Super plasticizers- Water proofers - Mineral Admixtures like Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaoline - Their effects on concrete properties

UNIT III PROPORTIONING OF CONCRETE MIX 9

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 IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete-Determination of Compressive and Flexural strength-Stress-strain curve for concrete-Determination of Young's Modulus

UNIT V SPECIAL CONCRETES 9

Light weight concretes - High strength concrete - Fibre reinforced concrete – Ferrocement – Ready mix concrete-SIFCON-Shotcrete – Polymer concrete - High performance concrete- Geopolymer Concrete-Self Compacting concrete

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- acquire and apply fundamental knowledge in the fresh and hardened properties of concrete
- identify the functional role of raw materials and apply this knowledge to mix design philosophy.
- select the correct raw material components and mix design needed to formulate a concrete that meets prescribed specification requirements
- assess the quality of concrete
- understand the use of special concretes

TEXT BOOKS

1. Gupta.B.L.,Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003

REFERENCES

1. Santhakumar,A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007
2. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, NewDelhi, 2007
3. IS10262-2009 Indian standard concrete mix design

WEB LINK

1. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=105104030>

CO PO Mapping

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CO3	2	-	-	-	1	-	-	-	-	-	-	2	1	1
CO4	2	-	-	-	1	-	-	-	-	-	-	2	1	1
CO5	2	-	-	-	1	-	-	-	-	-	-	1	1	1



COURSE OBJECTIVES

- To understand the concept of energy principles.
- To learn the computation of deflection of beams using energy principles and to know the concept of analysis of indeterminate beams.
- To estimate the load carrying capacity of columns and analysis of three dimensional state of stress.
- To understand the concept of theories of failure of materials.
- To understand advanced concepts like unsymmetrical bending, shear center and fracture of materials.

UNIT I ENERGY PRINCIPLES

9

Strain energy and strain energy density – Strain energy in axial force - Shear, flexure and torsion – Castigliano's and Engesser's theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams – **Maxwell's reciprocal theorem**.

UNIT II INDETERMINATE BEAMS

9

Propped Cantilever and Fixed Beams – Fixed end moments reactions, slope and deflection for standard cases of loading – Continuous beams – support reactions and moments – **Theorem of three moments – Shear Force and Bending Moment Diagrams**.

UNIT III COLUMNS

9

Behaviour of short and long columns. **Euler's theory of long columns** – Critical loads for prismatic columns with different end conditions - Rankine-Gordon Formula - Eccentrically loaded long columns - Eccentrically loaded short columns - middle third rule – Core of section.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

9

Determination of principal stresses and principal planes – **Volumetric strain – Theories of failure – Principal stress, principal strain, shear stress, strain energy and distortion energy theories** – Application in analysis of stress, load carrying capacity and design of members. Interaction problems - Interaction curves.

UNIT V ADVANCED TOPICS

9

Unsymmetrical bending of beams - symmetrical and unsymmetrical sections, shear centre – stresses on curved beams for simple solid sections – Winkler Bach Formula – Thick cylinders – Compound cylinders - residual stresses, stress concentration, fatigue, torsion of thin walled sections.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, students will be able to

- understand the fundamental concepts of energy principles.
- gain knowledge about analysis of indeterminate beams and use of energy method for estimating the slope and deflections.
- analyse behaviour of columns.
- describe the failure of materials.
- understand unsymmetrical bending, shear center and fracture of materials

TEXT BOOKS

1. Rajput.R.K. Strength of Materials, S.Chand& Company Ltd., New Delhi 2014.
2. Punmia, B.C.,Theory of Structures (SMTS) Vol.I and II, Lakshmi Publishing Pvt. Ltd., New Delhi,2004.

REFERENCES

1. Malhotra, D.R. Gupta, H.C., The Strength of Materials, SatyaPrakashan, No. (Tech.India Publications), New Delhi 1995.
2. William A.Nash, Schaum's Outline Series, McGraw Hill International Editions, Fifth Edition, 2011.
3. Rattan S.S., Strength of Materials, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2011
4. Ramamrutham.SDhanapatRai Publishing Company (P) Ltd.,New Delhi 2009.
5. Elangovan.A, Porul Valimaiyial - II, Anna University, 2011.

WEB LINKS

1. <http://nptel.ac.in/courses/105105108/>
2. <http://studentskey.in/strength-of-materials-notes/>

CO PO Mapping

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CO4	2	3	2	2	-	-	-	-	-	-	-	2	1	2
CO5	2	3	2	3	-	-	-	-	-	-	-	2	1	2



COURSE OBJECTIVES

- To understand various flow measuring techniques available to measure the discharge of liquids flowing through pipes and in open channels.
- To study the performance of various types of pumps.
- To acquire thorough knowledge about various types of turbines.
- To test the performance of pumps and turbines.

LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for Venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of losses in pipes
6. Study of Bernoulli's theorem apparatus
7. Study on performance characteristics of Pelton turbine
8. Study on performance characteristics of Francis turbine
9. Study on performance characteristics of Kaplan turbine
10. Study on performance characteristics of Centrifugal pumps
11. Study on performance characteristics of Reciprocating pump.
12. Study on performance characteristics of Gear pump

TOTAL PERIODS

60

COURSE OUTCOMES

At the end of this course, the students will be able to

- determine the flow in pipes and in open channels..
- select an appropriate pump for a specific application.
- select a suitable type of turbine for the given situation.
- select a suitable type of turbine for the given situation.



REFERENCES

1. Sarbajit Singh. Experiments in Fluid Mechanics, PHI Learning Private Ltd., New Delhi 2009.
2. Hydraulic Laboratory Manual, Centre for Water Resources, Anna University, 2004.
3. Modi P. N. and Seth S.M., Hydraulics and Fluid Mechanics. Standard Book House, New Delhi, 19th edition, 2013.

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CO3	2	2	1	1	2	-	-	-	-	-	-	2	3	1
CO4	2	2	1	1	2	-	-	-	-	-	-	2	3	1

COURSE OBJECTIVES

- To apply geometric and trigonometric principles of surveying.
- To set out a curve by different methods.
- To give exposure to modern surveying instruments like GPS and Total station.
- To set out a curve by different methods.

LIST OF EXPERIMENTS

1. Study of theodolite
2. Measurement of horizontal angles by reiteration and repetition and vertical angles
3. Theodolite survey traverse
4. Heights and distances - Triangulation - Single plane method.
5. Tacheometry - Tangential system - Stadia system - Subtense system.
6. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.
7. Field work using Total Station.

TOTAL PERIODS 60**COURSE OUTCOMES**

At the end of this course, the students will be able to

- determine the heights, distances, and gradient using trigonometric methods
- apply field procedures in setting out of a curve
- use modern surveying instruments like total station, GPS.
- apply field procedures in setting out of a curve

CO PO Mapping

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CO2	2	2	2	1	3	-	-	-	1	-	-	2	3	1
CO3	3	2	2	1	3	-	-	-	1	-	-	2	3	1
CO4	3	2	2	1	3	-	-	-	1	-	-	2	3	1



COURSE OBJECTIVE

- To gain knowledge of computing slopes and deflections using energy methods.
- To gain knowledge of influence lines for statically determinate and indeterminate structures
- To analyse and solve arched and cable profiled structures.
- To analyse the indeterminate structures for internal forces by theorem of three moments and slope deflection method.
- To analyse the indeterminate structures for internal forces moment distribution method.

UNIT I DEFLECTION OF DETERMINATE STRUCTURES 9

Principles of virtual work for deflections - Deflections of beams, pin-jointed plane frames and rigid plane frames
-Deflection of trusses.

UNIT II MOVING LOADS AND INFLUENCE LINES 9

(Determinate & Indeterminate Structures with Redundancy Restricted To One)

Influence lines for reactions in statically determinate structures - influence lines for members forces in pin-jointed frames - Influence lines for shear force and bending moment in beam sections - Calculation of critical stress resultants due to concentrated and distributed moving loads- Muller Breslau's principle - Influence lines for continuous beams and single storey rigid frames - Indirect model analysis for influence lines of indeterminate structures - Beggs deformeter.

UNIT III ARCHES 9

Arches as structural forms - Examples of arch structures - Types of arches - Eddy's theorem - Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches - Settlement and temperature effects

UNIT IV SLOPE DEFLECTION METHOD 9

Analysis of continuous beams (with and without support yielding) and rigid frames (with and without sway) - Symmetry and antisymmetry - Support displacements.

UNIT V MOMENT DISTRIBUTION METHOD 9

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

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- determine the slopes and deflections of beams and frames.
- draw influence lines for statically determinate and indeterminate structures.
- analyse and solve arched and cable profiled structures.
- analyse the indeterminate structures by exact analysis.
- analyse the indeterminate structures by iterative procedure.

TEXT BOOKS

1. BhaviKatti, S.S, Structural Analysis – Vol. 1 & Vol. 2, Vikas Publishing Pvt Ltd., New Delhi, 2008.

- Vaidyanadhan, R and Perumal, P, "Comprehensive Structural Analysis – Vol. 1 & Vol.2", Laxmi Publications, New Delhi, 2003.

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- C.K. Wang, Analysis of Indeterminate Structures – Tata McGraw-Hill, 1992.
- Punmia B.C., Theory of Structures (SMTS)Vol II Laxmi Publishing Pvt Ltd, New Delhi, 2004.
- L.S. Negi& R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003..
- Gambhir. M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
- Reddy. C.S., "Basic Structural Analysis", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2013.

WEB LINKS

- <http://www.ce.memphis.edu/3121/notes/notes.html>
- <http://elearning.vtu.ac.in/CV42.html>
- <http://textofvideo.nptel.iitm.ac.in/105105105/lec14.pdf>
- <http://nptel.ac.in/courses/105105104/pdf/m11l28.pdf>
- <http://nptel.ac.in/courses/105101083/download/lec18.pdf>

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO2	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO3	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO4	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	2



COURSE OBJECTIVES

- To gain knowledge of planning of roadways.
- To illustrate proficiency in the geometric design of various highway elements.
- To gain knowledge of planning and design of flexible and rigid pavements.
- To illustrate exposure of materials used for highways and construction procedures.
- To gain knowledge of highway projects under public-private sector participation.

UNIT I HIGHWAY PLANNING AND ALIGNMENT**9**

History of road development in India - Classification of highways - Institutions for Highway planning, design and construction at different levels - factors influencing highway alignment - Road ecology - Engineering surveys for alignment, objectives, conventional and modern methods.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS**9**

Typical cross sections of Urban and Rural roads - Cross sectional elements - Horizontal curves, super elevation, transition curves, widening of curves - Sight distances - Vertical curves, gradients, hairpin bends - Lateral and vertical clearance at underpasses - IRC standards - Road signs and safety.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS**9**

Design principles - pavement components and their role - Design practice for flexible and rigid pavements (IRC methods only).

UNIT IV HIGHWAY CONSTRUCTION AND MAINTENANCE**9**

Highway construction materials, properties, testing methods - Construction practice including modern materials in concrete and flexible pavements (problem not included), Highway drainage - Special considerations for hilly roads - Evaluation and Maintenance of pavements.

UNIT V HIGHWAY ECONOMICS AND FINANCE**9**

Introduction, Highway User Benefits, Highway Costs, Vehicle Operation Costs, Economic analysis, Highway projects under Public-Private Sector Participation, Bidding process, Highway finance.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- planned design the highway components.
- execute geometric design of various highway components.
- prepare the design of flexible and rigid pavements.
- gain knowledge of construction procedures of various roads.
- explain the economic analysis of highways

TEXT BOOKS

1. Veeraragavan. A, Khanna.K and Justo.C.E.G. Highway Engineering, Nem Chand & Bros Publishers, 2014
2. Subramanian K.P., Highways, Railways, Airport and Harbour Engineering, Scitech Publications (India), Chennai, 2010.

3. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

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1. Transportation Engineering & Planning, C.S. Papacostas, P.D. Prevedouros, Prentice Hall of India Pvt Ltd, 2006.
2. Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHILearning Pvt. Ltd., 2005.
3. R.Srinivasa Kumar., Textbook of Highway Engineering Universities Press (India) Private Limited, Hyderabad, 2011.
4. Nicholas Garber, Lester Hoel, "Traffic and Highway Engineering" Cengage Learning, 4th edition, Stamford, USA., 2009.
5. Subhash C Saxena, Textbook of Highway and Traffic Engineering, CBS Publishers, 2014
6. C.Venkatramaiah., Transportation Engineering-Highway Engineering, Universities Press (India) Private Limited, Hyderabad, 2015

CODE BOOKS

1. Indian Road Congress (IRC), Guidelines and Special Publications on Planning and Design of Highways.
2. IRC Standards (IRC 37 - 2001 & IRC 58 - 1998)

WEB LINKS

1. <http://ascelibrary.org/toc/jtpedi/>
2. www.CE.mtu.edu/~zyou/links/links-research.html

CO PO MAPPING:

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CO2	3	-	3	-	-	-	-	-	-	-	-	-	1	3
CO3	2	3	3	2	-	-	-	-	-	-	-	-	1	3
CO4	2	3	2	2	-	-	-	-	-	-	-	-	1	3
CO5	-	2	1	1	-	-	-	-	-	-	-	-	1	2



COURSE OBJECTIVES

- To make themselves conversant with the principles of wastewater supply, treatment and distribution.
- To distinguish the concept of transport of wastewater
- To estimate the load carrying capacity of the treatment.
- To gain knowledge about various advanced wastewater treatment.
- To identify disposal method of sewage and sludge.

UNIT I PLANNING FOR SEWERAGE SYSTEMS 9

Sources of wastewater generation - Effects - Estimation of sanitary sewage flow - Estimation of storm runoff - Factors affecting Characteristics and composition of sewage and their significance; Effluent standards - Legislation requirements.

UNIT II SEWER DESIGN 9

Sewerage - Hydraulics of flow in sewers - Objectives - Design period - Design of sanitary and storm sewers - Small bore systems - Computer applications - Laying, joining & testing of sewers - sewer appurtenances; Pumps - selection of pumps and pipe Drainage ; Plumbing System for Buildings - One pipe and two pipe system.

UNIT III PRIMARY TREATMENT OF SEWAGE 9

Objective - Selection of treatment processes - Principles, Functions, Design and Drawing of Units; Onsite sanitation - Septic tank with dispersion trench and Soak pit; Grey water harvesting - Primary treatment - Principles, functions design and drawing of screen, grit chambers and primary sedimentation tanks- Construction, operation and Maintenance aspects.

UNIT IV SECONDARY TREATMENT OF SEWAGE 9

Objective -Selection of Treatment Methods - Principles, Functions, Design and Drawing of Unit; Activated Sludge Process and Trickling filter - Oxidation ditches, UASB - Waste Stabilization Ponds - Reclamation and Reuse of sewage - sewage recycle in residential complex - Recent Advances in Sewage Treatment - Construction and Operation and Maintenance of Sewage Treatment Plants.

UNIT V DISPOSAL OF SEWAGE AND SLUDGE MANAGEMENT 9

Standards for Disposal - Methods - dilution - Self purification of surface water bodies; Oxygen sag curve - Land disposal- Sludge characterization- Thickening - Sludge digestion - Biogas recovery - Sludge Conditioning and Dewatering - disposal - Advances in Sludge Treatment and disposal.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain knowledge about various wastewater resources of India and Tamilnadu.
- gain knowledge of sewer design.
- acquire an elaborate knowledge of selection of wastewater treatment process.
- explore planning, design, operation and maintenance of STP.
- gain knowledge about proper disposal methods of sewage and sludge.

TEXT BOOKS

1. Garg, S. K., "Environmental Engineering", Vol I & Vol II, Khannah Publishers, New Delhi, 1994
2. Punmia, B.C., Jain, A.K., and Jain. A., "Environmental Engineering", Vol.II, Lakshmi Publications, News letter, 2005

REFERENCES

1. Manual on wastewater and treatment CPHEEC, Ministry of Urban Affairs and Employment, Govt. of India, New Delhi, 1990
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008
3. Hussain. S. K., "Text Book of Water Supply and Sanitary Engineering", Oxford and IBH Publishing.

WEB LINKS

1. <http://www.nilim.go.jp/lab/bcg/siryounn/tnn0437pdf/ks043712.pdf>

CO PO MAPPING:

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	1	-	-	1	1	2	-	-	-	1	2
CO2	1	-	-	1	2	-	-	1	2	-	-	-	1	2
CO3	1	-	2	1	2	-	-	-	3	-	2	-	1	2
CO4	1	-	2	1	2	2	-	1	-	-	2	1	1	2
CO5	1	-	3	1	-	2	-	-	-	-	2	1	1	2



COURSE OBJECTIVES

- To gain knowledge of the engineering properties and compaction of soils
- To acquire knowledge about permeability of soil and Seepage
- To impart idea about stress distribution in soil media and consolidation of soil
- To familiarise themselves with the behaviour of soil under shear
- To gain knowledge of stability analysis of slopes

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Nature of soil - phase relationships - Soil description and classification for engineering purposes, their significance; Index properties of soils; BIS classification system; Soil compaction -Theory, comparison of laboratory and field compaction methods - Factors influencing compaction behavior of soils.

UNIT II SOIL WATER AND WATER FLOW 9

Soil Water - static pressure in water -effective stress concepts in soils - capillary stress - permeability measurement in the laboratory and field pumping in pumping out tests - factors influencing permeability of soils; Seepage - introduction to flow nets - Simple problems. (sheet pile and Weir)

UNIT III STRESS DISTRIBUTION AND SETTLEMENT 9

Stress distribution - soil media - Boussinesq theory - use of Newmarks influence chart; components of settlement- immediate and consolidation settlement; Terzaghi's one dimensional consolidation theory- computation of rate of settlement - $\sqrt{t}$ and log t methods - e-log p relationship - factors influencing compression behaviour of soils.

UNIT IV SHEAR STRENGTH 9

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory; Measurement of shear strength, direct shear - triaxial compression , UCC and Vane shear tests - Pore pressure parameters – cyclic mobility– liquefaction.

UNIT V SLOPE STABILITY 9

Slope failure mechanisms - Types - infinite slopes - finite slopes - Total stress analysis for saturated clay - Fellenius method - Friction circle method - Use of stability number - Slope protection measures.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- classify the soil based on engineering properties
- assess the permeability characteristics of soil and seepage
- find out the settlement of the structure
- assess the shear strength of various types of soil.
- analyze the stability of slopes using different methods.

TEXT BOOKS

1. Murthy, V.N.S., “soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd, New Delhi 2015

2. Punmia P.C., "Soil Mechanics and Foundations", Laximi Publications Pvt. Ltd., New Delhi, Jan 2005.
3. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi 2011.

REFERENCES

1. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations". Prentice-Hall, 2006.
2. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2010.
3. Das, B.M., "Principles of Geotechnical Engineering". Brooks / Coles / Thompson Learning Singapore, 8th Edition, 2013.
4. Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, 2013
5. Palanikumar. M, "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Leaning Private Limited, Delhi, 2013.
6. GopalRanjan and Rao, A.S.R., " Basic and Applied Soil Mechanics" , New age Ltd. International Publisher New Delhi (India) 2006
7. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 1995

WEB LINKS

1. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/soil_mech/index.htm
2. <http://www.eng.fsu.edu/~tawfiq/soilmech/lecture.html>
2. <http://aboutcivil.org/soil-mechanics/soil-mechanics-1-high.pdf>

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	-	-	-	-	-	-	-	-	3	2
CO2	2	2	1	2	-	-	-	-	-	-	-	-	3	2
CO3	2	3	1	2	-	-	-	-	-	-	-	-	3	2
CO4	2	3	1	2	-	-	-	-	-	-	-	-	3	2
CO5	2	3	1	2	-	-	-	-	-	-	-	-	3	2



COURSE OBJECTIVE

- To understand the components of the hydrological cycle, the mechanics of rainfall, its spatial and temporal measurement and their applications.
- To know the methods of estimating evaporation and infiltration losses.
- To acquire in-depth knowledge about various types of hydrographs and their applications.
- To realize the importance of flood control and mitigation measures.
- To understand the dynamics of ground water flow and their implications.

UNIT I PRECIPITATION

9

Hydrologic cycle - Types of precipitation - Form of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration and frequency relationship - Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION

9

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall splines - Design of crankshafts - Design of rigid and flexible couplings.

UNIT III HYDROGRAPHS

9

Factors affecting Hydrograph - Base flow separation - Unit hydrograph - Derivation of unit hydrograph- S curve hydrograph - Unit hydrograph of different deviations - Synthetic Unit Hydrograph.

UNIT IV FLOODS AND FLOOD ROUTING

9

Flood frequency studies - Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control.

UNIT V GROUND WATER HYDROLOGY

9

Types of aquifers - Darcy's law - Dupuit's assumptions - Confined Aquifer - Unconfined Aquifer - Recuperation test - Transmissibility - Specific capacity - Pumping test - Steady flow analysis only.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the various components of hydrological cycle and their interactions.
- estimate the mean areal precipitation and their significance in design of various hydraulic structures.
- determine the magnitude of infiltration and evaporation and evapotranspiration by various empirical methods.
- estimate the concept of flood routing the impact of flood through various methods.
- understand the dynamics of groundwater flow and their estimation

TEXT BOOKS

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

REFERENCES

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000.
3. Patra K C, "Hydrology and Water Resources Engineering" Narosa Publishing House, New Delhi, 2002
4. JayaramiReddi P, "Text book of Hydrology", Laxmi Publications Pvt. Ltd., New Delhi, 1997

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1. <http://nptel.ac.in/downloads/105101002/>.
2. <http://nptel.ac.in/courses/105101002/8>
3. <http://nptel.ac.in/courses/105107129/>.
4. <https://www.ipcc.ch/ipccreports/tar/wg2/pdf/wg2TARchap4.pdf>.

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	-	2	-	-	-	-	-	-	-	2	2
CO2	1	-	2	-	3	-	-	-	-	-	-	-	1	2
CO3	1	-	2	-	2	-	-	-	-	-	-	-	1	2
CO4	1	-	2	-	3	-	-	-	-	-	-	-	3	3
CO5	1	-	2	-	3	-	-	-	-	-	-	-	2	2



COURSE OBJECTIVES

- To gain knowledge about surveying instruments and advance instruments.
- To acquire knowledge of total station surveying.
- To understand the concept of GPS and its components
- To understand the concept of EDM
- To gain knowledge of the working principle of instruments and field use.

UNIT I FUNDAMENTALS**9**

Methods of measuring distance- historical development- **basic principles of EDM-** classifications- applications and comparison with conventional surveying.

UNIT II TOTAL STATION SURVEYING**9**

Basic Principle – Classifications; Electro-optical system- **Measuring principle, Working principle**, Sources of Error, Infrared and Laser Total Station instruments; Microwave system- Measuring principle, working principle, Sources of Error, Microwave Total Station instruments; Comparison between Electro-optical and Microwave system; Care and maintenance of Total Station instruments- Modern positioning systems -Traversing and Trilateration.

UNIT III GPS SURVEYING**9**

Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure- Orbit determination and representation - Anti Spoofing and Selective Availability - Task of control segment - Hand Held and Geodetic receivers -data processing - Traversing and triangulation.

UNIT IV ELECTROMAGNETIC DISTANCE MEASURING SYSTEM**9**

Electro-optical system, measuring principle- working principle- sources of error- infrared EDM instruments- Laser EDM instruments and total station; Microwave system- measuring principle- working principle- sources of error- microwave EDM instruments - comparison with Electro-optical system- care and maintenance of EDM instruments- Modern Positioning Systems EDM traversing- trilateration and base line measurement using EDM

UNIT V**FIELD STUDIES****9**

Study of different EDM instruments and Total Station EDM traversing- trilateration and base line measurement using EDM.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain knowledge about surveying instruments and advance instruments.
- familiarize them with the total station method.
- understand the concept of GPS and its components
- understand the concept of EDM
- illustrate the working principle of instruments and field use.

TEXT BOOKS

1. Punmia B.C., Surveying, Vols. I, II and III, Laxmi Publications, 1989
2. Dr.P.Purushothama Raj, "Surveying-II" Tata McGraw-Hill Publishing company Ltd. Newdelhi,2013.

REFERENCES

1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1971.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
4. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, AdamHilger Ltd., 1967

WEB LINKS

1. http://navybmr.com/study%20material/14336a/14336A_ch4.pdf
2. <https://theconstructor.org/surveying/modern-surveying-instruments-uses/16/>

CO PO MAPPING:

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CO3	2	2	1	1	-	-	-	-	-	-	-	2	3	1
CO4	2	2	2	2	-	-	-	-	-	-	-	2	3	1
CO5	1	2	2	2	-	-	-	-	-	-	-	2	3	1



COURSE OBJECTIVES

- To learn the necessity of planning in the diverse construction projects.
- To know the appropriate techniques used for scheduling the resources.
- To gain knowledge about various costs, control methods and departmental procedure for accounting.
- To examine the quality control and monitoring techniques and the necessity of training the personnel.
- To create awareness of management information system and usage of data base in the project accountings.

UNIT I CONSTRUCTION PLANNING**9**

Basic concepts in the development of construction plans - choice of Technology and Construction method - Defining Work Tasks - Definition - Precedence relationships among activities - Estimating Activity Durations - Estimating Resource Requirements for work activities - coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES**9**

Relevance of construction schedules - Bar charts - The critical path method- Calculations for critical path scheduling - Activity float and schedules - Presenting project schedules - **Critical path scheduling for Activity** - on-node and with leads, Lags and Windows - Calculations for scheduling with leads, lags and windows - Resource oriented scheduling - Scheduling with resource constraints and precedencies - Use of Advanced Scheduling Techniques - Scheduling with uncertain durations - Crashing and time/cost tradeoffs - Improving the Scheduling process - Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING**9**

The cost control problem - **The project Budget-Forecasting for Activity cost control** - financial accounting systems and cost accounts - Control of project cash flows - Schedule control-Schedule and Budget updates - Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION**9**

Quality and safety Concerns in Construction - Organizing for Quality and Safety - Work and Material Specifications - **Total Quality control** - Quality control by statistical methods - Statistical Quality control with Sampling by Attributes - Statistical Quality control by Sampling and Variables - Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION**9**

Types of project information - Accuracy and Use of Information - Computerized organization and use of Information - Organizing information in databases - relational model of Data bases - Other conceptual Models of Databases - Centralized database Management systems - Databases and application programs - Information transfer and Flow.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the requirement of planning techniques exercised in the construction projects.
- select suitable scheduling technique for the particular project.
- gain knowledge of the modern cost account systems and control techniques adopted in the construction projects.

- use advanced management tools for quality control and monitoring techniques towards speedy and guaranteed projects.
- use the MIS and data base for complex large projects.

TEXT BOOKS

1. Dr.S.Seetharaman, “Construction Planning and Scheduling”, Revised edition, Anuradha Publication, Chennai 2014.
2. Chitkara, K.K. “Construction Project Management : Planning & Scheduling and Control”, Third edition , Tata McGraw-Hill Publishing Co., New Delhi, 2014.
3. Srinath,L.S., “Pert and CPM Principles and Applications “, Third edition,Affiliated East West Press, 2001

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1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Edward .M.Willis., “Scheduling Construction projects”, John Wiley and Sons 1986. Digitized in 2008
3. Frederick Gould & Nancy Joyce, “Construction Project Management”,Third edition, Pearson Prentice Hall,2013.

WEB LINKS

1. [http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati /cpm/index.html](http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/cpm/index.html)
2. <http://theconstructor.org/?s=construction+planning>
3. <https://books.google.co.in/books?isbn=1136827617>

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CO4	1	2	1	1	-	3	-	-	2	-	3	-	2	-
CO5	1	2	1	1	2	-	-	-	2	-	3	-	2	-



COURSE OBJECTIVES

- To impart the knowledge about sources, effect and control of air pollution.
- To identify the principles of dispersion characteristics of pollution in atmosphere.
- To gain knowledge of control of air pollution-n.
- To tell the concepts behind the air pollution management.
- To illustrate the sources, effect and control of noise pollution.

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9

Classification of air pollutants - Particulates and gaseous pollutants - Sources of air pollution - Source inventory- **Effects of air pollution on human beings, materials, vegetation, animals**; Global warming-ozone layer depletion; Sampling and Analysis - Basic Principles of Sampling - Source and ambient sampling; Analysis of pollutants- Principles.

UNIT II DISPERSION OF POLLUTANTS 9

Elements of atmosphere - Meteorological factors - Wind roses - Lapse rate - Atmospheric stability and turbulence - Plume rise - Dispersion of pollutants - Dispersion models - Applications.

UNIT III AIR POLLUTION CONTROL 9

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

UNIT IV AIR QUALITY MANAGEMENT 9

Air quality standards - Air quality monitoring - Preventive measures - Air pollution control efforts – Zoning- Town planning regulation of new industries - Legislation and enforcement - Environmental Impact Assessment and Air quality

UNIT V NOISE POLLUTION 9

Sources of noise pollution - Effects -Assessment of noise pollution- Standards of limits for noise pollution - various Control methods - Prevention activities

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- classify the sources and effects of air pollution.
- realize the dispersion characteristics and modeling of air pollution.
- gain knowledge of air pollution control methods
- familiarize themselves with air pollution management ideas.
- create awareness on sources, effects and control of noise pollution

TEXT BOOKS

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 2006.

REFERENCES

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New York, 1997.
2. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 2008
5. RaoM.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 2001.

WEB LINKS

1. <http://nptel.ac.in/courses/10510409>

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	1	-	2	2	-	-	-	-	-	2	-
CO2	-	-	-	1	-	2	2	-	-	-	-	-	2	-
CO3	-	-	-	2	3	2	2	-	-	-	-	-	2	-
CO4	-	-	-	2	3	2	2	2	-	-	-	-	2	-
CO5	-	-	-	2	3	2	2	2	-	-	-	-	2	-



COURSE OBJECTIVES

- To understand the basic principles and concept of ecological Engineering.
- To study the functions of ecosystem and its types.
- To familiarize students with bio monitoring techniques, scope and applications of ecological principles for wastewater treatment and reuse.
- To create awareness of various effects of industrialization on ecology and ecological based waste purification methods.
- To understand various integrated ecological engineering systems.

UNIT I PRINCIPLES AND CONCEPTS**9**

Aim - **Scope and applications of Ecological Engineering** - Eco technology and their relevance to human civilization - Development and evolution of ecosystems - principles and concepts pertaining species, populations and community

UNIT II ECOSYSTEM FUNCTIONS**9**

Energy flow and nutrient cycling - **Food chain and food webs** - biological magnification, diversity and stability, immature and mature systems; Primary productivity - **Biochemical cycling of nitrogen**, phosphorous, sulphur and carbon dioxide; Habitat ecology - Terrestrial, fresh water, estuarine and marine habitats.

UNIT III ECOLOGICAL ENGINEERING METHODS**9**

Bio monitoring and its role in evaluation of aquatic ecosystem; Rehabilitation of ecosystems through ecological principles - step cropping, bio-wind screens, Wetlands, ponds, Root Zone Treatment for Waste water, Aquaculture system, Reuse of treated wastewater through ecological systems.

UNIT IV ECOLOGICAL EFFECTS OF INDUSTRIALISATION**9**

Ecological effects of exploration- production-extraction- processing- manufacture & transport.

UNIT V CASE STUDIES**9**

Case studies of integrated ecological engineering systems.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- apply the basic principles and concept to preserve ecology.
- gain knowledge of scope and applications of ecological principles for waste water treatment and reuse.
- understand the social issues and ecological effects of industrialization.
- interpret the relationship among integrated ecological engineering systems.
- gain knowledge of ecological engineering systems.

TEXT BOOKS

1. Odum, E.P., "Fundamental of Ecology", W.B.Sauders, 2002.
2. Kormondy, E.J., "Concepts of Ecology", Prentice Hall, New Delhi, 1996

REFERENCES

1. Mitch, J.W. and Jorgensen, S.E., Ecological Engineering – An Introduction to Ecotechnology, John Wiley and Sons, 1996.
2. Colinvaux, P., Ecology, John Wiley and Sons, 1996.
3. Etnier, C & Guterstam, B., “Ecological Engineering for Wastewater Treatment”, 2nd Edition, Lewis Publications, London, 1996.

WEB LINKS

1. https://www.researchgate.net/journal/0925-8574_Ecological_Engineering

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CO1	-	-	-	2	-	2	3	-	1	-	-	-	-	2
CO2	-	-	-	2	2	2	3	-	1	-	-	-	-	2
CO3	-	-	-	2	2	2	3	-	1	-	-	-	-	2
CO4	-	-	-	2	2	2	3	-	1	-	-	-	-	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	2



COURSE OBJECTIVES

- To impart the principles of sampling and preservation of water and wastewater.
- To provide the analyzing methods for water and wastewater.
- To estimate the load carrying capacity of the treatment.
- To convey the principles of testing of water and wastewater.

LIST OF EXPERIMENTS

1. Determination of
i) pH, ii) turbidity
2. Determination of
i) Hardness, ii) Electrical conductivity
3. Determination of Chlorides
4. Determination of Sulphate
5. Determination of Optimum Coagulant Dosage
6. Determination of available Ammonia Nitrogen
7. Determination of dissolved Oxygen
8. Determination of total, suspended and dissolved solids
9. Determination of Alkalinity
10. B.O.D. test
11. C.O.D. test
12. Determination of nutrients – Nitrogen and Phosphates (Demonstration only)

TOTAL PERIODS 30**COURSE OUTCOMES**

At the end of this course, the students will be able to

- acquire the sampling and preservation methods of water and wastewater.
- the water and wastewater analysis.
- acquire an elaborate knowledge of selection of wastewater treatment process.
- test the water and wastewater.

**REFERENCES**

1. Standard methods for the examination of water and wastewater, APHA, 20th Edition, Washington, 1998
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

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CO1	2	-	-	1	-	1	1	-	-	-	-	-	3	2
CO2	2	2	-	2	2	-	-	-	-	-	-	-	2	2
CO3	2	1	-	-	-	-	3	-	-	-	-	-	-	2
CO4	2	1	-	2	2	2	-	-	-	-	-	-	3	2

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SEMESTER VI

CE15601

RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING

3 0 0 3

COURSE OBJECTIVES

- To gain knowledge of planning and design of railway tracks.
- To provide proficiency in the geometric design of railway tracks.
- To develop skills in planning and design of airports.
- To illustrate exposure to airport visual aids and traffic control devices.
- To gain knowledge of components of docks and harbours

UNIT I RAILWAY PLANNING AND DESIGN

9

Role of Indian railways in national development - Railways for urban transportation - LRT & MRTS - engineering surveys for track alignment - obligatory points - Conventional and modern methods - Remote Sensing, GIS & GPS, EDM and other equipment - Permanent way- components and their functions; Rails - types, fastenings, gauge, coning of wheels, creeps and kinks ; Sleepers-functions, materials, density ; Ballast- functions, materials - ballast less tracks.

UNIT II GEOMETRIC DESIGN OF RAILWAY TRACKS

9

Gradients and grade compensation, super elevation, widening of gauges in curves, transition curves, horizontal and vertical curves; Points and crossings- Turnouts- design, working principle - Track circuiting, signaling, interlocking - construction – maintenance- conventional, modern methods and materials; Soil suitability analysis- track drainage - Track modernization - Automated maintenance and upgrading, relaying of track - lay outs of railway stations and yards- rolling stock, tractive power, track resistance- Level crossings.

UNIT III AIRPORT PLANNING AND DESIGN

9

Role of air transport - Components of airports - Airport planning - air traffic potential, site selection, design of components - Cost estimates, evaluation and institutional arrangements; Runway - design, orientation, cross wind component, wind rose diagram - Geometric design and corrections for gradients - drainage - taxiway - geometric design elements, minimum separation distances, design speed - airport drainage.

UNIT IV AIRPORT VISUAL AIDS AND AIR TRAFFIC CONTROL

9

Airport zoning - clear zone, approach zone, buffer zone, turning zone, clearance over highways and railways - airport layouts - apron, terminal building, hangars, motor vehicle parking area and circulation pattern - Case studies of airport layouts- airport buildings - Primary functions, planning concept, passenger facilities - Visual aids - Runway and taxiway markings, wind direction indicators, runway and taxiway lightings - Air traffic control -basic actions and network - Helipads - Hangars- Service equipment.

UNIT V HARBOURS

9

Introduction - Harbours, ports and docks- components, factors influencing the site selection, wind, wave characteristics - Breakwater - Components and types- Tetrapods and other special blocks- Erosion - Tides - types of tides; Docks - types of docks- warehouses - Transit sheds, fenders- Quays and jetties - dolphins - containerization - mooring, types of mooring - goods transport - Container movement- Wave action on Coastal structures and Coastal protection works-Environmental concern of port operations-Coastal Regulation Zone,2011.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- planned design the railway track components.
- perform geometric design of railways track.
- do the design of runways, taxiways and apron.
- possess knowledge about airport visual aids and traffic control.
- familiarize themselves in the components of docks and harbours.

TEXT BOOKS

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013.
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.

REFERENCES

1. SaxenaSubhash C and SatyapalArora, "A Course in Railway Engineering", DhanpatRai and Sons, Delhi, 2003.
2. Mundrey J.S. "A course in Railway Track Engineering". Tata McGraw Hill, 2007.
3. Khanna S.K, Arora M.G and Jain S.S, "Airport Planning and Design", Nemchand and Brothers, Roorkee, 2012.
4. Dr.K.P.Subramanian,"A text book on Railways, Airports, Docks and Harbours", Scitech, Chennai, 2012.
5. Bindra S P, "A Course in Docks and Harbour Engineering", DhanpatRai and Sons, New Delhi, 2013.

WEB LINKS

1. www.fhwa.dot.gov/resourcecenter/teams/safety/courses.cfm
2. http://www.faa.gov/airports/central/aip/sponsor_guide/media/0500.pdf

CO PO MAPPING:

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CO1	2	-	2	-	-	-	-	-	-	-	-	-	2	3
CO2	2	-	2	-	-	-	-	-	-	-	-	-	2	3
CO3	2	3	2	1	-	-	-	-	-	-	-	-	2	3
CO4	2	3	-	1	-	-	-	-	-	-	-	-	2	2
CO5	2	2	2	2	-	-	-	-	-	-	-	-	2	2



COURSE OBJECTIVES

- To analyse statically indeterminate structures by imposing boundary conditions on flexibility matrix.
- To formulate the element stiffness matrix and assemble the structure stiffness matrix for solving indeterminate problems.
- To understand the basics of finite element method and its application to structural analysis.
- To introduce the importance of plastic analysis to calculate the collapse loads for beams and frames
- To analyse the suspension bridges and space truss.

UNIT I MATRIX FLEXIBILITY METHOD

9

Equilibrium and compatibility - **Determinate vs. Indeterminate structures** - Indeterminacy - Primary structure- Compatibility conditions - Formation of flexibility matrix for beams and frames - **Analysis of indeterminate pin-jointed plane frames**, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II STIFFNESS MATRIX METHOD

9

Element and global stiffness matrices - **Analysis of continuous beams** - Transformations of stiffness matrices, load vectors and displacements vectors - **Analysis of pin-jointed plane frames and rigid frames** (with redundancy restricted to two)

UNIT III FINITE ELEMENT METHOD

9

Introduction - Element shapes, nodes, nodal unknowns and coordinate systems - Shape functions - Discretisation of a structure- Assembling stiffness equation - Displacement functions - Truss element - Beam element - Plane stress and plane strain - Triangular elements

UNIT IV PLASTIC ANALYSIS OF STRUCTURES

9

Introduction to plastic analysis - **Statically indeterminate axial problems** - Beams in pure bending - Plastic moment of resistance, Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism - Plastic analysis of indeterminate beams and frames - Upper and lower bound theorems

UNIT V CABLE STRUCTURES AND BEAMS CURVED IN PLAN

9

Suspension cables - Suspension bridges with two and three hinged stiffening girders - Beams curved in plan

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- analyse statically indeterminate structures by imposing boundary conditions on flexibility matrix.
- form the element stiffness matrices and assemble the global stiffness matrix for solving indeterminate problems.
- apply the concept of finite element method to structural analysis.
- employ plastic analysis to calculate the collapse loads for beams and frames.
- determine the member forces in suspension bridges and space truss

TEXT BOOKS

1. Bhavikatti,S.S, Structural Analysis, Vol.1, Vikas Publishing House Pvt. Ltd., NewDelhi-4,2010.
2. Bhavikatti,S.S, Structural Analysis, Vol.2, Vikas Publishing House Pvt. Ltd., NewDelhi-4,2013

- Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis - Vol. I & II", Laxmi Publications, New Delhi, 2003

REFERENCES

- Punmia, B.C., Ashok Kumar and Arun Kumar Jain, "Theory of Structures", Laxmi Publications, 2004.
- Ghali, A., Nebille, A.M. and Brown, T.G. "Structural Analysis" A unified classical and Matrix approach" - 5th edition. Spon Press, London and New York, 2003.
- L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003.
- Coates R.C, Coutie M.G. and Kong F.K., "Structural Analysis", ELBS and Nelson, 1990
- Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
- William Weaver Jr & James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, Delhi, 2004.
- Vazrani, V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

WEB LINKS

- <http://www.ce.memphis.edu/3121/notes/notes.html>.
- <http://elearning.vtu.ac.in/CV42.html>

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CO3	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO4	2	3	2	1	-	-	-	-	-	-	-	-	3	2
CO5	2	3	2	1	-	-	-	-	-	-	-	-	3	2



COURSE OBJECTIVES

- To describe limit state design concepts and the design of bolted and riveted joints.
- To gain knowledge of design of tension members.
- To acquire knowledge about design of compression member.
- To gain knowledge about design of beams.
- To gain knowledge of design of industrial structures.

UNIT I INTRODUCTION**9**

Properties of steel- Structural steel sections- **Limit state design concepts**- Loads on Structures- Connections using rivets, welding, bolting- **Design of bolted and welded joints**- Eccentric Connections- Efficiency of joints.

UNIT II TENSION MEMBER**9**

Types of sections - Net area - Net effective sections for angles and Tee in tension - **Design of connections in tension members** - Use of lug angles -Design of tension splice -Concept of shear lag.

UNIT III COMPRESSION MEMBER**9**

Types of compression members - **Theory of columns** - Basis of current codal provision for compression member design - Slenderness ratio - Design of single section and compound section compression members - Design of lacing and battening type columns - Design of column bases - Gusseted base.

UNIT IV BEAMS**9**

Design of laterally supported and unsupported beams - Built up beams - Beams subjected to Uniaxial and biaxial Bending - Design of plate girders - Intermediate and bearing stiffeners -Flange and web splices.

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES**9**

Roof trusses - Roof and side coverings - Design loads, **design of purlin and elements of truss**- Design of gantry girder.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain knowledge of limit state design concepts and joints.
- design tension members.
- design compression members.
- gain knowledge of design of beams.
- design components of steel trusses such as purlins and gantry girders.

TEXT BOOKS

1. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800–2007, International Publishing House Pvt. Ltd., 2009
2. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.
3. Ramachandra, S. and VirendraGehlot, "Design of Steel Structures – Vol. I & II", Standard Publication, NewDelhi, 2007

REFERENCES

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005
2. Dayaratnam, P., "Design of Steel Structures", Second edition, S. Chand & Company, 2003.
3. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007 Structures Publications, 2009.
4. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
5. IS800 :2007, General Construction In Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007
6. IS 875: (Part 3) 1987 (Reaffirmed 1997), Code of practice for design loads (Other than Earthquake) For Buildings and Structures.

WEB LINKS

1. <https://engineering.purdue.edu/~ahvarma/CE%20470/>
2. <http://www.learnerstv.com/Free-engineering-Video-lectures-ltv323-Page1.html>
4. http://peer.berkeley.edu/~yang/courses/ce248/CE248_LN_Floor_vibrations.pdf

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CO3	2	2	3	1	-	1	-	-	-	-	-	-	2	3
CO4	2	2	3	1	-	1	-	-	-	-	-	-	2	3
CO5	2	2	3	1	-	1	-	-	-	-	-	-	2	3



COURSE OBJECTIVES

- To tell the various compositions of concrete
- To understand the usage of admixtures
- To acquire knowledge about types of concrete
- To ensure the quality of concrete
- To know the modern concrete

UNIT I INGREDIENTS OF CONCRETE**9**

Cement- chemical composition and physical properties and its uses - Tests on cement; Aggregates- General classification of aggregates, Mechanical and chemical properties of aggregate - bulking of sand, soundness of aggregates, alkali-aggregate reaction, thermal properties of aggregates - Grading of fine and coarse aggregates Gap graded aggregates - Artificial aggregates - Heavy weight, light weight and normal aggregates Sampling aggregates - Tests on aggregates; Water- Quality of water - Permissible impurities - Suitability of sea water.

UNIT II CONCRETE ADMIXTURES**9**

Admixtures; Accelerators - catalysts - retarders - corrosion inhibitors - air entraining agent - workability agent Information regarding commercially available admixtures; Plastizers - water repelling materials – pulverized flyash - pozzolanas - Use of silica fumes-Damp proof course material.

UNIT III PROPERTIES OF FRESH CONCRETE AND HARDENED CONCRETE**9**

Properties of fresh concrete and hardened concrete -Workability of concrete - Test on fresh concrete –elastic segregation-bleeding – Test on hardened concrete-Strength of concrete in compression - Tension and flexure - properties of concrete - shrinkage of concrete - creep - thermal expansion - permeability - water tightness and crack control - Durability - thermal conductivity.

UNIT IV QUALITY CONTROL IN CONCRETE**9**

General - Frequency of sampling - Test specimen - statistical analysis of test results - standard deviation - Coefficient of variation - characteristic strength - acceptance and rejection criteria - quality control in concrete.

UNIT V SPECIAL CONCRETING METHODS**9**

Gap graded concrete - Light weight concrete- Heavy weight concrete - Prepacked concrete - Ready mixed concrete - vacuum concrete - concrete - fibre reinforced concrete - polymer Concrete - Geopolymer concrete-Self compacting concrete-Resin concretes - Ferro cement - High performance concrete - SIFCON- Vacuum Dewatering-Hot weather concreting and cold weather concreting.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- acquire and apply the fundamental knowledge of the fresh and hardened properties of concrete
- identify the functional role of raw materials and apply this knowledge to mix design philosophy.
- select the correct raw material components and mix design needed to formulate a concrete that meets prescribed specification requirements

- assessing the quality of concrete
- assess awareness of the utilization of special concretes

TEXT BOOKS

1. Shetty,M.S, "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2003
2. Santhakumar,A.R; "Concrete Technology", Oxford University Press, New Delhi, 2007

REFERENCES

1. Gupta.B.L.,Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
2. Gambir, M.L; "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007

WEB LINK

1. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=105104030>

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CO3	1	1	-	-	2	2	-	-	-	-	-	-	2	1
CO4	1	1	1	-	-	2	-	-	-	-	-	-	2	1
CO5	1	1	1	-	-	3	1	-	-	-	-	-	2	1



COURSE OBJECTIVES

- To gain knowledge about the geotechnical site investigation.
- To understand the types of foundation and design principles
- To gain knowledge of footings and special foundation
- To discuss different types of pile foundation and its capacity
- To study various earth pressure theories

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION**9**

Scope and objectives - Methods of exploration -Auguring and boring -Wash boring and rotary drilling- Depth and spacing of bore holes; **Soil samples** - Representative and undisturbed - Sampling methods - Split spoon sampler, Thin wall sampler, Stationary piston sampler ; Penetration tests (SPT and SCPT) - Data interpretation - Strength parameters and Evaluation of Liquefaction potential - Selection of foundation based on soil condition- Bore log report.

UNIT II SHALLOW FOUNDATION**9**

Introduction - Location and depth of foundation - Codal provisions - Bearing capacity of shallow foundation on homogeneous deposits -Terzaghi's formula and BIS formula- Factors affecting bearing capacity - Bearing capacity from in-situ tests (SPT, SCPT and plate load) - Allowable bearing pressure - Seismic considerations in bearing capacity evaluation; Determination of Settlement of foundations on granular and clay deposits - Total and differential settlement - Allowable settlements - Codal provision -Methods of minimizing total and differential settlements.

UNIT III FOOTINGS AND RAFTS**9**

Types of Isolated footing, Combined footing, Mat foundation - Contact pressure and settlement distribution - Proportioning of foundations for conventional rigid behavior - Minimum depth for rigid behavior - Applications - Floating foundation -Special foundations - Seismic force consideration - Codal provision

UNIT IV PILE FOUNDATION**9**

Types of piles and their functions - Factors influencing the selection of pile - Carrying capacity of single pile in granular and cohesive soil - Static formula - Dynamic formulae (Engineering news and Hileys) - Capacity from insitu tests (SPT and SCPT) - Negative skin friction - Uplift capacity- Group capacity by different methods (Feld's rule, Converse - Labarra formula and block failure criterion) - Settlement of pile groups - Interpretation of pile load test (routine test only)- Under reamed piles - Capacity under compression and uplift

UNIT V RETAINING WALLS**9**

Plastic equilibrium in soils - **Active and passive states** - Rankine's theory - Cohesion less and cohesive soil - Coulomb's wedge theory - Condition for critical failure plane - Earth pressure on retaining walls of simple configurations - Culmann Graphical method - Pressure on the wall due to line load -Stability analysis of retaining walls

TOTAL PERIODS 45

At the end of this course, the students will be able to

- conduct sub surface investigation and select foundation based on soil condition
- calculate bearing capacity of soil and settlement
- know contact pressure distribution below the footing
- describe the types of piles and their load carrying capacity
- check the stability of retaining wall

1. Murthy, V.N.S., “Soil Mechanics and Foundation Engineering”, CBS Publishers Distribution Ltd, New Delhi 2015
2. Arora, K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi 2011.
3. GopalRanjan and Rao, A.S.R., “ Basic and Applied Soil Mechanics” , New age Ltd. International Publisher New Delhi (India) 2006

1. Das, B.M. “Principles of Foundation Engineering” (Eighth edition), Thompson Asia Pvt. Ltd., Singapore, 2013.
2. Kaniraj, S.R. “Design aids in Soil Mechanics and Foundation Engineering”, Tata McGraw Hill publishing company Ltd., New Delhi, 2002.
3. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt.Ltd., New Delhi, 2005.
4. Venkatramaiah, C., “Geotechnical Engineering”, New Age International Publishers, New Delhi, 2007 (Reprint)
5. IS Code 6403: 1981 (Reaffirmed 1997) “Bearing capacity of shallow foundation”, Bureau of Indian Standards, New Delhi.
6. IS Code 1892 (1979): Code of Practice for subsurface Investigation for Foundations. Bureau of Indian Standards, New Delhi.

1. http://www.cdeep.iitb.ac.in/nptel/Civil%20Engineering/Foundation_Engineering/TOC-M1.htm
2. <http://elearning.vtu.ac.in/06CV64.html>
2. <http://aboutcivil.org/soil-mechanics/soil-mechanics-1-high.pdf>

[illegible]

ELECTIVE II

BA15151

PROFESSIONAL ETHICS AND HUMAN VALUES

3 0 0 3

COURSE OBJECTIVES

- To understand the basic human values of a professional.
- To discuss the significance of ethics in engineering and the theories related to it.
- To familiarize oneself with the role of engineers as responsible experimenters.
- To expose the students to their roles and responsibilities in assessing safety and reducing risks.
- To describe the global issues in ethics and role of engineers as manager and consultants.

UNIT I HUMAN VALUES

9

Morals, Values and Ethics - Integrity - Work Ethic - Service Learning - Civic Virtue - Respect for Others - Living Peacefully - caring - Sharing - Honesty - Courage - Valuing Time - Cooperation - Commitment - **Empathy - Self-Confidence** - Character - Spirituality.

UNIT II ENGINEERING ETHICS

9

Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas- moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy - Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES

9

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

TOTAL PERIODS 45

COURSE OUTCOMES

At the end of this course, the students will be able to

- describe the basic human values of a professional.
- understand the significance of ethics in engineering and the theories related to it.
- be familiar with the role of engineers as responsible experimenters.
- acquire knowledge about their roles and responsibilities in assessing safety and reducing risks.
- discuss the global issues in ethics and role of engineers as manager and consultants.

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics –Concepts and Cases",Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003).
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers",Oxford University Press, (2001).
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective",Biztantra, New Delhi, (2004).
4. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	-	3	2	2	1	2	-	-
CO2	-	-	-	-	-	2	-	3	2	2	1	2	-	-
CO3	-	-	-	-	-	2	-	3	2	2	1	2	-	-
CO4	-	-	-	-	-	2	-	3	2	2	1	2	-	-
CO5	-	-	-	-	-	2	-	3	2	2	1	2	-	-



COURSE OBJECTIVES

- To impart the concepts of remote sensing techniques and their concepts.
- To gain knowledge of various applications of resource significance.
- To develop knowledge about various interpretation and analysis.
- To understand the definition and importance of GIS.
- To interpret the applications of data models.

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL 9

Definition of remote sensing and its components - Electromagnetic spectrum - wave length regions important to remote sensing -Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law Atmospheric scattering, absorption - Atmospheric windows - spectral signature concepts - typical spectral reflective characteristics of water, vegetation and soil.

UNIT II PLATFORMS AND SENSORS 9

Types of platforms - orbit types, Sun-synchronous and Geosynchronous - Passive and Active sensors - resolution concept - Pay load description of important Earth Resources and Meteorological satellites - Airborne and spaceborne TIR and microwave sensors.

UNIT III IMAGE INTERPRETATION AND ANALYSIS 9

Types of Data Products - types of image interpretation - **basic elements of image interpretation** -visual interpretation keys - Digital Image Processing - Pre-processing - image enhancement techniques - multispectral image classification - Supervised and unsupervised.

UNIT IV GEOGRAPHIC INFORMATION SYSTEM 9

Introduction - Maps - Definitions - Map projections - types of map projections - map analysis - GIS definition- basic components of GIS - standard GIS softwares - Data type - Spatial and nonspatial (attribute) data- measurement scales - Data Base Management Systems (DBMS).

UNIT V DATA ENTRY, STORAGE AND ANALYSIS 9

Data models - vector and raster data - data compression - data input by digitization and scanning - attribute data analysis - integrated data analysis - Modeling in GIS Highway alignment studies - Land Information System.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- understand the principles of remote sensing techniques.
- identify the aid of remote sensing techniques
- analyse the image interpretation.
- analyse the RS and GIS data and interpret the data for modeling applications
- apply on data models and storage.

TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and J.W. Chipman. "Remote Sensing and Image Interpretation" 5th Edition., John Wiley and Sons Asia Pvt. Ltd., New Delhi, 2004.
2. Anji Reddy, M. "Textbook of Remote Sensing and Geographical Information System" 2nd edition. BS Publications, Hyderabad, 2001.

REFERENCES

1. Lo. C.P. and A.K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 2002
2. Peter A. Burrough, Rachael A. McDonnell, "Principles of GIS", Oxford University Press, 2000
3. Ian Heywood "An Introduction to GIS", Pearson Education Asia, 2000

WEB LINKS

1. <http://www.sciencedirect.com/science/article/pii/S0273117783901072>
2. <http://www.geol-amu.org/notes/b8-4-2.html>

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	-	-	-	-	-	-	-	-	-	-	-	-	2	2
CO3	1	-	-	-	-	-	-	-	3	3	-	-	2	2
CO4	1	-	2	-	-	-	-	-	-	-	1	2	2	2
CO5	2	2	2	2	3	-	-	-	2	3	-	-	2	2



COURSE OBJECTIVES

- To understand the basic types of irrigation, irrigation standards.
- To study the crop water essentiality and uses.
- To study the design of various canal structures.
- To acquire knowledge of canal irrigation.
- To understand the various issues connected with irrigation and water management.

UNIT I IRRIGATION PRINCIPLES**9**

Need for irrigation - Advantages and ill effects - **Development of irrigation** - National Water Policy - Tamil Nadu scenario - Physical properties of soil that influence soil moisture characteristics - **Concept of soil water potential and its components**; Gravitational and Osmotic pressures- Retention of water in soils - Concept of available water - Movement of water into and within the soils - Measurement of soil moisture content.

UNIT II CROP WATER REQUIREMENT**9**

Necessity and importance- **Crop and crop seasons in India** -Duty, Delta, Base Period- Factors affecting Duty- Irrigation efficiencies- Consumptive use of water-**Irrigation requirements of crops** - Standards for irrigation water- Planning and Development of irrigation projects.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES**9**

Head works -Weirs and Barrages -Types of impounding structures - Factors affecting, location of dams -Forces on a dam -**Design of Gravity dams**; Earth dams, Arch dams - Spillways -Energy dissipaters.

UNIT IV CANAL IRRIGATION**9**

Classification of canals- **Alignment of canals** - **Design of irrigation canals**- Regime theories - Canal Head works- Canal regulators - Canal drops - Cross drainage works - Canal Outlets, Escapes -Lining and maintenance of canals -Other methods of Irrigation: Surface, Subsurface - Merits and Demerits.

UNIT V IRRIGATION WATER MANAGEMENT**9**

Modernization techniques - **Rehabilitation** - **Command Area Development** - Systems of rice intensification - Water delivery systems - Participatory Irrigation Management - Farmers organization and turn over - Water users' associations - Economic aspects of irrigation.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- select suitable method of irrigation.
- assess the irrigation needs of crops.
- select and design suitable type of dam based on the requirement.
- design various types of canal structures.
- provide solutions to various issues related to irrigation and water management.

TEXT BOOKS

1. Punima B.C. & Pande B.B. Lal Irrigation and Water Power Engineering, Laxmi Publishing, New Delhi 2007
2. S.R. Sahasrabudhe, "Irrigation Engineering and Hydraulic Structures" S.K. Kataria & Sons, New Delhi, 2012

REFERENCES

1. Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
2. Basak, N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co, New Delhi, 2008.
3. Sharma R.K., "Irrigation Engineering", S.Chand & Co. 2007.
4. Michael, A.M., "Irrigation Engineering", Vikas Publishers, New Delhi, 2008.

WEB LINKS

1. <http://enotesweekly.blogspot.com> > 2011/11 > irrigation-engineering
2. <http://npdp.stanford.edu> > principles of irrigation engineering
2. <http://new1.dli.ernet.in> > data1 > upload > insa > INSA 1

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	2	2	-	-	-	-	-	2	-
CO2	-	2	2	1	-	-	-	-	-	-	-	-	2	-
CO3	3	2	2	1	-	-	-	-	-	-	2	-	2	3
CO4	3	2	2	1	-	-	-	-	-	-	2	-	2	3
CO5	-	-	-	2	-	-	-	-	-	-	-	-	2	3



COURSE OBJECTIVES

- To study the various water resources of India and Tamilnadu.
- To understand the statistical techniques in network design.
- To describe the necessity of estimation of water resources.
- To impart required knowledge about reservoir planning and management.
- To understand economic analysis including irrigation and irrigation management practices

UNIT I GENERAL 9

Water resources survey - Water resources of India and Tamilnadu - Description of water resources planning Economics of water resources planning, physical and socio economic data -National Water policy -Collection of meteorological and hydrological data for water resources development.

UNIT II NETWORK DESIGN 9

Hydrologic measurements - Analysis of Hydrologic station network - Station network design - Statistical techniques in network design.

UNIT III WATER RESOURCE NEEDS 9

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality - Scope and aims of master plan - Concept of basin as a Unit for development - Water budget and development plan.

UNIT IV RESERVOIR PLANNING AND MANAGEMENT 9

Reservoir - Single and multipurpose - Multi objective - Fixation of Storage capacity - Strategies for reservoir operation - Sedimentation of reservoir - Design flood-levees and flood walls - Channel improvement

UNIT V ECONOMIC ANALYSIS 9

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques - Computer Applications.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain knowledge of various water resources of India and Tamilnadu.
- get knowledge of the network design.
- develop knowledge of estimation of water resources.
- acquire skills in planning, design, operation and management of reservoir system.
- describe about economic analysis.

TEXT BOOKS

1. Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.
2. Douglas J.L. and Lee R.R, "Economics of Water Resources Planning", New Age International Publishers.

REFERENCES

1. Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc, New Delhi, 1997.
2. Goodman Alvin S., "Principles of Water Resources Planning", Prentice-Hall, 1984. Maass et al. Design of Water Resources Systems, Macmillan, 1968

WEB LINKS

1. <http://nptel.ac.in/downloads105105110/>

CO PO MAPPING:

Mapping of course objectives with Programme Outcome(1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	1	2	-	1	-	-	-	-	-	-	-	-	2	3
C02	1	2	-	1	-	-	-	-	-	-	-	-	2	3
C03	2	2	-	1	-	-	-	-	-	-	-	-	2	3
C04	2	2	3	1	-	-	-	-	-	-	-	-	2	3
C05	2	2	-	1	-	-	-	-	-	-	-	-	2	2



COURSE OBJECTIVES

- To create awareness of requirements of irrigation system.
- To understand of irrigation scheduling.
- To understand various issues connected with irrigation and water management.
- To study the various operations of canal structures.
- To understand the importance of involvement of stakeholders.

UNIT I IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems - supply and demand of water - cropping pattern - crop rotation - crop diversification - estimation of total and peak crop water requirements - effective and dependable rainfall - irrigation efficiencies.

UNIT II IRRIGATION SCHEDULING 9

Time of irrigation - Critical stages of water need of crops - Criteria for scheduling irrigation - Frequency and Interval of irrigation.

UNIT III MANAGEMENT 9

Structural and non-structural strategies in water use and management - Conjunctive use of surface and ground Waters - Quality of irrigation water.

UNIT IV OPERATION 9

Operational plans - Main canals, laterals and field channels - Water control and regulating structures - Performance indicators - Case study.

UNIT V INVOLVEMENT OF STAKE HOLDERS 9

Farmer's participation in system operation - water user's associations - farmer councils - changing paradigms on irrigation management - Participatory irrigation management with a case study.

TOTAL PERIODS 45**COURSE OUTCOMES**

At the end of this course, the students will be able to

- gain knowledge of the requirement of irrigation system.
- select suitable method of irrigation scheduling.
- create awareness about effective usage of irrigation water.
- gain knowledge of various regulating structures.
- gain knowledge about involvement of stakeholders.

TEXT BOOKS

1. Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
2. Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009
3. Dilip Kumar Maiumdar, "Irrigation Water Management – Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2000.

REFERENCES

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.
2. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
3. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 1994.
4. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi.

WEB LINKS

1. <http://www.scielo.cl/pdf/chiljar/v69s1/AT03.pdf>
2. <https://pdfs.semanticscholar.org/a74f/b5cf58c7e6fbf545bf995b1cb84f10e201e1.pdf>
3. <http://nptel.ac.in/downloads/105105110/>

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	3	2	-	-	-	-	-	-	2	-	-	3
CO2	-	2	3	2	-	-	-	-	-	-	2	-	-	3
CO3	-	2	3	2	-	-	-	-	-	-	3	-	-	3
CO4	-	2	3	2	-	-	-	-	-	-	2	-	-	3
CO5	-	2	3	2	-	-	-	-	-	-	3	-	-	2



COURSE OBJECTIVES

- Design and draw the coagulation and sedimentation tank in detail which showing the plan, elevation and sections.
- Design and draw the rapid sand filter in detail which showing the plan, elevation and sections.
- Design and draw the syphon aqueduct in detail which showing the plan, elevation and sections.
- Design and draw the canal drop, canal regulator in detail which showing the plan, elevation and sections.

LIST OF EXPERIMENTS**PART A : ENVIRONMENTAL ENGINEERING**

1. Design and Drawing of coagulation and sedimentation tank.
2. Design and Drawing of rapid sand filter
3. Design and Drawing of screen chamber and grit chamber.
4. Design and Drawing of septic tank.
5. Design and Drawing of activated sludge process.
6. Design and Drawing of trickling filter.

PART B : IRRIGATION ENGINEERING

7. Design and Drawing of tank sluice with tower head.
8. Design and Drawing of tank surplus weir.
9. Design and Drawing of canal drop.
10. Design and Drawing of canal regulator cum foot path.
11. Design and Drawing of syphon aqueduct.

TOTAL PERIODS 60**COURSE OUTCOMES**

Upon the completion of the course, students will be able to

- design and draw coagulation and sedimentation tank structures.
- design and draw rapid sand.
- design and draw canal drop, canal regulator.
- design and draw syphon aqueduct.

REFERENCES

1. Mohanakrishnan. A, "A few Novel and Interesting Innovative Irrigation Structures: Conceived, Designed and Executed in the Plan Projects in Tamil Nadu", Publ. No. 44 and Water Resources Development & Management Publ.No.43, IMTI Thuvakudy, Trichy, 2011.
2. Raghunath, H.M. "Irrigation Engineering", Wiley India Pvt. Ltd., New Delhi, 2011.

3. Sharma R.K., "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002.
4. SatyaNarayana Murthy Challa, "Water Resources Engineering: Principles and Practice", New Age International Publishers, New Delhi, 2002.
5. Garg, S.K., "Irrigation Engineering and Design of Structures", New Age International Publishers, New Delhi, 1997.
5. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999.

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong,2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO2	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO3	2	1	2	-	-	2	3	-	-	-	-	2	1	2
CO4	2	1	2	-	-	2	3	-	-	-	-	2	1	2



COURSE OBJECTIVES

- To gain knowledge of various tests of coarse aggregate.
- To explain about various workability tests on fresh concrete.
- To find out the strength parameters of hardened concrete.
- To gain knowledge about the quality of different bitumen mixes.

LIST OF EXPERIMENTS**I TESTS ON FRESH CONCRETE**

1. Slump cone test
2. Flow table
3. Compaction factor
4. Vee bee test

II TESTS ON HARDENED CONCRETE

1. Compressive strength - Cube & Cylinder
2. Flexure test
3. Modulus of Elasticity

III TESTS ON BITUMEN

1. Penetration
2. Softening Point
3. Ductility
4. Viscosity
5. Elastic Recovery

IV TESTS ON AGGREGATES

1. Soundness
2. Proportioning of Aggregates
3. Water Absorption
4. Fineness modulus of aggregate
5. Impact strength
6. Crushing strength

V TESTS ON BITUMINOUS MIXES (DEMONSTRATION ONLY)

1. Determination of Binder Content
2. Marshall Stability and Flow values
3. Specific Gravity
4. Density

TOTAL PERIODS 60

COURSE OUTCOMES

At the end of this course, the students will be able to

- assess the quality of coarse aggregate used in concrete.
- do various workability tests on fresh concrete.
- ensure the strength characteristics of the given concrete.
- check the existing quality of conventional bituminous roads and constituent materials with the help of the modern state of art equipment.

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	3	-	-	-	-	-	-	-	-	2	2
CO2	1	2	-	3	-	-	-	-	-	-	-	-	2	2
CO3	1	2	-	3	-	-	-	-	-	-	-	-	2	2
CO4	1	2	-	3	-	-	-	-	-	-	1	-	2	2



COURSE OBJECTIVES

To enable the students to

- gain knowledge on survey field techniques
- Know the basic concepts of advanced equipment.
- Apply to solve the description to engineering and surveying activities.
- Learn the various methods of surveying to solve the real world problems.

SYLLABUS

Two weeks survey camp will be conducted during winter vacation to expose on field surveying such as

1. Triangulation,
2. Vertical control by spirit leveling
3. Contouring.

COURSE OUTCOMES

At the end of this course, the students will be able to

- attain practical knowledge on handling survey instruments.
- Determine L.S and C.S by using advanced equipment.
- Understand the surveying techniques in field.
- Prepare contour map for given area.

CO PO MAPPING:

Mapping of course objectives with Programme Outcomes: (1/2/3 indicates strength of correlation) 3- strong, 2-Medium, 1-Weak														
Cos	Programme Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	1	-	3	-	1	1	-	-	-	-	3	-
CO2	-	2	1	-	3	-	-	1	-	-	-	-	3	-
CO3	-	2	1	-	3	-	-	2	-	-	-	-	3	-
CO4	-	2	1	1	2	-	-	1	-	-	-	-	3	-



14.	Blains Apparatus	1
15.	Los - Angeles abrasion testing machine	1
16.	Marshall Stability Apparatus	1

CE6701 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:

- The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures to the students. Different types of dynamic loading also to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the focus of the course.

UNIT I THEORY OF VIBRATIONS

9

Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM

9

Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

UNIT III ELEMENTS OF SEISMOLOGY

9

Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Estimation of earthquake parameters - Magnitude and intensity of earthquakes – Spectral Acceleration.

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE

9

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V DESIGN METHODOLOGY

9

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Later load analysis – Design and detailing as per IS:13920 – 1993.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course, student will have the knowledge to analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXTBOOKS:

- Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.
- Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007

REFERENCES:

- Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York, 1964
- Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009
- Paz, M. and Leigh.W. "Structural Dynamics – Theory & Computation", 4th Edition, CBS Publishers & Distributors, Shahdara, Delhi, 2006.

14.	Blains Apparatus	1
15.	Los - Angeles abrasion testing machine	1
16.	Marshall Stability Apparatus	1

CE6701 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:

- The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures to the students. Different types of dynamic loading also to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the focus of the course.

UNIT I THEORY OF VIBRATIONS

9

Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM

9

Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

UNIT III ELEMENTS OF SEISMOLOGY

9

Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Estimation of earthquake parameters - Magnitude and intensity of earthquakes – Spectral Acceleration.

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE

9

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V DESIGN METHODOLOGY

9

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Later load analysis – Design and detailing as per IS:13920 – 1993.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course, student will have the knowledge to analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions.

TEXTBOOKS:

- Chopra, A.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.
- Agarwal. P and Shrikhande. M., "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2007

REFERENCES:

- Biggs, J.M., "Introduction to Structural Dynamics", McGraw Hill Book Co., New York, 1964
- Dowrick, D.J., "Earthquake Resistant Design", John Wiley & Sons, London, 2009
- Paz, M. and Leigh.W. "Structural Dynamics – Theory & Computation", 4th Edition, CBS Publishers & Distributors, Shahdara, Delhi, 2006.

OBJECTIVES:

- To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear.

UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9

Basic concepts – Advantages – Materials required – Systems and methods of prestressing – Analysis of sections – Stress concept – Strength concept – Load balancing concept – Effect of loading on the tensile stresses in tendons – Effect of tendon profile on deflections – Factors influencing deflections – Calculation of deflections – Short term and long term deflections - Losses of prestress – Estimation of crack width.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per I.S.1343 Code – Design of sections of Type I and Type II post-tensioned and pre-tensioned beams – Check for strength limit based on I.S. 1343 Code – Layout of cables in post-tensioned beams – Location of wires in pre-tensioned beams – Design for shear based on I.S. 1343 Code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel's method, Guyon's method and IS1343 code – design of anchorage zone reinforcement – Check for transfer bond length in pre-tensioned beams.

UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Analysis and design of composite beams – Methods of achieving continuity in continuous beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tension and compression members – Tanks, pipes and poles – Partial prestressing – Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS**OUTCOMES:**

- Student shall have a knowledge on methods of prestressing and able to design various prestressed concrete structural elements.

TEXTBOOKS:

- Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
- Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributors Pvt. Ltd, 2012.

REFERENCES:

- Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
- Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
- Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
- IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

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- IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

OBJECTIVES:

- The student is exposed to different phases in Water Resources Management and National Water Policy. Further they will be imparted required knowledge on Reservoir planning, management and economic analysis including Irrigation and Irrigation management practices.

UNIT I WATER RESOURCES**9**

Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Estimation of water requirements for irrigation and drinking- Single and multipurpose reservoir – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Design flood-levees and flood walls.

UNIT II WATER RESOURCE MANAGEMENT**9**

Economics of water resources planning; – National Water Policy – Consumptive and non-consumptive water use - Water quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget- Conjunctive use of surface and ground water

UNIT III IRRIGATION ENGINEERING**9**

Need – Merits and Demerits – Duty, Delta and Base period – Irrigation efficiencies – Crops and Seasons - Crop water Requirement – Estimation of Consumptive use of water.

UNIT IV CANAL IRRIGATION**9**

Types of Impounding structures: Gravity dam – Diversion Head works - Canal drop – Cross drainage works – Canal regulations – Canal outlets – Canal lining - Kennady's and Lacey's Regime theory

UNIT V IRRIGATION METHODS AND MANAGEMENT**9**

Lift irrigation – Tank irrigation – Well irrigation – Irrigation methods: Surface and Sub-Surface and Micro Irrigation - Merits and demerits – Irrigation scheduling – Water distribution – Participatory irrigation management with a case study

TOTAL :45 PERIODS**OUT COMES:**

- The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXTBOOKS:

- Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.
- Punmia B.C., et. al; Irrigation and water power Engineering, Laxmi Publications, 16th Edition, New Delhi, 2009
- Garg S. K., "Irrigation Engineering and Hydraulic structures", Khanna Publishers, 23rd Revised Edition, New Delhi, 2009

REFERENCES:

- Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2005
- Chaturvedi M.C., "Water Resources Systems Planning and Management", Tata McGraw-Hill Inc., New Delhi, 1997.
- Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
- Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
- Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.

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- Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
- Dilip Kumar Majumdar, "Irrigation Water Management", Prentice-Hall of India, New Delhi, 2008.
- Asawa, G.L., "Irrigation Engineering", New Age International Publishers, New Delhi, 2000.

OBJECTIVES:

- To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

UNIT I ESTIMATE OF BUILDINGS**11**

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

UNIT II ESTIMATE OF OTHER STRUCTURES**10**

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

UNIT III SPECIFICATION AND TENDERS**8**

Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – TTT Act – e-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

UNIT IV VALUATION**8**

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

UNIT V REPORT PREPARATION**8**

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TOTAL : 45 PERIODS**OUTCOMES:**

- The student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student shall be able to prepare value estimates.

TEXTBOOKS:

- Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
- Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

REFERENCES:

- PWD Data Book.
- Tamilnadu Transparencies in Tender Act, 1998
- Arbitration and Conciliation Act, 1996
- Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 12

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads, lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost trade offs -Improving the Scheduling process – Introduction to application software.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem-The project Budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information -Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

TOTAL: 45 PERIODS

OUTCOMES:

- The student should be able to plan construction projects, schedule the activities using network diagrams, determine the cost of the project, control the cost of the project by creating cash flows and budgeting and to use the project information as decision making tool.

TEXTBOOKS:

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2005
2. Srinath, L.S., "Pert and CPM Principles and Applications", Affiliated East West Press, 2001

REFERENCES:

1. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Moder, J., Phillips, C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
3. Willis, E.M., "Scheduling Construction projects", John Wiley and Sons, 1986.
4. Halpin, D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.

CE6006 TRAFFIC ENGINEERING AND MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:

- To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 9

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

UNIT II TRAFFIC SURVEYS**10**

Traffic Surveys – Speed, journey time and delay surveys – Vehicles – Volume Survey including non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

UNIT III TRAFFIC DESIGN AND VISUAL AIDS**10**

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals — Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

UNIT IV TRAFFIC SAFETY AND ENVIRONMENT**8**

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

UNIT V TRAFFIC MANAGEMENT**8**

Area Traffic Management System - Traffic System Management (TSM) with IRC standards — Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods – Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

TOTAL: 45 PERIODS**OUTCOMES:**

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems

TEXTBOOKS:

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
3. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd.1996.

REFERENCES:

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesley Publishing Company, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", University of Brimingham, Peragamon Press Ltd, 2005
6. Taylor MAP and Young W, "Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.

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OBJECTIVES:

- The objective of the course is to train the students to have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects. The course focuses on cost effective construction materials and methods. Emphasis is given on the principles of sustainable housing policies and programmes.

UNIT I INTRODUCTION TO HOUSING**10**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES**10**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS**9**

Formulation of Housing Projects – Land Use and Soil suitability analysis -Building Byelaws and Rules and Development Control Regulations - Site Analysis, Layout Design, Design of Housing Units (Design Problems) – Housing Project Formulation.

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS**8**

New Constructions Techniques – Cost Effective Modern Materials and methods of Construction- Green building concept- Building Centers – Concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL**8**

Evaluation of Housing Projects for sustainable principles – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy- Public Private Partnership Projects – Viability Gap Funding - Pricing of Housing Units (Problems).

TOTAL: 45 PERIODS**OUTCOMES:**

- The students should have a comprehensive knowledge of planning, design, evaluation, construction and financing of housing projects.

TEXTBOOKS:

- Meera Mehta and Dinesh Mehta, "Metropolitan Housing Markets", Sage Publications Pvt. Ltd., New Delhi, 1999.
- Francis Cherunilam and Odeyar D Heggade, "Housing in India", Himalaya Publishing House, Bombay, 1997.

REFERENCES:

- Wiley- Blackwell, "Neufert Architects" Data, 4th Edition, Blackwell Publishing Ltd, 2012
- Donald Watson and Michael J.Crosbie, "Time Saver Standards for Architectural Design", 8th Edition, Tata McGraw Hill Edition, 2011
- Walter Martin Hosack, "Land Development Calculations", McGraw Hill 2nd Edition, USA 2010
- Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2004.
- UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS Habitat, Nairobi, 1994
- Government of India, National Housing Policy, 1994

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- Government of India, National Housing Policy, 1994

OBJECTIVES:

- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
- To understand the techniques of development and management of groundwater.

UNIT I HYDROGEOLOGICAL PARAMETERS**9**

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation– Ground water table fluctuation and its interpretations – Groundwater development and Potential in India – GEC norms.

UNIT II WELL HYDRAULICS**9**

Objectives of Groundwater hydraulics – Darcy's Law - Groundwater equation – steady state flow - Dupuit Forchheimer assumption - Unsteady state flow - Theis method - Jacob method - Slug tests - Image well theory – Partial penetrations of wells.

UNIT III GROUNDWATER MANAGEMENT**9**

Need for Management Model – Database for groundwater management – groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration gallery.

UNIT IV GROUNDWATER QUALITY**9**

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

UNIT V GROUNDWATER CONSERVATION**9**

Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students will be able to understand aquifer properties and its dynamics after the completion of the course. It gives an exposure towards well design and practical problems of groundwater aquifers.
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts.

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES:

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.

OBJECTIVES:

- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
- To understand the techniques of development and management of groundwater.

UNIT I HYDROGEOLOGICAL PARAMETERS**9**

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation– Ground water table fluctuation and its interpretations – Groundwater development and Potential in India – GEC norms.

UNIT II WELL HYDRAULICS**9**

Objectives of Groundwater hydraulics – Darcy's Law - Groundwater equation – steady state flow - Dupuit Forchheimer assumption - Unsteady state flow - Theis method - Jacob method - Slug tests - Image well theory – Partial penetrations of wells.

UNIT III GROUNDWATER MANAGEMENT**9**

Need for Management Model – Database for groundwater management – groundwater balance study – Introduction to Mathematical model – Conjunctive use – Collector well and Infiltration gallery.

UNIT IV GROUNDWATER QUALITY**9**

Ground water chemistry - Origin, movement and quality - Water quality standards – Health and aesthetic aspects of water quality - Saline intrusion – Environmental concern and Regulatory requirements

UNIT V GROUNDWATER CONSERVATION**9**

Artificial recharge techniques – Remediation of Saline intrusion– Ground water management studies – Protection zone delineation, Contamination source inventory, remediation schemes - Ground water Pollution and legislation.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students will be able to understand aquifer properties and its dynamics after the completion of the course. It gives an exposure towards well design and practical problems of groundwater aquifers.
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts.

TEXTBOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

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1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
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OBJECTIVES:

- To introduce the student to the concept of Mathematical approaches for managing the water resources system.
- To make the students apply an appropriate system approach to optimally operate a water resource system.

UNIT I SYSTEM APPROACH

7

Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – scopes and steps in systems engineering.

UNIT II PHYSICAL AND SOCIO - ECONOMIC DATA

6

Collection, evaluation and processing – project appraisal – public involvement, master
Comprehensive and integrated planning of water resources project.

UNIT III LINEAR PROGRAMMING

10

Operation research - introduction - Problem Formulation-graphical solution- Simplex method – Sensitivity analysis - simple applications

UNIT IV DYNAMIC PROGRAMMING

11

Optimality criteria Stage coach problem – Bellman's optimality criteria Problem formulation and Solution - simple applications

UNIT V SIMULATION

11

Basic principles – Methodology and Philosophy – Model development – input and outputs – Deterministic simulation - simple applications

TOTAL: 45 PERIODS

OUTCOMES:

- The students will be exposed to the economical aspects and analysis of water resources systems by which they will get an idea of comprehensive and integrated planning of a water resources project.
- The students will develop skills in solving problems in operations research through LP, DP and Simulation techniques.

TEXTBOOK:

1. Vedula, S., and Majumdar, P.P. "Water Resources Systems" – Modeling Techniques and Analysis Tata McGraw Hill, 5th reprint, New Delhi, 2010.

REFERENCES:

1. Hall Warren, A. and John A. Dracup., "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998
2. Chadurvedi M.C., "Water resource Systems Planning and Management", Tata McGraw Hill inc., New Delhi, 1997
3. Taha H.A., "Operation Research", McMillan Publication Co., New York, 1995.
4. Maass A., Husfchimidt M.M., Dorfman R., Thomas H. A., Marglin S.A and Fair G. M., "Design of Water Resources System", Hardward University Press, Cambridge, Mass., 1995.
5. Goodman Aluvn S., "Principles of Water Resources Planning". Prentice Hall of India, 1984

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OBJECTIVES:

- Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 8

Introduction – Pavement as layered structure – Pavement types rigid and flexible. Resilient modulus - Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 10

Flexible pavement design factors influencing design of flexible pavement, Empirical - Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS 9

Cement concrete pavements factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 10

Pavement Evaluation - causes of distress in rigid and flexible pavements – Evaluation based on Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Raveling, Roughness, Skid Resistance. Structural Evaluation by Deflection Measurements - Pavement Serviceability index. - Pavement maintenance (IRC Recommendations only).

UNIT V STABILIZATION OF PAVEMENTS 8

Stabilisation with special reference book to highway pavements – Choice of stabilizers – Testing and field control Stabilisation for rural roads in India – use of Geosynthetics in roads.

TOTAL : 45 PERIODS**OUTCOMES:**

- Students will have adequate knowledge to design flexible and rigid pavements based on IRC guidelines. Further they know various techniques to evaluate performance of pavements.

TEXTBOOKS:

1. Wright P.H. "Highway Engineers", John Wiley and Sons, Inc., New York, 1996.
2. Khanna, S.K., Justo C.E.G. and Veeraragavan. A., "Highway Engineering", Nem Chand and Brothers, 10th Edition, Roorkee, 2014.
3. Kadiyali, L.R. 'Principles and Practice of Highway Engineering', Khanna tech.Publications, New Delhi, 1989.

REFERENCES:

1. Yoder, R.J. and Witchak M.W. "Principles of Pavement Design", John Wiley 2000.
2. IRC-37-001, The Indian roads Congress, Guidelines for the Design of Flexible Pavements, New Delhi, 2001
3. IRC 58-1998. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, New Delhi, 1991
4. Rajib B.Mallick, Tahar El-Korchi, "Pavement Engineering: Principles and Practice, 2nd Edition, CRC Press, 2013.

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OBJECTIVES:

- To impart knowledge on Environmental management and Environmental Impact Assessment.

UNIT I INTRODUCTION 8
Impact of development projects – Sustainable development- Need for Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA-Stages of EIA, Types of EIA

UNIT II METHODOLOGIES 9
Methods of EIA – Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives

UNIT III PREDICTION AND ASSESSMENT 9
Assessment of Impact on land, water, air, social & cultural activities and on flora & fauna- Mathematical models- Public participation

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN 9
Plan for mitigation of adverse impact on environment – Options for mitigation of impact on water, air, land and on flora & fauna - Addressing the issues related to the Project Affected People. Post project monitoring

UNIT V CASE STUDIES 10
EIA for infrastructure projects – Dams – Highways – Multi-storey Buildings – Water Supply and Drainage Projects – Waste water treatment plants, STP.

TOTAL : 45 PERIODS

OUTCOMES:

The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

1. Canter, R.L., "Environmental Impact Assessment", McGraw Hill Inc., New Delhi, 1996.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.

REFERENCES:

1. John G. Rau and David C Hooten "Environmental Impact Analysis Handbook", McGraw Hill Book Company, 1990.
2. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

CE6023

INDUSTRIAL WASTE MANAGEMENT

**L T P C
3 0 0 3**

OBJECTIVES:

- To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control

UNIT I INTRODUCTION 8
Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage

treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II CLEANER PRODUCTION 8

Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.

UNIT III POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts

UNIT IV TREATMENT TECHNOLOGIES 11

Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering – Disposal

UNIT V HAZARDOUS WASTE MANAGEMENT 9

Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- an insight into the pollution from major industries including the sources and characteristics of pollutants
- ability to plan minimization of industrial wastes
- ability to design facilities for the processing and reclamation of industrial waste water

TEXTBOOKS:

1. Rao M. N. & Dutta A. K. , "Wastewater Treatment", Oxford - IBH Publication, 1995.
2. Eckenfelder W.W. Jr., "Industrial Water Pollution Control", McGraw Hill Book Company, New Delhi, 2000.
3. Patwardhan. A.D., "Industrial Wastewater Treatment", Prentice Hall of India, New Delhi 2010.

REFERENCES:

1. Shen T.T., "Industrial Pollution Prevention", Springer, 1999.
2. Stephenson R.L. and Blackburn J.B., Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New York, 1998
3. Freeman H.M., "Industrial Pollution Prevention Hand Book", McGraw Hill Inc., New Delhi, 1995.
4. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw Hill, 2000.
5. Pandey, "Environmental Management" Vikas Publications, 2010.
6. Industrial Wastewater Management, Treatment and Disposal", (WEF - MOP - FD3) McGraw Hill, 2008.

CE6011

AIR POLLUTION MANAGEMENT

**L T P C
3 0 0 3**

OBJECTIVES:

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

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS

9

UNIT II	DISPERSION OF POLLUTANTS	9
Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.		

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

Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

- an understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- ability to identify, formulate and solve air and noise pollution problems
- ability to design stacks and particulate air pollution control devices to meet applicable standards.

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

1. Heumann. W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New York, 1997.
2. Mahajan S.P., "Pollution Control in Process Industries", Tata McGraw Hill Publishing Company, New Delhi, 1991.
3. Peavy S.W., Rowe D.R. and Tchobanoglous G. "Environmental Engineering", McGraw Hill, New Delhi, 1985.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 1998
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6. Thod Godesh, "Air Quality, Lewis India Edition, 2013.

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UNIT V CASE STUDIES 10
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TOTAL : 45 PERIODS

OUTCOMES:

The students completing the course will have ability to

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CE6023

INDUSTRIAL WASTE MANAGEMENT

**L T P C
3 0 0 3**

OBJECTIVES:

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UNIT I INTRODUCTION 8
Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage

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UNIT II CLEANER PRODUCTION 8
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UNIT V HAZARDOUS WASTE MANAGEMENT 9
Hazardous wastes - Physico chemical treatment – solidification – incineration – Secure land fills
TOTAL: 45 PERIODS

OUTCOMES:

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CE6011

AIR POLLUTION MANAGEMENT

**L T P C
3 0 0 3**

OBJECTIVES:

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

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9

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OBJECTIVES:

- To make the students conversant with different aspects of the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

UNIT I SOURCES AND TYPES**8**

Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization; Effects of improper disposal of solid wastes-Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – Municipal solid waste (M&H) rules – integrated management-Public awareness; Role of NGO's.

UNIT II ON-SITE STORAGE AND PROCESSING**8**

On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling.

UNIT III COLLECTION AND TRANSFER**8**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower– Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems- solving.

UNIT IV OFF-SITE PROCESSING**12**

Objectives of waste processing – Physical Processing techniques and Equipments; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

UNIT V DISPOSAL**9**

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor– Dumpsite Rehabilitation

TOTAL: 45 PERIODS**OUTCOMES:**

The students completing the course will have

- an understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management
- ability to plan waste minimisation and design storage, collection, transport, processing and disposal of municipal solid waste

TEXTBOOKS:

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues". McGraw Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000

REFERENCES:

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001
3. Manser A.G.R. and Keeling A.A.," Practical Handbook of Processing and Recycling of Municipal solid Wastes", Lewis Publishers, CRC Press, 1996
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4. George Tchobanoglous and Frank Kreith "Handbook of Solidwaste Management", McGraw Hill, New York, 2002

OBJECTIVES:

- At the end of the course student is expected to identify the problematic soil and suitable suggest remedial measures to improve their behaviour.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 8

Role of ground improvement in foundation engineering – methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 10

Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two – dimensional flow for fully and partially penetrated slots in homogeneous deposits - Simple cases - Design.

UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 10

Insitu densification of cohesion-less soils and consolidation of cohesive soils: Dynamic compaction Vibroflotation, Sand compaction piles and deep compaction. Consolidation: Preloading with sand drains, and fabric drains, Stone columns and Lime piles-installation techniques – simple design - relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – simple design - applications of reinforced earth. Role of Geotextiles in filtration, drainage, separation, road works and containment.

UNIT V GROUT TECHNIQUES 8

Types of grouts – Grouting equipments and machinery – injection methods – Grout monitoring – stabilization with cement, lime and chemicals – stabilization of expansive soil.

TOTAL: 45 PERIODS**OUTCOMES:**

- Student will be in a position to identify and evaluate the deficiencies if any in the deposits of a project area and capable of providing alternate methods to improve its character suitable to the project so that the structures built will be stable and serve.

TEXTBOOKS:

- Purushothama Raj. P, "Ground Improvement Techniques", Firewall Media, 2005.
- Koerner, R.M. "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill, 1994.
- Mittal.S, "An Introduction to Ground Improvement Engineering", Medtech Publisher, 2013.

REFERENCES:

- Moseley, M.P., "Ground Improvement Blockie Academic and Professional", Chapman and Hall, Glasgow, 1998.
- Jones J.E.P. "Earth Reinforcement and Soil Structure", Butterworths, London, 1985.
- Winterkorn, H.F. and Fang, H.Y. "Foundation Engineering Hand Book". Van Nostrand Reinhold, 1994.
- Das, B.M. – "Principles of Foundation Engineering" 7th edition, Cengage learning, 2010.
- Coduto, D.P. "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt.Ltd. New Delhi, 2011.
- Koerner, R.M. "Designing with Geosynthetics" 4th Edition, Prentice Hall, Jersey, 1999.
- IS9759 : 1981 "Guidelines for Dewatering During Construction", Bureau of Indian Standards, New Delhi, Reaffirmed 1999
- IS15284(Part 1) : 2003 "Design and Construction for Ground Improvement – Guidelines" (Stone Column), Bureau of Indian Standards, New Delhi, 2003

OBJECTIVES:

- To provide the student with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with the ability to do rate analysis, valuation of properties and preparation of reports for estimation of various items.

UNIT I ESTIMATE OF BUILDINGS**11**

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

UNIT II ESTIMATE OF OTHER STRUCTURES**10**

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

UNIT III SPECIFICATION AND TENDERS**8**

Data – Schedule of rates – Analysis of rates – Specifications – sources – Preparation of detailed and general specifications – Tenders – TTT Act – e-tender – Preparation of Tender Notice and Document – Contracts – Types of contracts – Drafting of contract documents – Arbitration and legal requirements.

UNIT IV VALUATION**8**

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease

UNIT V REPORT PREPARATION**8**

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

TOTAL : 45 PERIODS**OUTCOMES:**

- The student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. Student shall be able to prepare value estimates.

TEXTBOOKS:

- Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
- Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

REFERENCES:

- PWD Data Book.
- Tamilnadu Transparencies in Tender Act, 1998
- Arbitration and Conciliation Act, 1996
- Standard Bid Evaluation Form, Procurement of Goods or Works, The World Bank, April 1996.

OBJECTIVES:

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

LIST OF EXPERIMENTS:

- Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details
- Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
- Design and drafting of circular and rectangular RCC water tanks
- Design of plate Girder Bridge - Truss Girder bridges – Detailed Drawings including connections
- Design of hemispherical bottomed steel tank

TOTAL: 60 PERIODS**OUTCOMES:**

- At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

TEXTBOOKS:

- Krishnaraju, N. "Structural Design & Drawing, Universities Press, 2009.
- Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

- Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III, CBS Publishers, 2010.
- Shah V L and Veena Gore, "Limit State Design of Steel Structures" IS800-2007, Structures Publications, 2009.

EXAMINATION DURATION: 3 HOURS**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

Sl. No.	Description of Equipment	Quantity
1.	Models of Structures	1 each
2.	Computers Pentium IV	30 Nos
3.	Analysis and Design Software - Minimum 5 use License	1 No

OBJECTIVES:

- The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than four. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

TOTAL: 60 PERIODS

OBJECTIVES:

- To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

LIST OF EXPERIMENTS:

- Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details
- Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
- Design and drafting of circular and rectangular RCC water tanks
- Design of plate Girder Bridge - Truss Girder bridges – Detailed Drawings including connections
- Design of hemispherical bottomed steel tank

TOTAL: 60 PERIODS**OUTCOMES:**

- At the end of the course the student acquires hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

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- Krishnaraju, N. "Structural Design & Drawing, Universities Press, 2009.
- Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

REFERENCES:

- Krishnamurthy, D., "Structural Design & Drawing – Vol. II and III, CBS Publishers, 2010.
- Shah V L and Veena Gore, "Limit State Design of Steel Structures" IS800-2007, Structures Publications, 2009.

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TOTAL: 60 PERIODS

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks : 20 marks
(Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report : 30 marks
(Evaluated by the external examiner appointed the University).
Every student belonging to the same group gets the same mark
3. Viva voce examination : 50 marks
(Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weightage)

Total: 100 marks

OUTCOMES:

- On completion of the design project students will have a better experience in designing various design problems related to Civil Engineering.

MG6851

PRINCIPLES OF MANAGEMENT

**LT P C
3 0 0 3**

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization .

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING

9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING

9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING

9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks : 20 marks
(Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report : 30 marks
(Evaluated by the external examiner appointed the University).
Every student belonging to the same group gets the same mark
3. Viva voce examination : 50 marks
(Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal Weightage)

Total: 100 marks

OUTCOMES:

- On completion of the design project students will have a better experience in designing various design problems related to Civil Engineering.

MG6851

PRINCIPLES OF MANAGEMENT

**LT P C
3 0 0 3**

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization .

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

9

Definition of Management – Science or Art – **Manager Vs Entrepreneur** - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - **Sole proprietorship, partnership, company-public and private sector enterprises** - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING

9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – **Strategic Management – Planning Tools and Techniques** – **Decision making steps and process.**

UNIT III ORGANISING

9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - **Human Resource Management – HR Planning**, Recruitment, selection, **Training and Development**, Performance Management , Career planning and management.

UNIT IV DIRECTING

9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – **leadership** – types and theories of leadership – communication – process of communication – barrier in communication – **effective communication –communication and IT.**

UNIT V CONTROLLING**9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – **Productivity problems and management** – control and performance – direct and preventive control – **reporting.**

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill, 1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999

CE6811**PROJECT WORK****L T P C**
0 0 12 6**OBJECTIVES:**

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and **prepares a comprehensive project report after completing the work to the satisfaction of the supervisor.** The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS**OUTCOMES:**

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

CE6001**HYDROLOGY****L T P C**

- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

REFERENCES

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

CE6013

BRIDGE STRUCTURES

**LT P C
3 0 0 3**

OBJECTIVES:

- To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

UNIT I INTRODUCTION

9

History of Bridges - Components of a Bridge and its definitions- Classification of Road Bridges - **Selection of Site and Initial Decision Process** - Survey and Alignment; **Geotechnical Investigations and Interpretations**. River Bridge: **Selection of Bridge site and planning** - Collection of Bridge design data - Hydrological calculation

Road Bridges - **IRC codes - Standard Loading for Bridge Design** - Influence lines for statically determinate structures - I.L. for statically indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs

Railway Bridges: **Loadings for Railway Bridges; Railroad data. Pre-design considerations;** - Railroad vs. Highway bridges.

UNIT II SUPERSTRUCTURES

9

Selection of main bridge parameters, **design methodologies** - Choices of superstructure types; Orthotropic plate theory, load + techniques - Grillage analysis - **Finite element analysis** - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge- Temperature Analysis-Distortional Analysis-**Effects of Differential settlement of supports-Reinforced earth structures**

UNIT III DESIGN OF STEEL BRIDGES

9

Design of Truss Bridges – **Design of Plate girder bridges.**

UNIT IV DESIGN OF RC AND PSC BRIDGES

9

Design of slab bridges – Girder bridges – PSC bridges

UNIT V SUBSTRUCTURE, BEARINGS AND DECK JOINTS, PARAPETS AND RAILINGS

9

Substructure - Pier; Abutment - Wing walls- **Importance of Soil-Structure Interaction** - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge- Continuous Bridge - Bearings and Deck Joints - **Different types of bridge bearings and expansion joints** - Parapets and Railings for Highway Bridges

TOTAL: 45 PERIODS

OUTCOMES:

- To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- To help the student develop an intuitive feeling about the sizing of bridge elements, ie., develop a clear understanding of conceptual design
- To understand the load flow mechanism and identify loads on bridges.
- To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements.

TEXTBOOKS:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Jagadeesh .T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013

REFERENCES:

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.
3. Rajagopalan. N. "Bridge Superstructure", Alpha Science International, 2006

CE6014**STORAGE STRUCTURES****LT P C
3 0 0 3****OBJECTIVES:**

- To introduce the student to basic theory and concepts of design of storage structures like steel and concrete tanks, bunkers and silos.

UNIT I STEEL WATER TANKS**9**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT II CONCRETE WATER TANKS**9**

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS**9**

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS**9**

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction

UNIT V PRESTRESSED CONCRETE WATER TANKS**9**

Principles of circular prestressing – Design of prestressed concrete circular water tanks

- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361]
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IAS and Sage Publishers, New Delhi, 2010.

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1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

CE6013

BRIDGE STRUCTURES

**LT P C
3 0 0 3**

OBJECTIVES:

- To make the student to know about various bridge structures, selection of appropriate bridge structures and design it for given site conditions.

UNIT I INTRODUCTION

9

History of Bridges - Components of a Bridge and its definitions- Classification of Road Bridges - Selection of Site and Initial Decision Process - Survey and Alignment; Geotechnical Investigations and Interpretations. River Bridge: Selection of Bridge site and planning - Collection of Bridge design data - Hydrological calculation

Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate structures - I.L. for statically indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs

Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations; - Railroad vs. Highway bridges.

UNIT II SUPERSTRUCTURES

9

Selection of main bridge parameters, design methodologies -Choices of superstructure types; Orthotropic plate theory, load + techniques - Grillage analysis - Finite element analysis - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.- Transverse Analysis of Bridge- Temperature Analysis-Distortional Analysis-Effects of Differential settlement of supports-Reinforced earth structures

UNIT III DESIGN OF STEEL BRIDGES

9

Design of Truss Bridges – Design of Plate girder bridges.

UNIT IV DESIGN OF RC AND PSC BRIDGES

9

Design of slab bridges – Girder bridges – PSC bridges

UNIT V SUBSTRUCTURE, BEARINGS AND DECK JOINTS, PARAPETS AND RAILINGS

9

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge- Continuous Bridge - Bearings and Deck Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

TOTAL: 45 PERIODS

OUTCOMES:

- To develop an understanding of an appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
- To help the student develop an intuitive feeling about the sizing of bridge elements, ie., develop a clear understanding of conceptual design
- To understand the load flow mechanism and identify loads on bridges.
- To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements.

TEXTBOOKS:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Jagadeesh .T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013

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2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.
3. Rajagopalan. N. "Bridge Superstructure", Alpha Science International, 2006

CE6014**STORAGE STRUCTURES****LT P C
3 0 0 3****OBJECTIVES:**

- To introduce the student to basic theory and concepts of design of storage structures like steel and concrete tanks, bunkers and silos.

UNIT I STEEL WATER TANKS**9**

Design of rectangular riveted steel water tank – Tee covers – Plates – Stays –Longitudinal and transverse beams – Design of staging – Base plates – Foundation and anchor bolts – Design of pressed steel water tank – Design of stays – Joints – Design of hemispherical bottom water tank – side plates – Bottom plates – joints – Ring girder – Design of staging and foundation.

UNIT II CONCRETE WATER TANKS**9**

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome – Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of under ground tanks – Design of base slab and side wall – Check for uplift.

UNIT III STEEL BUNKERS AND SILOS**9**

Design of square bunker – Jansen's and Airy's theories – IS Codal provisions – Design of side plates – Stiffeners – Hooper – Longitudinal beams – Design of cylindrical silo – Side plates – Ring girder – stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS**9**

Design of square bunker – Side Walls – Hopper bottom – Top and bottom edge beams – Design of cylindrical silo – Wall portion – Design of conical hopper – Ring beam at junction

UNIT V PRESTRESSED CONCRETE WATER TANKS**9**

Principles of circular prestressing – Design of prestressed concrete circular water tanks

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of the course the student shall be able to design concrete and steel material storage structures.

TEXTBOOKS:

1. Rajagopalan K., "Storage Structures", Tata McGraw Hill, New Delhi, 1998.
2. Krishna Raju N., "Advanced Reinforced Concrete Design", CBS Publishers and Distributors, New Delhi, 1998.

REFERENCES:

1. Punmia B.C, Ashok Kumar Jain, Arun K.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2006.
2. Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.

CE6015

TALL BUILDINGS

**L T P C
3 0 0 3**

OBJECTIVES:

- The design aspects and analysis methodologies of tall buildings will be introduced. The stability analysis of tall buildings is another important objective of this course.

UNIT I DESIGN CRITERIA AND MATERIALS

9

Development of High Rise Structures - General Planning Considerations - Design philosophies - Materials used for Construction - High Strength Concrete - High Performance Concrete - Self Compacting Concrete - Glass - High Strength Steel

UNIT II LOADING

9

Gravity Loading - Dead Load - Live Load - Live load reduction technique - Impact Load - Construction Load - Sequential Loading. Lateral Loading - Wind load - Earthquake Load. Combination of Loads.

UNIT III BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS

9

Factors affecting growth, Height and Structural form. High rise behaviour of Various structural systems - Rigid frames, braced frames, Infilled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger - braced and hybrid mega systems.

UNIT IV ANALYSIS AND DESIGN

9

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of buildings as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerised general three dimensional analysis.

UNIT V STABILITY OF TALL BUILDINGS

9

Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plumb effects, stiffness of member in stability, effect of foundation rotation.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of this course the student should have an understanding on the behaviour of tall buildings subjected to lateral building. The students should have knowledge about the rudimentary principles of designing tall buildings as per the existing codes.

TEXTBOOKS:

1. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
2. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.

REFERENCES:

1. Lin.T.Y, Stotes Burry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 1977.

CE6016

PREFABRICATED STRUCTURES

L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

UNIT I INTRODUCTION

9

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS

9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III DESIGN PRINCIPLES

9

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS

9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V DESIGN FOR ABNORMAL LOADS

9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

OUTCOMES:

- The student shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods in using these elements.

TEXTBOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009

1. Bryan Stafford Smith, Alex coull, "Tall Building Structures, Analysis and Design", John Wiley and Sons, Inc., 1991.
2. Taranath B.S., "Structural Analysis and Design of Tall Buildings", McGraw Hill, 2011.

REFERENCES:

1. Lin.T.Y, Stotes Burry.D, "Structural Concepts and systems for Architects and Engineers", John Wiley, 1988.
2. Lynn S.Beedle, "Advances in Tall Buildings", CBS Publishers and Distributors, Delhi, 1986.
3. Wolfgang Schueller "High Rise Building Structures", John Wiley and Sons, New York 1977.

CE6016

PREFABRICATED STRUCTURES

L T P C
3 0 0 3

OBJECTIVES:

- To impart knowledge to students on modular construction, industrialised construction and design of prefabricated elements and construction methods.

UNIT I INTRODUCTION

9

Need for prefabrication – Principles – Materials – Modular coordination – Standarization – Systems – Production – Transportation – Erection.

UNIT II PREFABRICATED COMPONENTS

9

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

UNIT III DESIGN PRINCIPLES

9

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT IV JOINT IN STRUCTURAL MEMBERS

9

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

UNIT V DESIGN FOR ABNORMAL LOADS

9

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL: 45 PERIODS

OUTCOMES:

- The student shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods in using these elements.

TEXTBOOKS:

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994

REFERENCES:

1. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009

OBJECTIVES:

- To make students aware of various measurement techniques and experimental planning and procedures adopted in laboratory.

UNIT I STRAIN GAUGES

9

Definition of Gauge length, sensitivity and range – Characteristics of an ideal strain gauge – Different types of mechanical strain gauges for use in metal and concrete specimens – Optical strain gauge – Acoustic strain gauge – Pneumatic strain gauge – Merits and demerits.

UNIT II ELECTRICAL STRAIN GAUGES

9

Inductance, capacitance and piezo-electric gauges – Bonded and unbonded resistance gauges and their application in stress analysis – Fixing technique and measurement of strains – Rosettes – Determination of principal strains using rosettes – Use of Murphy's construction for drawing circle of strains – Mohr's stress circle – Analytical solution.

UNIT III PHOTOELASTICITY

9

Principles – Maxwell's stress optic law – Plane and circularly polarised light and their use in photo elasticity – Polariscopes – Diffusion type, lense type and reflection type polariscopes – Isochromatics and Isoclinics – Model materials – Calibration methods for finding material fringe value – Model fringe value – Examples of beam flexure and diametrically loaded circular plates.

UNIT IV MODEL ANALYSIS

9

Direct and indirect models – Laws of structural similitude – Choice of scales – Limitation of model studies - Buckingham pi theorem – Dimensional analysis – Model materials – Begg's deformeter and its use in model analysis – Simple design of models for direct and indirect model analysis.

UNIT V BRITTLE COATINGS

9

Historical review – Stress Coat – Ceramic coatings – Application – Moire fringe method of stress analysis.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students will be able to select the appropriate strain gauges for strain measurements and they have sufficient knowledge in model analysis and predict the behaviour of prototypes.

TEXTBOOKS:

- T.K.Roy, "Experimental Analysis of Stress and Strains", S.Chand and Company Ltd., New Delhi, 2000
- Hetenyi. M., Hand Book of Experimental Stress Analysis, John Wiley and Sons Inc., New York, 1966

REFERENCES:

- J.W.Dally and W.F.Riley, "Experimental Stress Analysis", McGraw Hill Book, New York, 1990
- L.S. Srinath, "Experimental Stress Analysis", Tata-McGraw Hill Book Company, New Delhi, 2001.
- Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2004.

OBJECTIVES :

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

9

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UNIT I STRAIN GAUGES

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Definition of Gauge length, sensitivity and range – Characteristics of an ideal strain gauge – Different types of mechanical strain gauges for use in metal and concrete specimens – Optical strain gauge – Acoustic strain gauge – Pneumatic strain gauge – Merits and demerits.

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- L.S. Srinath, "Experimental Stress Analysis", Tata-McGraw Hill Book Company, New Delhi, 2001.
- Sadhu Singh, "Experimental Stress Analysis", Khanna Publishers, New Delhi, 2004.

OBJECTIVES :

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION

9

Introduction - Need for quality - Evolution of quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM - Quality statements - Customer focus - Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Costs of quality.

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors..

TOTAL: 45 PERIODS

OUTCOMES:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXTBOOK:

- Dale H. Besterfield, et al., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint, 2006.

REFERENCES:

- James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
- Suganthi. L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
- Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

GE 6084

HUMAN RIGHTS

L T P C

3 0 0 3

OBJECTIVES :

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I 9

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II 9

Evolution of the concept of Human Rights Magna carta – Geneva convention of 1864. Universal Declaration of Human Rights, 1948. Theories of Human Rights.

UNIT III	9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.	
UNIT IV	9
Human Rights in India – Constitutional Provisions / Guarantees.	
UNIT V	9
Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO's, Media, Educational Institutions, Social Movements.	
TOTAL : 45 PERIODS	

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi

CE6018	COMPUTER AIDED DESIGN OF STRUCTURES	LT P C 3 0 0 3
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OBJECTIVES:

- To introduce the students about computer graphics, structural analysis, design and optimization and expert systems, applications in analysis.

UNIT I	INTRODUCTION	9
Fundamental reason for implementing CAD - Software requirements – Hardware components in CAD system – Design process - Applications and benefits.		
UNIT II	COMPUTER GRAPHICS	9
Graphic Software – Graphic primitives - Transformations - 2 Dimensional and 3 Dimensional transformations – Concatenation - Wire frame modeling - Solid modeling - Graphic standards - Drafting packages – Auto CAD.		
UNIT III	STRUCTURAL ANALYSIS	9
Principles of structural analysis - Fundamentals of finite element analysis - Concepts of finite elements – Stiffness matrix formulation – Variational Method – Weighted residual method – Problems – Conditions of convergence of functions – Analysis packages and applications.		
UNIT IV	DESIGN AND OPTIMIZATION	9
Principles of design of steel and RC structures - Beams and Columns - Applications to simple design problems - Optimization techniques - Algorithms - Linear programming.		
UNIT V	EXPERT SYSTEMS	9
Introduction to artificial intelligence - Knowledge based expert systems – Applications of KBES- Rules and decision tables - Inference mechanisms - simple applications		
TOTAL: 45 PERIODS		

OUTCOMES:

- Students will be able to implement ideas of computer aided design with advantages and demerits.

TEXTBOOKS:

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 1993.

2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

REFERENCES:

1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
3. Richard Forsyth (Ed), "Expert System Principles and Case Studies", Chapman and Hall, London, 1989.

CE6019

INDUSTRIAL STRUCTURES

L T P C
3 0 0 3

OBJECTIVES:

- This course deals with some of the special aspects with respect to Civil Engineering structures in industries.

UNIT I PLANNING

9

Classification of industries and industrial structures – General requirements of various industries
– Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENTS

9

Lighting – Ventilation - Acoustics – Fire safety – Guidelines from factories act.

UNIT III DESIGN OF STEEL STRUCTURES

9

Industrial roofs – Crane girders – Mills buildings – Bunkers and Silos - Chimney.

UNIT IV DESIGN OF R.C. STRUCTURES

9

Corbels, Brackets and Nibs - Silos and bunkers –Chimney - Principles of folded plates and shell roofs

UNIT V PREFABRICATION

9

Principles of prefabrication – Prestressed precast roof trusses - Construction of roof and floor slabs - Wall panels.

TOTAL: 45 PERIODS

OUTCOMES:

- At the end of this course the student shall be able to design some of the structures used in industries.

TEXTBOOKS:

1. Ramamrutham.S., "Design of Reinforced Concrete Structures", Dhanpat Rai Publishing Company, 2007.
2. Varghese.P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India Eastern Economy Editions, 2nd Edition, 2003.
3. Bhavikatti.S.S., "Design of Steel Structures", J.K. International Publishing House Pvt.Ltd., 2009.

REFERENCES:

1. Henn W. "Buildings for Industry", Vol.I and II, London Hill Books, 1995
2. SP32-1986, Handbook on Functional Requirements of Industrial buildings, Bureau of Indian Standards, 1990
3. Structural Engineering Research Centre, Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Madras, 1982
4. Koncz.J., "Manual of Precast Construction", Vol.I and II, Bauverlay GMBH, 1971.

2. Krishnamoorthy C.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993

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1. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
2. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
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4. Koncz.J., "Manual of Precast Construction", Vol.I and II, Bauverlay GMBH, 1971.

OBJECTIVES:

- To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications.

UNIT I INTRODUCTION TO FINITE ELEMENT ANALYSIS AND FINITE ELEMENT FORMULATION TECHNIQUES 9

Introduction - Basic Concepts of Finite Element Analysis - Introduction to Elasticity - Steps in Finite Element Analysis - Virtual Work and Variational Principle - Galerkin Method- Finite Element Method: Displacement Approach - Stiffness Matrix and Boundary Conditions.

UNIT II ELEMENT PROPERTIES 9

Natural Coordinates - Triangular Elements - Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements -Isoparametric Formulation - Stiffness Matrix of Isoparametric Elements Numerical Integration: One, Two and Three Dimensional

UNIT III ANALYSIS OF FRAME STRUCTURES 9

Stiffness of Truss Members - Analysis of Truss - Stiffness of Beam Members - Finite Element Analysis of Continuous Beam - Plane Frame Analysis - Analysis of Grid and Space Frame.

UNIT IV FEM FOR TWO AND THREE DIMENSIONAL SOLIDS 9

Constant Strain Triangle - Linear Strain Triangle - Rectangular Elements - Numerical Evaluation of Element Stiffness -Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element -Finite Element Formulation of Axisymmetric Element -Finite Element Formulation for 3 Dimensional Elements

UNIT V APPLICATIONS OF FEM 9

Plate Bending Problems - Finite Elements for Elastic Stability - Finite Elements in Fluid Mechanics - Dynamic Analysis

TOTAL: 45 PERIODS**OUTCOMES:**

- Students will be in a position to develop computer codes for any physical problems using FE techniques.

TEXTBOOKS:

- Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Third Edition, Prentice Hall, India, 2003.
- Krishnamoorthy C. S. , "Finite Element Analysis Theory and Programming", Tata McGraw Hill Education, 1994
- David V. Hutton, "Fundamentals of Finite Element Analysis", Tata McGraw Hill, 2004
- Daryl L.Logan, "A First Course in Finite Element Method", Cengage Learning, 2012.

REFERENCES:

- Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill, Intl. Student Edition, 1985.
- Zienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4th Edition, McGraw-Hill, Book Co., 1987
- Rao S.S, "The Finite Element Method in Engineering", Pergaman Press, 2003.
- Desai C.S. and. Abel J.F, "Introduction to the Finite Element Method", Affiliated East West Press, 1972.
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- Cook R. D., "Concepts and Applications of Finite Element Analysis", Wiley and Sons, 1989.

OBJECTIVES:

- To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

UNIT I MAINTENANCE AND REPAIR STRATEGIES**9**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT II STRENGTH AND DURABILITY OF CONCRETE**9**

Quality assurance for concrete – Strength, Durability and Thermal properties, of concrete - Cracks, different types, causes – Effects due to climate, temperature, Sustained elevated temperature, Corrosion - Effects of cover thickness.

UNIT III SPECIAL CONCRETES**9**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS**9**

Non-destructive Testing Techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES**9**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, Leakage, earthquake – DEMOLITION TECHNIQUES - Engineered demolition methods - Case studies.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students must gained knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

TEXTBOOKS:

- Denison Campbell, Allen and Harold Roper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991.
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REFERENCES:

- Shetty M.S., "Concrete Technology - Theory and Practice", S.Chand and Company, 2008.
- Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001
- Ravishankar.K., Krishnamoorthy.T.S, "Structural Health Monitoring, Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004.
- CPWD and Indian Buildings Congress, Hand book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.
- Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

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5. Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013

OBJECTIVES:

- To understand the dynamics of earth and to estimate dynamic properties of soils
- To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential.

UNIT I SEISMOLOGY AND EARTHQUAKES**7**

Internal Structure of the Earth – Continental Drift and Plate Tectonics – Faults – Elastic rebound theory – Different sources of Seismic Activity – Geometric Notation – Location of Earthquakes – Size of Earthquakes.

UNIT II DYNAMIC PROPERTIES OF SOILS**11**

Measurement of Dynamic Properties of soils – Field Tests – Low strain – Seismic Reflection – Seismic Refraction – Horizontal layering – Steady State Vibration – Spectral analysis of surface wave – Seismic cross hole – Down Hole – Up hole – tests – Laboratory tests – Resonance Column Test – Bender Element – Cyclic Tri-axial test.

UNIT III SEISMIC HAZARD ANALYSIS**9**

Identification and Evaluation of Earthquake Sources – Geologic Evidence – Tectonic Evidence – Historical Seismicity – Instrumental Seismicity – Deterministic Seismic Hazard Analysis – Probabilistic Seismic Hazard Analysis.

UNIT IV GROUND RESPONSE ANALYSIS**9**

Ground Response Analysis – One Dimensional Linear – Evaluation of Transfer Function – Uniform undamped soil on rigid rock – Uniform damped soil on Rigid Rock – Uniform damped soil on elastic rock – layered damped soil on elastic rock – Equivalent linear Approximation – Deconvolution.

UNIT V LIQUEFACTION ANALYSIS**9**

Liquefaction – Flow liquefaction – Cyclic Mobility – Evaluation of liquefaction Hazards – Liquefaction Susceptibility – Criteria – Historical Geologic – Compositional – State – Evaluation of Initiation of Liquefaction – Cyclic stress approach – Characterization of Liquefaction Resistance – SPT Test – Various correction factor – Factor of Safety.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students are able to perform site specific response analysis to develop design spectra and to do detailed liquefaction analysis using SPT data.

TEXTBOOKS:

1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series, Pearson Education Inc and Donling Kindersley Publishing Inc. 2013
2. Roberto Villaverde, "Fundamental Concepts of Earthquake Engineering", CRC Press Taylor & Francis Group, 2009.

REFERENCES:

1. Kameswara Rao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing - New Delhi, 2000.
2. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
3. McGuire, R.K. "Seismic Hazard and Risk Analysis Earthquake Engineering" Research Institute, 2004.
4. Mahanti, N.C. Samal, S.K. Datta, P. Nag.N.K., "Diaster Management", Narosa Publishing House, New Delhi, India, 2006.

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Measurement of Dynamic Properties of soils – Field Tests – Low strain – Seismic Reflection – Seismic Refraction – Horizontal layering – Steady State Vibration – Spectral analysis of surface wave – Seismic cross hole – Down Hole – Up hole – tests – Laboratory tests – Resonance Column Test – Bender Element – Cyclic Tri-axial test.

UNIT III SEISMIC HAZARD ANALYSIS**9**

Identification and Evaluation of Earthquake Sources – Geologic Evidence – Tectonic Evidence – Historical Seismicity – Instrumental Seismicity – Deterministic Seismic Hazard Analysis – Probabilistic Seismic Hazard Analysis.

UNIT IV GROUND RESPONSE ANALYSIS**9**

Ground Response Analysis – One Dimensional Linear – Evaluation of Transfer Function – Uniform undamped soil on rigid rock – Uniform damped soil on Rigid Rock – Uniform damped soil on elastic rock – layered damped soil on elastic rock – Equivalent linear Approximation – Deconvolution.

UNIT V LIQUEFACTION ANALYSIS**9**

Liquefaction – Flow liquefaction – Cyclic Mobility – Evaluation of liquefaction Hazards – Liquefaction Susceptibility – Criteria – Historical Geologic – Compositional – State – Evaluation of Initiation of Liquefaction – Cyclic stress approach – Characterization of Liquefaction Resistance – SPT Test – Various correction factor – Factor of Safety.

TOTAL: 45 PERIODS**OUTCOMES:**

- Students are able to perform site specific response analysis to develop design spectra and to do detailed liquefaction analysis using SPT data.

TEXTBOOKS:

1. Krammer S.L., "Geotechnical Earthquake Engineering", Prentice Hall, International Series, Pearson Education Inc and Donling Kindersley Publishing Inc. 2013
2. Roberto Villaverde, "Fundamental Concepts of Earthquake Engineering", CRC Press Taylor & Francis Group, 2009.

REFERENCES:

1. Kameswara Rao, N.S.V., "Dynamics soil tests and applications", Wheeler Publishing - New Delhi, 2000.
2. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.
3. McGuire, R.K. "Seismic Hazard and Risk Analysis Earthquake Engineering" Research Institute, 2004.
4. Mahanti, N.C. Samal, S.K. Datta, P. Nag.N.K., "Diaster Management", Narosa Publishing House, New Delhi, India, 2006.

5. Wai-Fah Chen and Charles Scawthorn, "Earthquake Engineering Hand book", Caspress, 2003.
6. Robert W. Day, "Geotechnical Earthquake Engineering" Hand book, McGraw Hill, 2002.

UNIT V CONTROLLING**9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS**OUTCOMES:**

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill, 1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999

CE6811**PROJECT WORK****L T P C
0 0 12 6****OBJECTIVES:**

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL: 180 PERIODS**OUTCOMES:**

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

CE6001**HYDROLOGY****L T P C**