CE151U ENGINEERING MECHANICS

Teaching Scheme : 03L + 01T   **Credit : 04**

Evaluation Scheme ; 30 MSE + 10 ISA + 60 ESE   **Total marks : 100**

Duration of ESE : 3Hrs

Course description: This course provides the elementary level knowledge of Engineering and Engineering mechanics which includes study of forces and force systems, Resultant and equilibrium of coplanar force systems, friction, Kinematics and kinetics of bodies, Concept of stress strain and SFD/ BMD.

Objectives: To enable the students understand the basic concepts of mechanics such as force, equilibrium, moment etc and to analyze simple determinate structures like beam and truss.

Course Objectives (CO)

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

1. to introduce concept of engineering mechanics and its applications.
2. to study equilibrium of rigid bodies, friction, beam with different supports and loadings.
3. to study types of trusses and analysis of simple truss.
4. to study how to find out centroid, moment of inertia of plane and composite bodies.
5. to study linear motion and momentum principle.
6. to study shear force and bending moment diagram in simple beam and loadings.
7. to study stress strain characteristics.

Relevance of COs /POs and strength of co-relation:

	1	2	3	4	5	6	7	8	9	10	11	12
CO1	√			√			√	√	√			√
CO2			√								√	
CO3		√			√							
CO4					√				√		√	
CO5		√							√			
CO6		√		√					√			
CO7	√		√									

Course content:

Introduction to Engineering Mechanics: Basic concept, Principles of Mechanics, Force types and Force System, composition and Resolution of forces, Resolution of Concurrent force System in Plane, Moment of forces/ Couple, Varignon's theorem, Equivalent Force system, Resultant of Non-Concurrent Force System in plane, Introduction to Space forces, Resultant of Concurrent Forces system in Space.

Equilibrium of Force System: Particle equilibrium in 2d/3d, rigid body equilibrium, type of supports and Loads, Free body diagram, Conditions and equations of equilibrium , Equilibrium of forces in Plane, Equilibrium of concurrent force system in space, Lami's theorem, Reactions of determinate beams.

Center of Gravity: Introduction, center of Gravity / centroid of simple figures / composite sections, centre of gravity and its implications.

Moment of Inertia: Introduction, definition, moment of inertia of plane sections / standard sections /composite sections, theorem of moment of Inertia, mass moment of inertia of circular plate, cylinder, cone, sphere and hook.

Basic Structural Analysis :- Equilibrium in three dimensions, method of Joints , method of sections, simple trusses, beams, types of beams, frames.

Friction: Introduction, types of friction, limiting friction, Laws of friction, simple and dynamic friction, motion of bodies, wedge friction, screw jack, differential screw jack.

Internal Forces in simply supported and cantilever member for point load and udl, Determination of variation of axial force (Axial force diagram), Shear force (Shear force diagram), Bending moment (Bending moment diagram) and twisting moment.

Concept of Stress and Strain:- Normal and shear stress and strain, state of stress at a point, stress strain curve, Hook's law, modulus of elasticity, poisson's ratio, modulus of rigidity, bulk modulus, transformation stress.

Kinematics of Particles: Motion related to cartesian coordinates.

Kinetics of Particles: Newton's second law, energy principles, Impulse momentum principle.

Virtual Work and Energy Method: Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies.

Tutorials

1. To find the various forces and angles including resultants in various parts of wall crane and roof truss.
2. To verify the law of polygon for various forces.
3. To find coefficient of friction between various materials on inclined plan.
4. Free body diagrams various systems including block-pulley.
5. To verify the principle of moment.
6. To draw a load efficiency curve for a screw jack.
7. To draw SFD and BMD of simply supported /cantilever beams for given loading.
8. To verify the Hook's law.
9. To study energy principles.
10. To study principle of virtual work.

Text Books:

1. Bhavikatti S.S, Engineering Mechanics, New Age International Publications, 4th edition, 2013.
2. F. P. Beer and E. R. Johnston, Vector Mechanics for Engineers Vol I-Statics, Vol. II-Dynamics, Tata McGraw Hill 9th Ed, 2011.
3. Stephen Timoshenko, Strength of Materials Part -1, CBS Publishers and Distributors, New Delhi, 2000.
4. Singer F.L. and Andrew Pytel, Strength of Material, Harper and Row Publishers, New York.

CE251U FLUID MECHANICS

Teaching Scheme: 3L Total: 3Hr

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE

Duration of ESE: 03 Hrs

Credit: 03

Total Marks: 100

COURSE DESCRIPTION

The objective of this course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications. The course provides a first level exposure to the students to fluid statics, kinematics and dynamics. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems. The topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application hydraulics and hydrology.

COURSE OBJECTIVES

1. Understand the broad principles of fluid statics, kinematics and dynamics
2. Understand definitions of the basic terms used in fluid mechanics
3. Understand classifications of fluid flow
4. To be able to apply the continuity, momentum and energy principles
5. To be able to apply dimensional analysis

COURSE OUTCOMES

After successful completion of this course; student shall be able to

1. Measure fluid pressure by various methods.
2. compute hydrostatic and hydrodynamic forces
3. analyze flow through various openings
4. apply principles of dimensional analysis to design experiments

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3					2							3		
2	3					2							2	1	
3	2	2				2							2		
4	2		3		2								2	2	

1-Weakly correlated   2 – Moderately correlated   3 – Strongly correlated

COURSE CONTENT

Introduction: Scope and applications of fluid mechanics, Newton's law of viscosity, classification of fluids, newtonian and non-newtonian fluids, ideal and real fluids.

Physical Properties of Fluids: mass density, specific weight, specific volume, specific gravity, dynamic and kinematic viscosity, variation of viscosity with temperature, compressibility, surface tension, capillarity, vapor pressure, boiling point, cavitation.

Fluid Pressure Measurement: Fluid pressure, pressure head, Pascal's law, pressure variation with temperature, measurement of pressure Simple and differential manometers, introduction to mechanical gauges.

Pressure on Surfaces: Static fluid pressure forces on plane and curved surfaces and their simple Civil Engineering applications.

~~Buoyancy: Archimedes's principle, buoyancy and flotation, metacentric height, stability of floating and submersed bodies.~~

Kinematics of Fluid Flow: Types of fluid flows steady and unsteady, uniform and non-uniform laminar and turbulent, one, two and three dimensional, rotational and irrational flows. Velocity and acceleration for one and three dimensional flows. Stream lines, equipotential lines and flow net, uses and limitations of flow net, equations of continuity for one and three-dimensional flows.

Dynamics of Fluid Flow: Forces acting on fluids in motion, forces exerted by fluid flow on pipe bend, vortex flow-free & forced, various equations of motion. Euler's equation of motion and Bernoulli's theorem for one and three dimensional flows, hydraulic gradient line and total energy line, kinetic energy correction factor. Simple applications of continuity and Bernoulli's equations such as Pitot tube and Venturimeter.

Dimensional Analysis and Hydraulic Similitude: Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem.

Model Analysis: Geometric, kinematics and dynamic similitudes, important dimensionless parameters and their significance. Model laws, Reynolds and Froude model laws and their applications to simple fluid flow problems.

Laminar Flow: Laminar flow through pipes Hagen-Poiseuilli's equation, Stoke's law. Various methods of measurement of viscosity. Reynolds's experiment, transition from laminar to turbulent flow.

Flow Through Opening: Orifices: types, coefficients of velocity, contraction and discharge, small and large orifices, completely submerged orifices.

Mouthpieces: Types, external cylindrical mouthpiece.

Flows over Notches and Weirs: Rectangular, triangular and trapezoidal notches and weirs, Cipolletti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions.

Text Books
1. Hydraulics and Fluid Mechanics Including Hydraulic Machines , Modi S.M. and Seth S.M, PHI Learning Pvt. Ltd. 20th edition 2015
2. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 1st 2010
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill, 2003

Reference Books
1. Engineering Fluid Mechanics Garde R.J. and Mirajgaokar A.G., Scitech Publication 3rd edition 2011.
2. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.
3. Introduction to Fluid Mechanics and Fluid Machines Som S.K., Gautam Biswas and Suman Chakraborty;, Mc Graw Hill Education, 3rd edition 2017

CE252U WATER TREATMENT AND PROCESSES

Teaching Scheme: 03L Total: 3Hr Credit: 03
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE Total Marks: 100
Duration of ESE: 03Hrs

COURSE DESCRIPTION

This course introduces about source of water, water quality and quantity, suitable methodsfor treatment of the impurities in water design of water treatment plant and water supply system.

COURSE OBJECTIVES

1. To learn the fundamentals of water treatment
2. To understand various components of water supply scheme
3. To build skills to quantitative and qualitative assessment of water requirement
4. To understand operation of water treatment units

COURSE OUTCOMES

After successful completion of this course; student shall be able to

1. understand the water supply scheme
2. estimate quantities and quality of water for municipal purpose.
3. analyze water supply engineering problems.
4. design and operate the processes used in water treatment systems.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3		3										3		
2		2		2		2		2					3	2	
3		3		2		3							2	3	
4	3		2		1								2	2	1

5. 1-Weakly correlated   2 – Moderately correlated   3 – Strongly correlated

COURSE CONTENT

Sources of Water: Factors considered in selection of source of water for treatment plant, conveyance of raw water-, canals and pipelines, hydraulics of conduits, different types of pipes used and their suitability, designing of rising main., intake structure, different types of intake structures. Quality- characteristics, Indian standards, testing of raw water for physical, chemical and bacteriological parameters and their significance.

Quantity: Population forecasting, different methods of population forecasting, rate of water consumption for various purposes, factors affecting demand of water, calculation of fire demand. Water treatment, necessity of water treatment processes different types of water treatment flow sheets. Aeration, principle and concept, necessity, methods,

Sedimentation- Theory of sedimentation, types of suspended solids, determination of settling velocity, types of sedimentation tanks, surface loading, detention time, and design of PST, inlets and outlets arrangements theory of chemical coagulation, factors affecting coagulation, turbidity, rapid mixing, coagulant dosage, characteristics of water, optimum PH, coagulant aids, choice of coagulants, common coagulants, coagulant aids like bentonite clay, lime stone, silicates and poly electrolytes, rapid mixing-necessity, gravitational, mechanical, pneumatic devices, slow mixing and flocculation, design of flocculation chamber, mean velocity gradient "g" and power consumption, concept of plate settler and tube settler.

Filtration: Theory of filtration, mechanism of filtration, filter materials, types of filters- rapid gravity filter, slow sand-filter and pressure filter. Components, materials, underdrainage system, working and cleaning of filters, operational troubles, design of filters. Theory of disinfection, factors affecting efficiency of disinfection, types of disinfectants, mathematical relationship governing disinfections variables. Theory of chlorination, break point

chlorination, bleaching powder estimation, water softening methods- lime-soda, ion exchange method and demineralization.

Tertiary Treatments: Softening, lime soda, quantity of lime and soda. Ion exchange, effect of fluoride, fluoridation and de-fluoridation. Demineralization methods like reverse osmosis, electro-dialysis, adsorption, MBR process.

System of Water Supply: Continuous and intermittent system. Distribution of water, different distribution systems and their components, layouts, methods of supply like gravity, pumping and combination, design of distribution system, determination of balancing capacity of ESR
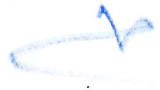
Text Book

1. Water Supply Engineering, Garg S.K , Khanna Publisher, New Delhi 33rd edition 2015.
3. Water Supply and Sanitation Engineering, G.S.Birdi and J.S.Birdi, Dhanpat Rai Publication Company, New Delhi 9th edition 2014.

Reference Book

1. Water Supply and Sewerage, E W Steel and Terence J McGhee, Tata McGraw Hill Publishing Company, 6th edition 2007
2. Physici-Chemical Processes for Water Quality Control,Walter J Weber, Wiley Inter-science Publications 2012.
3. Water Supply Engineering, Punamia, Jain and Jain, Laxmi Publications, New Delhi 2015.
4. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India.
5. Water Supply, Waste Disposal and Environmental Engineering, A. K. Chatterjee, Khanna Publisher, 8th edition, 2006.

CE253U BASIC THEORY OF STRUCTURES

Teaching Scheme: 03LTotal: 3Hr, ·Credit: 03
Evaluation Scheme: 30 MSE + 10 ISA + 60 ESE Total Marks: 100
Duration of ESE :03Hrs

COURSE DESCRIPTION:

Basic theory of structures   is an important aspect of Civil Engineering covers the statically indeterminate structures, which emphasis on the analysis of statically indeterminate beams and rigid frames. Methods included are moment area method to calculate·slope and deflection, and matrix analysis. The course also includes Influence Line Diagram and three hinged arches.

COURSE OBJECTIVES

1. Analyze statically determinate and indeterminate structures such as beams and arches subjected to external loads.
2. Get knowledge of different analytical tools for understanding the behavior of statically determinate and indeterminate structures.
3. Know computation of deflections, internal axial forces, shear forces, and bending moments in beams, frames and arches.
4. Able to deal with the methods necessary for analyzing various types of structures such as fixed beam, continuous beams and frames.
5. Know the fundamental concepts of flexibility and stiffness method of structural analysis, and influence line diagram including identification of positions of load for maximum shear force and bending moments at specified sections.

COURSE OUTCOME

After successful completion of this course; student shall be able to

1. formulate equilibrium and compatibility equations·for structural members
2. analyze one dimensional and two dimensional problems using classical methods
3. analyze indeterminate structures
4. analyze structures for dead /gravity loads, moving loads and lateral loads
5. draw influence line diagrams to understand behavior of structural elements and to find out response of structure and deformations.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	2	3									2		
2	1	3	1	2								1	3	2	
3	2	2	2	3								1	1	2	
4		2	2	2									2		
5	2	2	3	2								1	2	2	

1-Weakly correlated   2 – Moderately correlated   3 – Strongly correlated

Course content:

Deflection of Beams: Relation between bending moment, slope and defection, introduction to double integration method, concept of moment area method, Mohr's theorems, use of moment area·method to calculate slope and deflections of beams such as simply supported, over hanging and of uniform cross sections and different cross sections. Conjugate beam method, application of conjugate beam method to simply supported, overhanging and compound beams.

Slope and Deflection: Castiglione's first theorem and its application to find slope and deflection of simple beams and frames, deflection in determinate trusses. Analysis of redundant trusses by Castiglione's second theorem, lack of fit and temperature changes in members, sinking of supports

Fixed Beams:- ~~Concept, advantages and disadvantages, nature of bending moment diagrams, fixed end moment due to various types of loads such as point, uniformly distributed, uniformly varying, couples for beams, effect of sinking of support, plotting of bending moment and shear force diagrams.~~

Continuous Beams: ~~Analysis of continuous beam by three moment (Clapyeron's theorem) up to three unknowns, effect of sinking of supports, plotting of bending moment and shear force.~~

Three Hinged Arch: Concept of three hinged arch as a hunched beam, support reactions, B.M., S.F. and axial thrust diagrams for circular and parabolic three hinged arches.

Two Hinged Arches: ~~Horizontal thrust at supports, shear, normal thrust and BM at a point, BM diagrams for parabolic arch due to concentrated load and uniformly distributed load.~~

Influence Lines: ~~Influence line diagrams for reactions, bending moment and shear force for determinate beams. Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, absolute maximum shear force and bending moment.~~

Text Books

1. Basic Structural Analysis, C.S. Reddy. Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 3rd edition, 2011.
2. Theory of Structures, S. Ramamrūthum and R. Narayanan, Dhanpat Rai and Sons Publication.9th edition, 2019

Reference Books

1. Mechanics of Structures Vol. – II, S. B. Junnarkar and Dr. H.J. Shah, Charotar Publishing House, 34th edition,2014.
2. Indeterminate Structures, C. K. Wang. Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 2014.
3. Theory of Structures, Timoshenko S. P. &Young D.H., McGraw Hill, International edition, 2nd edition,1965.

Useful Link

NPTEL, www.nptel.ac.in

CE254U HYDROLOGY AND IRRIGATION

Teaching Scheme: 03L Total: 3Hr   Credit: 03
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE   Total Marks: 100
Duration of ESE: 03Hrs

COURSE DESCRIPTION

This course introduce the elements of hydrology and describe the precipitation, infiltration evaporation, runoff and hydrograph. The course is focused on developing the skills of students for identification and assessment of available natural and artificial water resources. It deals with the study of Hydrology and water requirement of crops related to Civil Engineering. The part of the subject is focused on irrigation engineering and development of water resources.

COURSE OBJECTIVES

1. Measure and analyze rainfall, runoff and water losses
2. Construct and analyze different hydrographs
3. Determine ground water flow
4. Compute the water requirement of crops

COURSE OUTCOMES

After successful completion of this course; student shall be able to

1. analyze hydrological parameters required for water resource management.
2. analyze ground water potential.
3. understand different hydrograph and statistical methods
4. identify suitable method of irrigation and drainage of waterlogged area.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2		1									3		
2	2					1							1	2	
3	2	2		1										2	
4	3				1	1							3		1

1-Weakly correlated   2 – Moderately correlated   3 – Strongly correlated

COURSE CONTENT

Introduction: Hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data.

Precipitation: Forms of precipitation, characteristics of precipitation in India. Measurement of precipitation, rain gauge network, mean precipitation over an area. Depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, probable maximum precipitation (PMP), rainfall data in India.

Abstractions from precipitation: Evaporation process, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction. Measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India. Actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

Runoff: Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve

Floods: Estimation of peak flow, rational method and introduction to other methods. Introduction to design floods for various hydraulic structures.

Hydrographs: Definition, components, factors affecting the shape, base flow separation, flood hydrograph, unit hydrograph – definition, assumptions, applications, derivations and limitations, S-hydrograph.

Ground Water Hydrology: Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, safe yield of basins, hydraulics of wells under steady flow in confined and unconfined aquifers, well loss, specific capacity of well, well irrigation: introduction to tube wells and open wells.

Introduction to Irrigation: Necessity, benefits, Ill effect, irrigation systems and methods and their classifications.

Soil-water-plant Relationships: Classification of soil water, saturation capacity, Field capacity, determination of field capacity, quality of irrigation water.

Water Requirement of Crops: Limiting soil moisture condition, depth of irrigation water and frequency, principal Indian crops and their seasons, base period, duty of water and delta, factors affecting & methods of improving the duty of water, intensity of irrigation, paleo irrigation, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, calculations of canal capacities, application of water, warabandi, National Water Policy.

Water Logging: Causes, preventive and curative measures of water logging

Text Books

1. Irrigation, Water Resources and Water Power Engineering, Modi P.N., Standard Book House, Delhi, 8th edition, 2012
2. Hydrology and Water Resources Engineering, Garg S.K., Khanna Publishers, Delhi, 23rd edition 1998:

Reference Books

1. Engineering Hydrology, Subramanya K, Tata McGraw-Hill Publishing Co.Ltd, New Delhi, 4rd edition, 2013.
2. Irrigation and Water Power Engineering, Punmia B.C., Pande B.B., .Lal, Ashok Kumar Jain, Laxmi Publications Pvt. Ltd., New Delhi, 2016.
3. Fundamentals of Irrigation Engineering, Bharat Singh, Nem Chand & Bros.,India; 7th Revised edition,1983
4. Irrigation and Water Resources Engineering, Asawa, G.L, New Age International publisher, 1st edition 2008

CE255U CIVIL ENGINEERING – SOCIETAL AND GLOBAL IMPACT

Teaching Scheme: 2L   Total: 2 Hr **Credit: 02**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 03 Hrs

COURSE DESCRIPTION

The course is designed to provide a better understanding of the impact which civil engineering has on the society at large and on the global arena. Civil engineering projects have an impact on the infrastructure, energy consumption and generation, sustainability of the environment, aesthetics of the environment, employment creation, contribution to the GDP, and on a more perceptible level, the quality of life. It is important for the civil engineers to realize the impact which this field has and take appropriate precautions to ensure that the impact is not adverse but beneficial.

COURSE OBJECTIVES

1. To develop awareness of the importance of civil engineering and the impact it has on the Society and at global levels
2. To illustrate the impact of civil engineering for the various specific fields of human endeavor
3. To think innovatively to ensure sustainability

COURSE OUTCOME

After successful completion of this course; student shall be able to

1. understand the impact which civil engineering projects have on the society
2. know the extent of infrastructure and its requirements for energy
3. able to identify the potentials of civil engineering for employment creation and its contribution to the GDP
4. know the built environment and factors impacting the quality of life

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2		3										2		
2	2	2			2								2	1	
3				2		1				1			2		1
4	1						2					2			3

1-Weakly correlated   2 – Moderately correlated   3 – Strongly correlated

Following curriculum is at elementary and basic level without numericals.

Introduction: Pre-industrial revolution days, agricultural revolution, first and second industrial revolutions, it revolution, the ancient and modern marvels and wonders in the field of civil engineering, recent major civil engineering breakthroughs and innovations, future vision for civil engineering.

Ecosystems in society and in nature, the steady erosion in sustainability, global warming, its impact and possible causes, evaluating future requirements for various resources.

GIS and applications for monitoring systems, human development index and ecological footprint of India vs other countries and analysis.

Infrastructure: Habitats, megacities, smart cities, futuristic visions; transportation (roads, railways & metros, airports, seaports, river ways, sea canals, tunnels (below ground, under water); futuristic systems (ex, hyper loop));

Energy generation (Hydro, Solar, Photovoltaic, Solar Chimney), wind, wave, tidal, geothermal, thermal energy); water provisioning; telecommunication needs (towers, above-ground and underground cabling);

Environment: Traditional &futuristic methods; solid waste management, water purification, wastewater treatment & recycling, hazardous waste treatment, flood control (dams, canals, river interlinking), multi-purpose water projects, atmospheric pollution; global warming phenomena and pollution mitigation measures.

~~**Built Environment**: Energy efficient built environments and LEED ratings, temperature/ sound control in built environment, security systems, intelligent/ smart buildings, aesthetics of built environment, role of urban arts commissions, conservation, repairs & rehabilitation of structures & heritage structures, innovations and methodologies for ensuring sustainability.~~

~~**Civil Engineering Projects**: Environmental impact analysis procedures, waste (materials, manpower, equipment) avoidance/ efficiency increase, advanced construction techniques for better sustainability, techniques for reduction of green house gas emissions in various aspects of civil engineering projects, contribution of civil engineering to GDP contribution to employment(projects, facilities management), quality of products, health & safety aspects for stakeholders.~~

Text books

1. Global Challenges and the Role of Civil Engineering, Žiga Turk, Chapter 3 in: Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32,(2014). Springer, Dordrecht.
2. Engineering impacting Social, Economical and Working Environment, Brito, Ciampi, Vasconcelos, Amarol, Barros ,120th ASEE Annual Conference and Exposition,(2013) .
3. Challenges for Engineering ,NAE Grand Engineering for the Developing World, The Bridge, Vol 34, No.2, Summer 2004.
4. Risk and resilience to enhance sustainability with application to urban water systems, Blackmore J M., Plant R A J, J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.(2008).

Reference books

1. UK's engineering Council guidance on sustainability, Bogle D. (2010). Proc ICE Engineering Sustainability 163. June Issue ES2 p61-63
2. Cleansing the city, Allen M. (2008). Ohio University Press. Athens Ohio
3. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

CE351 ADVANCED THEORY OF STRUCTURES

Teaching Scheme: 03L+ 00T, Total: 03
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE
Duration of ESE: 03Hrs

Credit: 03
Total Marks: 100

Basic Concepts of Structural Analysis: Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, stress-strain relations,force-displacent relations, concept of linear/non-linear structures. Energy theorem, Muller Breslau principle, concept of complementary energy,fundamental concept of force and the displacement method of analysis.

Slope Deflection Method: Applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown),Sway and non-sway problems.

Moment Distribution Method: Applied to continuous beams and rigid jointed rectangular frames , transnational and rotational yielding of supports.

Approximate Analysis of Multistory Frames: Vertical and lateral loads, substitute frame, portal frame and cantilever method.

Self Study)
Fundamental Concept of Flexibility: Method for structural analysis, flexibility coefficient, matrixformulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, temperature and lack of fit, hand solution of simple problems on beams, pin jointed plane truss and rigid jointed frames (Up to three unknowns)

Fundamental Concept of Stiffness: Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, degree of freedom. Influence coefficients, physical significance effect of settlement and rotation of ~~trusses and~~ rigid jointed plane frames (Upto three unknown)

~~Plastic Analysis of Steel Structures : Introduction, shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, application to continuous, fixed and single bay single storey rectangular frames.~~

Text Books:
1. Basic Structural Analysis, Reddy C. S., 3nd Edition Tata – McGraw Hill, New Delhi, 2012.
2. Theory of Structures, Stephen P. Timoshenko and D. H. Young, 2nd edition, McGraw-Hill, 1965.

Reference Books:
1. Structural Analysis ,Bavikatti S. S., New Age Publicatio.4th edition, 2013
2. Structural Analysis, Pandit and Gupta ,TataMcGrawHill,Pub. Co.Ltd ., New Delhi,2nd edition, 2008.

CE352 DESIGN OF STEEL STRUCTURES

Teaching Scheme :03L+00T, Total: 03
Evaluation Scheme:15 ISE1 +15 ISE2 + 10 ISA + 60 ESE
Duration of ESE : 03Hrs

Credit: 03
Total Marks: 100

Design should be based on IS 800-2007

Introduction: Types of steel structures, grades of structural steel, various rolled steel sections, relevant IS specifications such as IS 800-2007, IS:808-1989, IS:875 part I to III and V, SP: 6(1), SP: 6(6), IS:4000-1992, codes for welded connections. Limit state method of design for strength and serviceability, partial safety factor for load and resistance, various design load combinations.

Types of Connections: Strength of bolted and welded connections, design of connections subjected to axial forces and moments, beam to beam and beam to column connection (framed connections)

Tension Member: Modes of failure, yielding of cross-section,rupture, block shear. Design of single and double angle sections with gusset plate with bolted and welded end connections.

Compression Member: Effective length, slenderness ratio, modes of failure, failure with full strength, local buckling, torsional buckling, classification of cross sections, buckling curves, design of compression members with bolted and welded connection using single and double angle sections.

~~**Flexural Member:** Laterally supported beams using single rolled steel section with and without flange plate, strength in flexure, low and high shear, check for deflection. Secondary and main beam arrangement for floor of a building, design of beam to beam and beam to column connections using bolt / weld, design of purlin. Design of compound beams.~~

Roof Truss: Design of members for dead load, live load and wind load, detailing of typical joints and supports.

Self Study

~~**Design of Built-up Column:** Design of lacing, introduction to battened column, design of connections, column bases under axial load, gusseted base.~~

~~**Design of Welded Plate Girder:** Design of cross section, curtailment of flange plates, stiffeners and connections~~

Text Books
1.Design of Steel Structures ,Negi, B.S,Tata McGraw Hill India, 1995.
2. State Design of Steel Structures ,Duggal S. K.,Limit, Tata Mc Graw Hill publishing company Ltd., New Delhi, 3rd edition, 2009

Reference Books
1. Design of Steel Structure by Limit State Method as per IS: 800-2007Bhavikatti S. S ; I K International Publishing House, New Delhi, 3rd edition
2. Design of Steel Structures ,Ram Chandra, Vol.I and Vol.II, Standard Book House, New Delhi, 10th edition, 2011

CE353 FOUNDATION ENGINEERING

Teaching Scheme :03L+00T, Total: 03   **Credit:** 03

Evaluation Scheme:15 ISE1 +15 ISE2 + 10 ISA + 60 ESE   **Total Marks:** 100

Duration of ESE : 03Hrs

Soil Exploration, Sampling and Testing: Subsurface exploration, trial pits, shafts and boring, geophysical tests, wash boring, representative and undisturbed samples, bore hole sampling, laboratory evaluation of foundation parameters, field testing, penetration tests, plate load test

Bearing Capacity: Definitions of ultimate bearing capacity, gross, net and safe pressures, allowable bearing pressure, load settlement curve, Terzaghi's bearing capacity analysis, bearing capacity equations for square and circular footings, factors influencing bearing capacity, performance of footings in different soils, local and general shear, effects of water table, bearing capacity of layered soils.

Elastic settlement: Elastic settlement, elastic stresses and strains, contact pressure, empirical relation for settlement of bases, total and differential settlement, tolerable settlement.

Shallow Foundations: Spread footings, minimum depth, plain and rcc footings, allowable soil pressure, use of SPT blow count, wall footings, column footings, combined footings, raft foundations, floating foundations, grillage foundations.(only derivations, no numerical)

Deep Foundation : Introduction to pile foundation, necessity of pile foundation, classification of piles, construction methods of bored piles, concrete bored piles, driven cast in-situ piles, pile capacity based on static analysis, dynamic methods and their limitations, in-situ penetration tests and pile load test as per IS:2911 specifications, negative skin friction, pile groups, ultimate load capacity of groups, under-reamed piles. introduction to piers , caissons and well

Machine Foundation: Mechanical vibrations, single degree freedom systems, free and forced vibrations, damped systems, natural frequency, resonance magnification, vibration parameters , vibration test, block foundation design Balkan method, isolation and control of vibration screen barriers.

Self Study

Text Books

1) Soil Mechanics and Foundation Engineering, Dr. B.C.Punmia, Laxmi Publications,16th edition 2005.

2) Soil Mechanics and Foundation Engineering ,K. R. Arora, Standard Publishers and Distributors, New Delhi, 7th edition, 2010.

3) Soil Mechanics and Foundation Engineering,V. N. S. Murthy, Saitech Publications, 1st edition 2004 .

ReferencBooks

1) GeoTechnical Engineering, Gulhati and Datta ,Tata McGraw Hill, 4th edition, 2000 .

2) Soil Engineering in Theory and Practice (Vol.II), Dr. Alam Singh, CBS Publication Delhi, 2nd edition 2006.

3) Modern Geotechnical Engineering and Foundation, Dr. Alam Singh, CBS Publication, Delhi.

4) GeoTechnical Engineering ,Ramamurthy T.N. and Sitharam T.G., S.CHAND publication, 5th edition.

5)Relevant Indian Standard Specifications and Codes, BSI Publications, New Delhi.

CE354-ENVIRONMENT ENGINEERING-II

Teaching Scheme : 03L+00T:Total 03
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE
Duration of ESE : 03Hrs

Credit: 03
Total Marks: 100

Quantity of Sewage: Components of sewage, dry weather flow, peak factor, quantity of storm water, rational formula, ground water infiltration, variation in flow rates, population equivalence. Reactor flow regime-Batch reactor, continuous flow reactor, plug flow reactor, completely mixed flow reactor, kinetics of microbial degradation in batch reactor.

Quality of Sewage: Parameters of characterization, dissolved oxygen and its significance, biochemical oxygen demand, first stage BOD satisfaction and nitrification process chemical oxygen demand, total solids, different types of solids in water, Sampling of sewage. Pollution effects due to disposal of sewage on land, river, lake and sea ,river re-aeration.

Sewage Pumping: Difficulties in pumping, types of pumps used, their maintenance. Conveyance of sewage ,Quantity of domestic and storm sewage-assessment, sewer- terminologies, non-silting non-scouring velocity, coefficient of roughness, Manning's formulation, Chezy's formulation, ogee shaped sewer material, sewer appurtenances, forces acting on sewers, laying of sewer, maintenance of sewer. House plumbing

Sewage Treatment: Primary treatment, types and functions of screen chamber , design of grit chamber, function, velocity control, design of oil and grease tank, primary settling tank,surface over flow rate, weir loading; secondary treatment, trickling filters, standard rate, high rate, recirculation, efficiency, design of trickling filters, sludge disposal, activated sludge process.

Low Cost Waste: Treatments, unit operations and processes, grit chamber, oxidation ponds, facultative pond, oxidation ditch, aerated lagoon, septic tank, soak pits, dispersion trenches, problems on design of oxidation pond, oxidation ditch and septic tank. theory and design of aerated lagoons, anaerobic lagoons, rotating biological disk

~~Sources of Solid Waste: Municipal solid waste - bad effect, generation rates, effect of socio-economic on rate of generation, global and Indian scenario, storage- sizing of dust bin, collection, removal methods, transportation- assessment of vehicle requirement, concept of route optimization (no mathematical treatment), methods of disposal- land filling, composting, incineration, vermin-composting, sea disposal, application to public places like colleges, parks, cinema halls, auditoriums, hospitals, offices etc.~~

Air and Noise Pollution: Sources of air pollution, primary, secondary and tertiary, stationary and mobile sources, effect of air pollution on man, material, and plants, Bhopal gas tragedy, control of air pollution, settling chambers, electrostatic precipitators, cyclone separators, scrubbers, air quality standards, sources, measurement, decibel scale, computation of noise, effect, control measures, tolerance levels.

Self Study)

VPJ

CE355 CONSTRUCTION MANAGEMENT

Teaching Scheme : 03L+00T:Total 03
Evaluation Scheme: 15 ISE1 +15 ISE2 + 10 ISA + 60 ESE
Duration of ESE : 03Hrs

Credit: 03
Total Marks: 100

Construction Organization: Construction industry, construction team, construction activities, classification of construction, stages in construction, need of management in construction. Job layout and value engineering. Leadership and its quality, organization, meaning and function, forms of organization-line ,line and staff, functional, Type A, Type B and Type C

Network Technique and Resource Planning: History, advantages, bar charts, S –Curve etc. various terms used in network technique, activity, event, critical path, duration etc. Development of networks, network scheduling, to find various times and float, EST, EFT, TF etc Monitoring of Network, three phases of network technique. PERT/CPM: Critical path theory and application, bar chart, grant chart.

Cost Analysis: Cost analysis, cost curve, optimization and crashing of networks. Updating of network, during monitoring, resource levelling, allocation ,levelling and smoothening. Line of balance-Concept and uses.

Materials Management: Role and objectives of materials management, materials procurement and delivery, inventory control-EOQ techniques.

Engineering Economics: Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply, cost concept. Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

~~Construction Equipment: Excavating and hauling equipments, power shovels ,size, basic parts ,selection, factors affecting output. Draglines, types , size, basic parts. Bulldozers, types, moving earth with bulldozers. Clamshells-Clamshell buckets. Choice of equipment and standard production rates.~~

Text Book :-

1) Construction planning and management, by Mahesh Varma , sixth edition,2002
2) Construction Management., by Gehlot and Dhir, second edition 1992 reprint 2002.
3) Construction Management , by U.K.Shrivastava , third edition 2005 reprint 2013.

Reference Book :-

1. Construction equipment and job planning, by S.V.Deodhar, Khanna publishers,fourth edition , 2012.
2. Construction Planning and Management, by Peurifoy, McGraw-Hill,2002
3. CPM and PERT, L.S.Srinath, PHI third edition,2012.
4. Engineering Economics, by Tarachand , fourteen edition, 2007