

# **COIMBATORE INSTITUTE OF TECHNOLOGY**

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

## **VISION AND MISSION OF THE INSTITUTE**

### **VISION**

The Institute strives to inculcate a sound knowledge in engineering along with realised social responsibilities to enable its students to combat the current and impending challenges faced by our country and to extend their expertise to the global arena.

### **MISSION**

The mission of CIT is to impart high quality education and training to its students to make them World-class engineers with a foresight to the changes and problems, and pioneers to offer innovative solutions to benefit the nation and the world at large.

**DEPARTMENT OF CIVIL ENGINEERING  
COIMBATORE INSTITUTE OF TECHNOLOGY**

**VISION AND MISSION OF THE DEPARTMENT**

**VISION**

To provide quality education in Civil Engineering and to become a state-of-the-art source of world-class Civil Engineers and Researchers.

**MISSION**

To provide the students with a broad and thorough education in fundamentals, applications, design and execution, that equips them with necessary skills to become successful professional engineers.

**DEPARTMENT OF CIVIL ENGINEERING  
COIMBATORE INSTITUTE OF TECHNOLOGY**

**PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

The following Programme Educational Objectives are designed based on the department mission

- PEO 1** : To impart profound knowledge in fundamentals, techniques and design of Civil Engineering system that encourages them to develop newer techniques in their professional practice
- PEO 2** : To equip the graduates with suitable skills making them industry ready when they leave the portals of the Institute and to become a competent distinguished Professional Civil Engineer.
- PEO 3** : To inculcate an aspiration for research and development in Civil Engineering and Allied Fields.
- PEO 4** : Function ethically in their Professional Civil Engineering Roles.
- PEO 5** : Engage in life-long continuous learning through independent study and participation in professional conferences, seminars and workshops.
- PEO 6** : To educate them to be successful leaders and innovators capable of meeting complex challenges.

**DEPARTMENT OF CIVIL ENGINEERING**  
**COIMBATORE INSTITUTE OF TECHNOLOGY**

**PROGRAMME OUTCOMES (POs)**

Students in the Civil Engineering Programme should at the time of their graduation be in possession of the following

- PO1** : Graduates can confidently apply appropriate mathematical, scientific and technical knowledge to Civil Engineering problems.
- PO2** : Graduates will be able to analyse the structures theoretically and simulate their behavior experimentally.
- PO3** : Graduates will be competent in planning, designing and executing different types of Civil Engineering projects.
- PO4** : Graduates will excel in teamwork and enjoy working with multi-disciplinary team.
- PO5** : Graduates will be able to solve well defined and open-ended engineering problems.
- PO6** : Graduates will understand the principles of professional ethics, protecting the public health, safety and welfare of people, respect the copyright and patents.
- PO7** : Graduates will be able to generate techno-economic viability reports and communicate the same through written, oral and graphical methods.
- PO8** : Graduates with a background of sciences, social sciences and humanities understand the impact of engineering projects on the quality of life and physical environment.
- PO9** : Graduates will realize the importance to be an active member in professional societies for continuous updating of knowledge.
- PO10** : Graduate will be aware of the importance of research and development in the field of Civil Engineering and engage themselves in research and development.
- PO11** : Graduates will be looking forward to the emerging technologies and implement them in their professional practice.
- PO12** : Graduates will be able to use technical, financial and managerial skills in industry, management and business.
- PO13** : Graduates will be able to exploit opportunities in public policy and administration.
- PO14** : Graduates will understand leadership qualities, attitudes and acquire skills to be an effective leader in their chosen field.
- PO15** : Graduates will be able to contribute to the nation's economic growth in creating better infrastructure.

# COIMBATORE INSTITUTE OF TECHNOLOGY

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## DEPARTMENT OF CIVIL ENGINEERING - PART TIME

### Curriculum from the Academic Year 2013 - 2014 onwards

#### Semester I

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13FY11	Mathematics I	3	1	0	4
13FY25	Engineering Mechanics	3	1	0	4
13CE32	Mechanics of Solids I	3	1	0	4
13CE33	Mechanics of Fluids	3	1	0	4
13PC15	Engineering Geology	3	0	0	3
	<b>Total Credits</b>				<b>19</b>

#### Semester II

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13FY21	Mathematics II	3	1	0	4
13CE42	Mechanics of Solids II	3	1	0	4
13CE43	Applied Hydraulics and Hydraulic Machinery	3	1	0	4
13CE44	Surveying II	3	0	0	3
13CE46	Basic Structural Design (Masonry, Timber and Steel)	3	1	0	4
	<b>Total Credits</b>				<b>19</b>

#### Semester III

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13CE31	Mathematics III	3	1	0	4
13CE35	Concrete Technology	3	0	0	3
13CE52	Structural Analysis I	3	1	0	4
13CE53	Mechanics of Soils	3	0	0	3
13CE54	Design of R.C Structural Elements	3	1	0	4
	<b>Total Credits</b>				<b>18</b>

**Semester IV**

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13CE41	Numerical Methods	3	0	0	3
13CE51	Transportation Engineering I	3	0	0	3
13CE62	Structural Analysis II	3	1	0	4
13CE63	Foundation Engineering	3	0	0	3
13CE65	Design of Reinforced Concrete Structures	3	1	0	4
	<b>Total Credits</b>				<b>17</b>

**Semester V**

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13CE55	Water Supply Engineering	3	0	0	3
13CE61	Transportation Engineering II	3	0	0	3
13CE64	Design of Steel Structures	3	1	0	4
13CE72	Irrigation Engineering	3	0	0	3
	<b>PRACTICAL</b>				
13CE67	Concrete Laboratory	0	0	3	2
	<b>Total Credits</b>				<b>15</b>

**Semester VI**

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13CE73	Sanitary Engineering	3	0	0	3
13CE74	Elective I	3	0	0	3
13CE75	Elective II	3	0	0	3
13CE82	Hydraulic Structures	3	0	0	3
13CE66	Design and Drawing*	2	0	4	4
	<b>Total Credits</b>				<b>16</b>

**\*Note :** Final Examination will be of 4 Hrs. duration and evaluation will be done by two internal examiners. Continuous assessment pattern will be followed.

**Semester VII**

Code	Course	Credit			
		L	T	P	C
	<b>THEORY</b>				
13CE71	Earthquake Resistant Design of Structures	3	0	0	3
13CE81	Construction Management	3	0	0	3
13CE84	Elective III	3	0	0	3
13CE85	Elective IV	3	0	0	3
	<b>PRACTICAL</b>				
13CE88	Project Work and Viva Voce	0	0	6	4
	<b>Total Credits</b>				<b>16</b>

L = Lecture, T = Tutorial, P = Practical, C = Credit

**Total Credits : 120**

## LIST OF ELECTIVE SUBJECTS

Code	Course	Credit			
		L	T	P	C
13CEE01	Prestressed Concrete Structures	3	0	0	3
13CEE02	Advanced Concrete Structures	3	0	0	3
13CEE03	Advanced Steel Structures	3	0	0	3
13CEE04	Experimental Stress Analysis	3	0	0	3
13CEE05	Health Monitoring of Structures	3	0	0	3
13CEE06	Prefabricated and Industrial Structures	3	0	0	3
13CEE07	Analysis and Design of Deep Foundations	3	0	0	3
13CEE08	Soil Structure Interaction	3	0	0	3
13CEE09	Environmental Impact Assessment	3	0	0	3
13CEE10	Solid and Hazardous Waste Management	3	0	0	3
13CEE11	Building Services and Systems Engineering	3	0	0	3
13CEE12	Renewable Energy Resources	3	0	0	3
13CEE13	Town Planning and Architecture	3	0	0	3
13CEE14	Construction Equipments and Techniques	3	0	0	3
13CEE15	Water Power Engineering	3	0	0	3
13CEE16	Engineering Hydrology	3	0	0	3
13CEE17	Finite Element Method	3	0	0	3
13CEE18	Theory of Plates	3	0	0	3
13CEE19	Optimization in Civil Engineering	3	0	0	3
13CEE20	Smart Materials and Structures	3	0	0	3
13CEE21	Disaster Management	3	0	0	3
13CEE22	Pavement Design	3	0	0	3
13CEE23	Design of Bridges	3	0	0	3
13CEE24	Industrial Waste Water Treatment and Disposal	3	0	0	3
13CEE25	Pollution and Control Engineering	3	0	0	3
13CEE26	Principles of Sustainable Development	3	0	0	3
13CEE27	Safety Engineering	3	0	0	3
13CEE28	Principles of Economics	3	0	0	3
13CEE29	Public Administration	3	0	0	3
13CEE30	Indian Economy	3	0	0	3
13CEE31	Principles of Management	3	0	0	3
13CEE32	Engineering Risk and Benefit Analysis	3	0	0	3
13CEE33	Accounting for Engineers	3	0	0	3
13CEE34	Infrastructure Planning and Management	3	0	0	3



## 13FY11 - MATHEMATICS - I

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVES:

- To incorporate the ideas of calculus that are imperative for the effective understanding of Engineering subjects.
- To enrich the concepts of ordinary differential equations those are vital for the study of Engineering subjects.
- To inculcate the concepts of Matrices and Hyperbolic functions which have got a direct leverage over all branches of Engineering and its study.
- To imbibe the concepts of solid geometry which are inevitable for the study of Engineering subjects.
- The topics introduced and discussed will serve as basic tools for specialized studies in many Engineering fields.

#### COURSE OUTCOMES :

- CO1** : At the end of this course the students will be familiar in applying advanced calculus ideas to solve Engineering problems.
- CO2** : Also they will be capable in applying Ordinary differential equations ideas in modeling and solving Engineering problems.
- CO3** : Also they will possess adequate knowledge in Matrices & Hyperbolic functions ideas to analyze and study their areas.
- CO4** : They will be able to solve problems related with the above mentioned areas and can to identify the areas in their disciplines wherein these ideas could be directly applied.

### MATRIX AND HYPERBOLIC FUNCTIONS

Eigenvalues and eigenvectors-Cayley Hamilton theorem (without proof)-Application to find the inverse and higher powers of a matrix-Diagonalization-Quadratic forms-Orthogonal reduction to canonical form. Hyperbolic and inverse hyperbolic functions-properties. (9)

### DIFFERENTIAL CALCULUS

Curvature-Evolutes-Envelopes-Functions of two variables-Expansions and extreme values-Constrained extrema using Lagrange's multiplier method. (9)

### INTEGRAL CALCULUS

Beta, Gamma integrals-properties-Double and triple integrals-changing the order of integration-Jacobian of transformation-Application to areas and volumes. (9)

### ORDINARY DIFFERENTIAL EQUATIONS

Second and higher order linear differential equations with constant coefficients- variable coefficients-Euler Cauchy type-Linear Simultaneous equations-Method of variation of parameters.

Applications of Differential equations-Electrical circuits-Simple harmonic motion-Resisted vertical motion (9)

## SOLID GEOMETRY

Equation of a sphere- Plane section of a sphere- Tangent plane-Orthogonal spheres- Equation of a cone- Right circular cone- Equation of a cylinder- Right circular cylinder. **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

### TEXT BOOKS :

1. Kandasamy, P. et al., "Engineering Mathematics for first year B.E/ B.Tech", (9th revised edition), S Chand & Co - (2011).
2. Veerarajan, T, "Engineering Mathematics" (For Semester I & II) (Third Edition), Tata .McGraw- Hill Publishing company Ltd., - (2012).
3. Venkataraman, M.K, "Engineering Mathematics", (First year), The National Publishing Company - (2008).

### REFERENCE BOOKS :

1. Erwin Kreyszig, "Advanced Engineering Mathematics", (10th Edition), Wiley India Pvt Ltd- (2011).
2. Grewal, B.S, "Higher Engineering Mathematics" (42nd Edition), Khanna Publishers - (2012).

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x			x	x										
2	x	x		x	x										
3	x			x	x										
4	x			x	x										

# 13FY25 - ENGINEERING MECHANICS

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies and the concept of friction. Further he should be able to understand centre of gravity, moment of inertia, kinematics and kinetics of particles, impulse and basics of vibration. All these should be achieved conceptually with worked out examples.*

### COURSE OUTCOME :

*The students will understand the statics and dynamics.*

## STATICS OF PARTICLES

Forces in plane and space - Vector addition of concurrent forces in plane and space-Problems involving the equilibrium of a particle - Free body diagram - Equilibrium of particle in space.

## STATICS OF RIGID BODIES IN TWO DIMENSIONS

Rigid bodies - Two dimensional structure - Moment of force about a point and about an axis - Moment of a couple - Equivalent systems of coplanar forces - Rigid body in equilibrium - Problems involving equilibrium of rigid body. (9)

## FRICTION

Laws of friction - Coefficient of friction - Problems involving dry friction - Wedge & ladder friction. Screw jack.

## APPLICATION OF STATICS

Types of supports - Reactions of beams and trusses - Plane roof trusses - Method of joints and sections. (9)

## CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

Centroids of areas, composite areas - Determination of moment of inertia of plane figures, polar moment of inertia - Radius of gyration. (9)

## KINEMATICS OF PARTICLES

Introduction - Plane, Rectilinear motion - Time dependent motion- Rectangular coordinates - Projectile motion.

## KINETICS OF PARTICLES

Equation of motion - Rectilinear motion - Work energy method - Potential energy - Kinetic energy - Conservation of energy. (9)

## IMPULSE & MOMENTUM

Impulse - momentum principle - Concept of conservation of momentum - Impact -Direct central impact - Oblique central impact

## INTRODUCTION TO VIBRATION

Simple Harmonic Motion - Mass spring system-Free vibration (elementary treatment only) **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

### TEXT BOOKS :

1. Beer F P and Johnston E R, "Vector Mechanics for Engineers, Statics & Dynamics", Tata Mc-Graw Hill Publishing Co., Ltd., New Delhi, 2007
2. Rajasekaran S and Sankarasubramanian G, "Engineering Mechanics- Statics and Dynamics", Vikas Publishing House Pvt. Ltd., New Delhi, 2005

### REFERENCE BOOKS :

1. Natesa S.C., "Engineering Mechanics-Statics and Dynamics", Umesh Publications, New Delhi, 2002.
2. Irving H Shames, "Engineering Mechanics-Statics and Dynamics", IV Edition, Pearson Education Asia Pvt Ltd, 2003
3. Hibbeler R C, "Engineering Mechanics, Voll, Statics and Vol II Dynamics", Pearson Education Asia Pvt Ltd, 2001
4. Bhavikatti S S & Rajasekarappa KG, "Engineering Mechanics", New Age International (P) Ltd., New Delhi, 2008
5. Bansal R K, "Engineering Mechanics", Laxmi Publications (P)., New Delhi, 2007

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x			x			x							

# 13CE32 - MECHANICS OF SOLIDS I

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To understand the properties of solids in terms of its strength and the behaviour. All these should be achieved conceptually with worked out examples.

### COURSE OUTCOMES :

**CO1** : The students will be able to understand the basic concepts of stresses in terms of axial, bending and Thermal stresses.

**CO2** : The students will be able to understand the concept of strain energy and complex stress systems.

**CO3** : The students will be able to draw BMD and SF diagram for beams of various end condition.

**CO4** : The students will be able to solve problems related to torsion, springs and stress in cylinders.

## CONCEPT OF STRESS AND STRAIN

Simple stresses and strains at a point -Normal and shear Stresses - Hooke's Law - Young's modulus - Bars subjected to axial Forces - simple problems - Thermal stresses - Simple statically Indeterminate problems like compound bars. Changes in dimensions and volume - Poisson's ratio - Modulus of Rigidity - Surface and volume strains - Bulk modulus - Relation between Elastic constants - Simple Tension Test on a Mild Steel rod - Stress-strain diagram - Concept of Factor of Safety and permissible stresses. **(9)**

## STRAIN ENERGY PRINCIPLES AND COMPLEX STRESSES

Strain energy -Resilience - Stresses due to suddenly applied loads and impact loads.

Complex stresses - Components of stress on inclined planes - Expression for stressed element subjected to two normal stresses with shear - Principal stresses and Principal planes - Mohr's circle of stress. **(9)**

## BENDING OF BEAMS

Types of Beams - Types of loads and loading diagrams - Shear force and Bending Moment -Relationship between loading intensity, shear force and bending moment - Shear force and bending moment diagrams for statically determinate beams. Theory of simple bending -Stress distribution due to shear force and bending moment - Design of beams - Beams of uniform strength - Flitched beams - Beams of Two materials - Leaf springs. **(9)**

## TORSION AND SPRINGS

Torsion of solid and hollow circular shafts - Power transmitted through shafts - Strain energy due to torsion - Combined bending and torsion -Close coiled and open coiled helical springs. **(9)**

## THIN AND THICK CYLINDER

Stresses in thin walled Cylindrical and spherical shells - Wire wound cylindrical Vessels - Thick cylinder - Lamé's equations - Compound cylinders - Shrink fit. **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOK:**

1. EgorP.Popov,"Introduction to Mechanics of Solids", Prentice Hall of India, New Delhi, 2003.
2. Beer F P, Johnston E R, DeWolf J T and Mazurek D, "Mechanics of Materials", McGraw-Hill Higher Education, 6th edition, 2011

**REFERENCE BOOKS:**

1. Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2012.
2. Prakash Rao D.S., "Strength of Materials" Volume I, Universities Press (India) Limited., Hyderabad, 2002.
3. Lehari, RS.,Lehari., AS., "Strength of Materials", S K Kotaria & Press, New Delhi, 2009.
4. Timonshenko, S.P, Gere, J.M., "Mechanics of Materials", CBS Publishers, New Delhi, 2002..
5. Rajput, RK., "Strength of Materials", S.Chand & Company Ltd., New Delhi, 2007.
6. Punmia BC, Ashok Jain and Arun Jain, "Strength of Materials and Theory of Structures" Vol 1, Laxmi Publications, New Delhi, 2000.
7. Bansal RK, "Strength of Materials", Laxmi Publications, New Delhi, 2010.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x				x				
2	x	x	x		x					x		x			x
3	x	x		x				x				x			
4	x	x	x		x		x				x			x	

# 13CE33 - MECHANICS OF FLUIDS

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To impart a thorough knowledge about the behavior of fluids, especially liquids, at rest or in motion and practical applications of the fluid properties and flow concepts.

### COURSE OUTCOMES :

**CO1** : The students will be able to apply the knowledge of Fluid properties in real situation

**CO2** : The students will be able to apply the knowledge attained in solving field problems in the area of storage

**CO3** : The students will be able to apply the practical application of similitude and model study

**CO4** : The students will be able to apply the knowledge attained in solving field problems in the area of liquid flow

## PROPERTIES OF FLUIDS & FLUID PRESSURE

Introduction of basic properties - Viscosity - compressibility - surface tension - real and ideal fluids - Fluid pressure - Various methods of measurements. **(8)**

## HYDROSTATICS

Total pressure and centre of pressure on plane submerged surfaces - simple problems - Buoyancy - Centre of buoyancy - Metacentre and metacentric height - conditions of equilibrium of floating and submerged bodies - Fluid mass subjected to uniform linear acceleration - fluid containers subjected to constant rotation. **(10)**

## CONCEPTS OF FLUID FLOW

Classification of fluid flow - velocity and acceleration - velocity potential and stream function- continuity equation - Euler's equation of motion - Bernoulli's equation - applications - venturimeter, orifice meter, pitot tube - simple problems - Velocity and discharge through orifices and mouthpieces. **(9)**

## DIMENSIONAL ANALYSIS AND MODEL STUDIES

Fundamental dimensions - dimensional homogeneity - Dimensional analysis by Rayleigh's method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models **(9)**

## FLOW THROUGH PIPES

Laminar flow in circular pipes - Hagen - Poiseuille's equation - Turbulent flow - Darcy-Weisbach equation - major and minor losses - transmission of power through pipes - parallel, series pipes - flow through long pipes - flow between reservoirs - flow through siphon pipes - water hammer. **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOK :**

1. Modi.P.N, &Seth.S.M., " *Hydraulics, Fluid Mechanics & Hydraulic Machinery*", Metropolitan Book Company, New Delhi, 2013.

**REFERENCE BOOKS :**

1. Bansal.R.K., "Text Book of Fluid Mechanics and Hydraulic Machines", M/s.Lakshmi Publications, Madras,2005.
2. Kumar.K.L, "Engineering Fluid Mechanics", M/s.S.Chand Co., Madras.2003.
3. Ramamrutham.S, "Fluid Mechanics, Hydraulics & Fluid Machinery", M/s. Dhanpat Rai & Sons, New Delhi, 1998.
4. Arora K.R., "Fluid Mechanics, Hydraulics and Hydraulic Machines", Standard Publishers & Distributors, 1998.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X		X								
2	X	X	X		X		X			X					
3	X		X		X		X			X					X
4	X	X	X		X		X			X					



## 13PC15 - ENGINEERING GEOLOGY

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To impart knowledge about various geological problems encounter during civil engineering projects like infrastructure development and mega projects like dams, tunnel and landslide. It also imparts knowledge about the methods used to explore the sub surface for natural resources.

#### COURSE OUTCOME :

- CO1** : The students will be able to acquire fundamental knowledge in structural geology & Crystallography.
- CO2** : The students will be able to explain the concepts of minerals identification and its uses.
- CO3** : The students will be able to explain the fundamental principles of Geophysical methods and Engineering properties of rocks.

### GENERAL GEOLOGY

The need for imparting geological training to the engineers. Weathering, soils, Geological action of wind, Rivers, Glacier ground water - Earthquake and Interior of the earth, Age of the earth. (9)

### STRUCTURAL GEOLOGY & CRYSTALLOGRAPHY

Contours, Dip, Apparent Dip, True Dip, strike, thickness of strata, folds, faults, joints, unconformities, outlier, Inlier's, overlap, offlap. Outline of elementary crystallography - symmetry elements, goniometer, miller's indices, study of the symmetry elements and forms of the normal class of the cubic, tetragonal, Hexagonal, orthorhombic, monoclinic and triclinic systems. (9)

### MINERALOGY

Physical properties of minerals - characteristic features of the following minerals and mineral groups. Quartz group - Rock crystal, Chalcedony, Agate, Flint, Jasper, opal Felspar group - Orthoclase, Microcline, Plagioclase Felspars. Pyroxene group - Hypersthene, Augite. Amphibole group - Hornblende only. Mica group - Muscovite, Biotite, Phlogopite and Lapidolite. Nepheline, chlorite, olivine, garnet, Beryl, sillimanite, Kyanite, Staurolite, Serpentine, Asbestos, Talc, clayminerals, Bauxite, Apatite, Corundum, Hematite, Magnetite, Limonite, chromite, Calcite, Dolomite, Barite, Gypsum, Galena, Pyrite, Fluorite and Graphite - Identification of minerals and its uses. (9)

### PETROLOGY & STRATIGRAPHY

Elementary classification, textures and structures of the three groups of rocks - forms and mode of occurrence of igneous rocks, detailed description, distribution and economic uses of the following rock types: Igneous Rocks - Granite, Syenite, Diorite, Gabbro, Pyroxenite, Dolerite, Rhyolite, Trachyte, Andesite, Basalt. Sedimentary Rocks - Conglomerate, Breccia, Sandstone, shale, limestone, laterite. Metamorphic Rocks - Slate, Phyllite, Schist, Gneiss, Quartzite, Marble, Granulite. Outline of stratigraphy of India with

particular reference to the following: Dharwars (Archaean), Cuddapahs, Vindhyan, Gondwanas, Trichy Cretaceous, Deccan Traps, Tertiary with special emphasis on formation containing Lignite/petroleum. Identification of rocks, description, distribution and uses. **(9)**

### APPLIED GEOLOGY

Landslide and related phenomenon, Geology of Reservoir and dam sites, Geology of Tunneling, Geology of Building stones, Building sites and Road metals, Geology of coastal protection, Fundamental principles of Geophysical methods. Engineering properties of Rocks. **(9)**

**Total : 45**

### TEXT BOOK :

1. Parbingsingh., "A Text book of General Engineering Geology", Katson Publishing House, Ludhiana, 2012.

### REFERENCE BOOKS :

1. Krynine and Judd, "Principles of Engineering Geology and Geotechnics"., Tata McGraw Hill, New Delhi, 1998.
2. Tyrrell, "Principles of Petrology", B.I.Publications, Bombay, 1998.
3. Billings, "Structural Geology", Asia Publishing House, New Delhi, 1989.
4. Sathya Narayanaswamy.B.S., Engineering Geology Laboratory Manual, LCSE - New Delhi.
5. Gurappa.K.M., Structural Geology Maps and Problems.
6. Gohale.N.E., Manual of Geological Map, CBS Publishers, New Delhi, 1987.

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1		x	x		x	x				x					
2	x				x	x	x				x			x	
3	x		x				x						x		

## 13FY21 - MATHEMATICS - II

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVES :

- To incorporate the Laplace Transforms ideas those are imperative for the effective understanding of engineering subjects.
- To impart the concepts of Fourier series those are vital for the study of various disciplines of Engineering.
- To inculcate the concepts of Vector Calculus which have got a direct leverage over various disciplines of Engineering and its applications.
- To fertilize the concepts of Theory of equations and Difference Calculus which are inevitable for the study of engineering subjects.
- The topics introduced and discussed will serve as basic tools for specialized studies in many Engineering fields.

#### COURSE OUTCOMES :

At the end of this course the students will be familiar in

**CO1** : Applying vector calculus ideas to solve various problems in their disciplines:

**CO2** : Also they will be capable in applying Laplace transforms ideas in modeling and solving the problems in their fields.

**CO3** : Also they will possess adequate knowledge in Fourier series & Theory of equations ideas to analyze and solve problems in their areas.

**CO4** : They will be able to solve problems related with the above mentioned areas and can to identify the areas in their discipline wherein these ideas could be directly applied.

#### THEORY OF EQUATIONS :

Relation between the roots and the coefficients-Symmetric functions of the roots -Transformation of equations-Reciprocal equations-Solution of algebraic and transcendental equations by Newton-Raphson method-polynomial equations by Graeffe's root squaring method and Horner's method. **(9)**

#### DIFFERENCE CALCULUS :

Finite differences-operators and their interrelations-Interpolations-Newton's and Lagrange's method, Numerical differentiation based on Newton's formula, Numerical integration-Trapezoidal and Simpson's 1/3 rule-Solutions of finite difference equations with constant coefficients. **(9)**

#### VECTOR CALCULUS

Vector differentiation-gradient-divergence-curl-physical interpretation and identities.Vector integration-line-surface and volume integrals. Gauss, Stoke's and Green's theorems (without proof)-applications. **(9)**

## LAPLACE TRANSFORMS

Transform of standard functions-Transform of unit step, dirac delta, error and periodic functions-Initial and final value theorems-Inverse transforms and their properties-Convolution theorem-Applications to ordinary differential equations and integral equations. (9)

## FOURIER SERIES

Dirichlet's conditions-Full range series-Half range series-Complex form of series-Parseval's identity - Harmonica analysis. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

## TEXT BOOKS :

1. Kandasamy, P. et al., "Engineering Mathematics for first year B.E/ B.Tech", (9th revised edition) S Chand & Co - (2011).
2. Kandasamy, P., et al., "Numerical methods." S.Chand& Co - (2011).
3. Veerarajan.T, "Transforms and Partial Differential Equations" (III Semester) (First Edition) Tata.McGraw - Hill Publishing Company Limited- (2011).

## REFERENCE BOOKS :

1. Erwin Kreyszig, "Advanced Engineering Mathematics", (10th Edition) Wiley India Private Limited- (2011).
2. Grewal, B. S., Higher Engineering Mathematics (42nd Edition), Khanna Publishers - (2012).

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x			x	x										
2	x	x		x	x										
3	x			x	x										
4	x			x	x										

## 13CE42 - MECHANICS OF SOLIDS - II

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The subject of Mechanics of Solids cuts broadly across all branches of engineering profession. At the end of this course, the student will have knowledge about behaviour of members subjected to various types of forces. The subject can be mastered best by solving numerous problems.

#### COURSE OUTCOMES :

- CO1** : The students will be able to find the slope and deflection of statically determinate and indeterminate beams.
- CO2** : The students will be able to understand the behaviour of cable structures.
- CO3** : The students will be able to understand the theory and behaviour of columns using various formulas.
- CO4** : The students will be able to explain various theories of failure.
- CO5** : The students will be able to understand concepts of unsymmetrical bending and shear centre.

#### DEFLECTION OF DETERMINATE BEAMS

Governing differential equation - slope and deflection and slopes of beams - Double Integration method - Macaulay's method - Moment area method - Conjugate beam method. Deflection due to shear. **(9)**

#### STATICALLY INDETERMINATE BEAMS

Analysis of propped cantilevers and fixed beams - Continuous beams - Theorem of Three moments. Reactions, Shear Force, Bending Moment and fixed end moments due to concentrated loads, uniformly distributed loads and uniformly varying loads and settlement of supports.

#### CABLES

Components and their functions, reactions - tension and length of suspension cables - effect of temperature. Stiffening girders - three hinged and two hinged. **(9)**

#### THEORY OF COLUMNS

Short columns -Stresses due to combined bending and axial Force - core of section - unsymmetrical sections - Elastic buckling of long columns - Euler's theory for long Columns - critical loads with different end conditions - limitations of Euler's theory - Rankine's and empirical formulae. **(9)**

#### THEORIES OF FAILURE

Maximum principal stress theory, maximum shear stress theory, strain energy theory, shear strain energy theory & maximum principal strain theory- Strain rosettes - Theories of failure and their Importance in design. **(9)**

## UNSYMMETRICAL BENDING AND SHEAR CENTRE

Significance of shear centre - Location of shear centre for Thin walled open sections with one axis of symmetry. Analysis of stresses and deflections due to unsymmetrical Bending. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

### TEXT BOOKS :

1. Egor P.Popov, "Introduction to Mechanics of Solids", Prentice Hall of India, New Delhi, 2003.
2. Beer F P, Johnston E R, DeWolf J T and Mazurek D, "Mechanics of Materials", McGraw-Hill Higher Education, 6th edition, 2011

### REFERENCE BOOKS :

1. Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2012.
2. Prakash Rao D.S., "Strength of Materials" Volume I, Universities Press (India) Limited, Hyderabad, 2002.
3. Lehri, RS.,Lehri., AS., "Strength of Materials", S K Kotaria & Press, New Delhi, 2009.
4. Timonshenko, S.P, Gere, J.M., "Mechanics of Materials", CBS Publishers, New Delhi, 2002.
5. Rajput, R.K., "Strength of Materials", S.Chand & Company Ltd., New Delhi, 2007.
6. Punmia BC, Ashok Jain and Arun Jain, "Strength of Materials and Theory of Structures" Vol 1, Laxmi Publications, New Delhi, 2000.
7. Bansal RK, "Strength of Materials", Laxmi Publications, New Delhi, 2010.

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x				x				
2	x	x	x		x					x		x			x
3	x	x		x				x				x			
4	x	x	x		x		x				x			x	
5	x	x	x		x		x				x			x	

# 13CE43 - APPLIED HYDRAULICS AND HYDRAULIC MACHINERY

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To impart a thorough knowledge about the applications of fluid flow concepts in open channels and an understanding of hydraulic machines

### COURSE OUTCOMES :

**CO1** : The students will be able to design pumps

**CO2** : The students will be able to design turbines and liquid Jets

**CO3** : The students will be able to design open channels carrying water

### UNIFORM FLOW IN OPEN CHANNELS

Uniform flow - Chezy's equation - Manning's equation - hydraulically best section for rectangular, trapezoidal and circular channels - circular sections running partially full - Flow over notches and weirs - flumes. **(9)**

### NON-UNIFORM FLOW IN OPEN CHANNELS

Non-uniform flow - critical depth - specific energy - flow characteristics - hydraulic jump - backwater curves - surges in channels. **(9)**

### IMPACT OF JETS

Impulse momentum principle - its applications on impact of liquid jets on plates and vanes at rest and in motion - moment of momentum equation - its applications on plates and vanes mounted on wheels - jet propulsion. **(9)**

### TURBINES

Classifications - Applications of Impact of Jets on Vanes to Turbines - velocity triangles - work done and efficiencies - Study of Pelton wheel, Francis turbine and Kaplan turbine - characteristics curves - performance of turbines - specific speed - unit quantities - model testing of turbines - selection of turbines. **(9)**

### PUMPS

Classification - Centrifugal pumps - work done - minimum starting speed - NPSH - characteristic curves - multistage pumps - specific speed - model testing

Reciprocating pump - work done - effect of acceleration and friction on pressure head - maximum speed of the pump - air-vessels - work saved against friction. **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOK :**

1. Modi.P.N, &Seth.S.M., " *Hydraulics, Fluid Mechanics & Hydraulic Machinery*", Metropolitan Book Company, New Delhi, 2013.

**REFERENCE BOOKS :**

1. Bansal. R.K., "*Text Book of Fluid Mechanics and Hydraulic Machines*", M/s. Lakshmi Publications, Madras, 2005.
2. Kumar. K.L, "*Engineering Fluid Mechanics*", M/s. S. Chand Co., Madras. 2003.
3. Ramamrutham. S, "*Fluid Mechanics, Hydraulics & Fluid Machinery*", M/s. Dhanpat Rai & Sons, New Delhi, 1998.
4. Arora K.R., "*Fluid Mechanics, Hydraulics and Hydraulic Machines*", Standard Publishers & Distributors, 1998.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X	X		X		X			X					
2	X	X	X		X		X			X					
3	X	X	X		X		X			X				X	



## 13CE44 - SURVEYING - II

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To impart knowledge about the measurements of heights and distances using tacheometry, triangulation etc., to introduce the fundamentals of horizontal and vertical curves and also to introduce modern survey instruments like total station, GPS etc.

#### COURSE OUTCOMES :

- CO1** : Students will be able to understand to problems in the civil engineering field with rise of surveying applications.
- CO2** : The students will be able to work with modern surveying instruments with better operating knowledge and collect field notes with higher accuracy.
- CO3** : The students will be able to analyze errors in surveying measurements based on their sources.
- CO4** : The students will be able to design various types of curves for smooth travel and can also calculate the area of land parcels with linear, circular or irregular boundary segments.

#### TACHEOMETRY

Systems - stadia, tangential - principles, instruments required. Stadia system - fixed hair method - horizontal and inclined sights - staff held vertical -horizontal distance and elevation formulae-movable hair method-Determination of stadia constants of the tacheometer - use of analytic lens.

Tangential system - subtense measurements - subtense bar, Tachometric Tables, Direct reading tacheometer. (9)

#### TRIANGULATION

Introduction - different net works - Grades of triangulation - Signals and towers - Field work - selection of triangulation stations - inter visibility and heights of stations.

Base Line - Choice - instrument and accessories - Measurement of base line - corrections - Satellite stations - need reduction to centre.

#### TRIGNOMETRIC LEVELLING

Corrections - Curvature and refraction - Axis signal correction - methods of trigonometrical levelling - single and reciprocal observations. (9)

#### TRIANGULATION ADJUSTMENT

Terms and definitions used - laws of weights - true and most probable values - weighted observations. Method of equal shifts - Principle of least squares - Normal equations. (9)

#### HORIZONTAL CURVES

Horizontal curves - Elements of simple curve - setting out with chain and tape - with Theodolites by deflection angles - Obstructions in curve ranging, compound and reverse curve (Parallel tangents only) - Transition curves - different kinds - functions and requirements - setting out the combined curve by Theodolites. (9)

## VERTICAL CURVES AND MODERN SURVEYING TECHNIQUES

Vertical curves - summits and sags - setting out vertical curve by tangent corrections.

Principle uses and advantages of electronic theodolites and electronic distance meters. Basic principles of remote sensing - GIS - GPS.

(9)

**Total : 45**

### TEXT BOOK :

1. *Kanetkar, T.P. and Kulkarni, S.V., " Surveying and Levelling", Volumes I and II, Pune VidyarthiGrihaPrakashan, Pune 2011.*

### REFERENCE BOOKS :

1. *Mahajan, Santhos K., "Advanced Surveying", Dhanpat Rai& Sons, NaiSarak, Delhi, 1987.*
2. *Punmia,B.C., "Surveying", Volumes I & II, Laxmi Publications, New Delhi, 2005.*
3. *Arora.K.R., "Surveying", Volume I, Standard Book House, Delhi-6, 2013.*
4. *Bannister A. and Raymond S., Surveying, ELBS, Seventh Edition, 1998.*
5. *Clark D., Plane and Geodetic Surveying, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2004.*
6. *Schofield,W., Engineering Surveying, Butterworth - Heinemann, London, Fifth Edition, 2001*
7. *Jack C. McCormac, " Surveying", John Wiley & Sons, 2012.*

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X		X	X					X	X			X	
2	X				X		X			X	X			X	
3	X				X	X	X			X					
4	X	X	X	X	X					X	X		X		

## 13CE46 - BASIC STRUCTURAL DESIGN (MASONRY, TIMBER & STEEL)

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To learn the design of structural components using steel, timber and masonry.

#### COURSE OUTCOMES :

- CO1** : The students will be able to design masonry walls, timber beams and columns, tension, compression member, beam and plastic analysis as per the current I.S codes.
- CO2** : The students will be able to analyze and understand the behaviour of structural elements.
- CO3** : The students will be able to make changes in design depending upon the availability of materials.
- CO4** : The students will be able to interpret the structural design of different elements.

### DESIGN OF BRICK MASONRY STRUCTURES

Classification of masonry structures - Design considerations of brick masonry -Permissible stresses. Load bearing walls - Non-load bearing walls. Design of load bearing walls and Columns - Pressure calculation for masonry walls. (9)

### DESIGN OF TIMBER STRUCTURES

Properties of structural timbers - Factors affecting the Strength - Permissible stresses - Grading of timber. Joints in timber structures - Design of bolted, nailed joints. Timber beams (rectangular) - Solid columns - Combined bending and direct stress. (9)

### CONCEPTS OF STRUCTURAL STEEL DESIGN

Working Stress Design - Limit State Design - Stress-strain relation of Mild steel - Modified stress-strain diagram - Assumptions in Plastic theory - Collapse load - load factor - plastic bending - Plastic hinge - Plastic moment of resistance - Plastic modulus - Shape factor - Plastic Analysis - Kinematic theorem, Static theorem and Uniqueness theorem - Propped cantilevers - Fixed beams and Continuous beams - Portal Frames. (9)

### CONNECTIONS

Bolted and welded connections for axial forces- eccentric connections with bolt and weld. (9)

### TENSION AND COMPRESSION MEMBERS

Design of tension members subjected to axial tension- tension member subjected to bending - lug angles. Design of compression members with single rolled steel sections - Angle struts.

### BEAMS

Design of Simple beams (laterally supported) of rolled sections for flexure, shear, web crippling and buckling and deflection. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS :**

1. Arya., "Structural Design in Steel, Masonry and Timber", Nem Chand and Bros, Roorkee, 1988.
2. Ramchandra, VirendraGehlot, "Limit State Design of Steel Structures", Scientific Publishers, Jodhur, 2010.
3. Bhavikatti.S.S. "Design of steel structures by Limit State Design", I.K International Pvt.Ltd., 2009.

**REFERENCE BOOKS :**

1. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2008.
2. IS: 1905 - Code of Practice for Structural use of Unreinforced Masonry, 1987.
3. SP 20 (S & T), "Hand Book on Masonry Design and Construction", Bureau of Indian Standards, 1991.
4. S.P.6 (1), ISI "Hand Book for Structural Engineers - Structural Steel Sections, BIS, 1964.
5. IS: 883, "Code of Practice for Design of Structural Timber in Building", Bureau of Indian Standards, 1994.
6. IS: 2366, "Code of Practice for Nail- Jointed Timber Constructions", Bureau of Indian Standards, 1983.
7. IS: 800, "Code of Practice for use of Structural Steel in General Building Construction", Bureau of Indian Standards, 2007.
8. IS: 816, " Code of Practice for Used of Metal arc Welding in General Construction in Mild steel, Bureau of Indian Standards, 1969.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x						x				
2	x	x	x		x					x					
3				x	x		x								
4					x		x			x	x				

# 13CE31 - MATHEMATICS III

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

The objective is to incorporate the ideas of complex variables, partial differential equations and its applications and Fourier transforms that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many engineering fields.

### COURSE OUTCOMES :

- CO1** : The students will be able to apply complex variable ideas to solve civil engineering problems.
- CO2** : The students will be able to solve partial differential equations and apply them in solving civil engineering problems.
- CO3** : The students will be able to work with Fourier transform ideas to analyze and solve communication oriented problems

## COMPLEX DIFFERENTIATION

Analytic functions-Definitions and properties-Cauchy Riemann equations in Cartesian and polar coordinates-construction of analytic functions- Conformal mappings-Bilinear Transformation -the mappings of the form  $w= z+a$ ,  $az$ ,  $1/z$ ,  $z^2$ ,  $e^z$ ,  $\sin z$ ,  $\cos z$ , -Simple problems. (9)

## COMPLEX INTEGRATION

Cauchy's integral theorem-Integral formula-Taylor's and Laurent's series (without proof)-Types of singularities, Poles and residues-Cauchy's residue theorem-Applications-Contour integration using circular and semicircular contours. (9)

## PARTIAL DIFFERENTIAL EQUATIONS

Formation by elimination of arbitrary constants and functions solution by direct method-solution of first order non-linear PDE-standard types- Lagrange's linear equation-Linear higher order homogeneous PDE with constant coefficients. (9)

## FOURIER TRANSFORMS

Fourier integral theorem (without proof)-Infinite Fourier transform - infinite Fourier sine and cosine transforms-properties and problems-Convolution theorem-Parseval's identity-Finite Fourier sine and cosine Transforms- properties and problems. (9)

## BOUNDARY VALUE PROBLEMS

Vibration of strings-one dimensional wave equations, one dimensional heat flow- unsteady state and steady state -Two dimensional heat flow steady state in Cartesian coordinates-Separation of variables-Fourier series solution. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS :**

1. *Kandasamy P., "Engineering Mathematics", Volume - II & III S. Chand & Co., 2004.*
2. *Veerarajan T., "Engineering Mathematics", Third Edition, Fifth Reprint, Tata Mc Graw - Hill Publishing Company Ltd, 2008.*
3. *Venkataraman, M.K., "Engineering Mathematics III", Revised and Enlarged Fourteenth Edition, The National Publishing Company, 2008.*

**REFERENCE BOOKS :**

1. *Erwin Kreyszig, "Advanced Engineering Mathematics", (Eighth Edition) John Wiley & Sons (Asia) Private Limited., - (2008).*
2. *Grewal, B.S., "Higher Engineering Mathematics", (Fourth Edition) Khanna Publishers - 2007.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X										
2	X	X			X										
3	X	X			X										

## 13CE35 - CONCRETE TECHNOLOGY

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To impart knowledge about concrete making materials, properties of fresh and hardened concrete, special concretes, mix design and nondestructive testing.*

#### **COURSE OUTCOMES :**

**CO1** : *Students will be able to understand about properties of concrete making materials*

**CO2** : *Students will be able to explain mix design procedures as per Indian Standard Codes.*

**CO3** : *Students will be able to explain fresh and hardened properties of concrete and special concretes*

### **CEMENT**

Types of cement - properties and specific uses of various cements - Tests of cement - Fineness - Setting time - Consistency- Soundness - compressive strength.

### **AGGREGATES**

Properties of aggregates - shape, texture, bond, strength, soundness and thermal properties - grading - bulking of sand - Tests on aggregates - Flakiness index - Elongation index - Crushing value - Impact value - Abrasion value. **(9)**

### **WATER**

Quality of water for mixing and curing - use of Sea water for mixing concrete.

### **ADMIXTURES**

Air-entraining agents - Accelerators - Retarders - Pozzolona - Water proofing agents - workability agents - plasticizers - super plasticizers

### **CONCRETE MIX DESIGN**

Factors affecting mix proportion - Water cement ratio - Aggregate cement ratio - Mix design by I.S. method and ACI method. **(9)**

### **MANUFACTURE OF CONCRETE**

Measurement of materials - Volume batching and weigh batching - mixing of concrete - Types of mixers - Transporting of concrete placing of concrete - compaction of concrete - Methods of compacting concrete - Tamping - Vibration - Vibroprocessing - Jolting - Rolling - Centrifugation -Curing of concrete - Different methods of curing. **(9)**

### **PROPERTIES AND TESTS ON FRESH AND HARDENED CONCRETE:**

#### **FRESH CONCRETE**

Workability - Workability Tests - Slump Test - Compacting factor Test - Flow test - Kelly Ball test - Vee Bee consistometer test - segregation and Bleeding.

## HARDENED CONCRETE

Compressive Strength of concrete - Modulus of Rupture -Tensile Strength - Modulus of elasticity - Bond stress - Shrinkage of concrete - Factors affecting shrinkage of concrete - creep - Factors influencing creep - Factors affecting permeability - Thermal properties. **(9)**

## QUALITY CONTROL

Sampling - Frequency of sampling - Standard deviation - acceptance criteria as per IS 456 - 2000.

## SPECIAL CONCRETES:

Light weight concrete - Fibre Reinforced Concrete - Ready Mixed concrete - High density Concrete - Polymer Concrete - Ferrocement- Shotcreting - Hot weather concreting - Cold weather concreting - high strength concrete - High performance concrete - Self compacting concrete - Ready mixed Concrete.**(9)**

**Total : 45**

## TEXT BOOK:

1. Shetty M.S., "Concrete Technology", S.Chand and Company Ltd, New Delhi, 2005.

## REFERENCE BOOKS:

- 1 Neville.A.M., "Properties of Concrete", ELBS, 2011.
2. Santhakumar A.R., "Concrete Technology" Oxford University Press, New Delhi, 2012
3. Krishnasamy K.T., "Concrete Technology", DhanpatRai, New Delhi, 2012.
4. Gambhir M.L., "Concrete Technology", Tata McGraw Hill Publishing Company Limited, New Delhi, 2009.
5. IS 456- 2000 Indian Standard Code of Practice for Plain and Reinforced Concrete, BIS, New Delhi.

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x			x					x	x				
2	x	x			x					x	x				
3	x	x			x					x	x				



## 13CE52 - STRUCTURAL ANALYSIS I

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*At the end of the course the student should be able to understand the different concepts of the analysis like equilibrium, energy approach, basics of arches, moving load concept on bridges, and basics of the force method using consistent deformation method.*

#### COURSE OUTCOMES :

**CO1** : *The students will be able to explain the basic concepts in structural analysis.*

**CO2** : *The students will be able to understand the various energy principles and apply them in structures.*

**CO3** : *The students will be able to analyse structures with moving loads and draw influence line diagrams.*

**CO4** : *The students will be able to analyse arches, statically indeterminate beams and trusses.*

### FUNDAMENTALS OF STRUCTURAL ANALYSIS

Determination of static indeterminacy and kinematic indeterminacy-Deficiency for beams, frames and pin jointed trusses - Behaviour of Structures - Principle of superposition- Analysis of Pinjointed space trusses by Method of Tension coefficient. **(9)**

### ENERGY CONCEPTS

Energy principles - Strain energy - Complementary energy - Principle of Virtual work - Principle of virtual displacement and virtual force - Castigliano's Theorems - Engesser's Theorem - Maxwell Betti's Theorem - Application of the above principles to find the deflections of statically determinate beams and plane trusses-Theorem of least work- Analysis of statically indeterminate beams (upto 2 degrees). **(9)**

### MOVING LOADS AND INFLUENCE LINES

Moving loads - Absolute maximum shear force and bending moment in simply supported beams - Determination of equivalent UDL - influence lines for shear force, bending moment and reactions in statically determinate beams and influence lines for forces in members of statically determinate plane trusses - Reversal of forces in members of plane trusses. Influence lines for shear force, bending moment and reactions in statically indeterminate beams by Muller-Breslau's Principle - Application of Muller Breslau Principle to beams with degree of static indeterminacy not exceeding one. **(9)**

### ANALYSIS OF ARCHES:

Analysis of three hinged arches of parabolic and circular profiles - Analysis of two hinged symmetric parabolic and circular arches. Settlement and temperature effects - Influence lines for bending moment, normal thrust and radial shear at sections of an arch. **(9)**

### CONSISTENT DEFORMATION METHOD:

Application of Consistent Deformation method to the analysis of statically indeterminate beams and statically indeterminate plane trusses subjected to loads, lack of fit settlement and temperature effects - Analysis of Trussed Beams. (9)

Theory : 45

Tutorial : 15

Total : 60

### TEXT BOOKS :

1. *Guptha.S.P and Pandit.G.S, "Theory of Structures, Vol.I& II", Tata McGraw Hill, New Delhi, 2012.*
2. *Rajasekaran.S and Sankarasubramanian. G, "Computational Structural Mechanics" Prentice Hall of India, New Delhi, 2012.*

### REFERENCE BOOKS:

1. *Bhavikatti.S.S, "Structural Analysis" Vol.I& II, Vikas Publishing House (P) Ltd., New Delhi, 2011.*
2. *Prakash Rao., D.S., "Structural Analysis", Universities Press, Hyderabad, 2001.*
3. *Armenakas.A.E., "Classical Structural Analysis" Mc-Graw Hill Book Co., NewYork, 1995.*
4. *Reddy.C.S, "Basic Structural Analysis", Tata Mc-Graw Hill, New Delhi, 2012.*
5. *Junnarkar and Shah., "Mechanics of Structures" Vol.II, Charotar Publishing House, Anand, 2012.*
6. *Punmia.B.C and A.K.Jain "Strength of Materials and Theory of Structures", Vol.II, Laxmi Publications, New Delhi, 2005.*
7. *Wang.C.K, "Intermediate Structural Analysis", Tata Mc-Graw Hill, New Delhi, 2010.*

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x			x					
2	x	x	x		x		x			x					
3	x	x	x		x		x			x					
4	x	x	x		x		x			x					

# 13CE53 - MECHANICS OF SOILS

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*Undergoing this course enables the student to gain adequate knowledge on engineering properties of soil.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to understand the type, properties and behaviour of soil.*

**CO2** : *The students will be able to understand the concept of application of laws of mechanics in soil engineering.*

**CO3** : *The students will be able to test the soil for the estimation of stress, strength and safety.*

**CO4** : *The students will be able to analyse the structure built using soil.*

## INTRODUCTION

Soil formation and soil types - Civil engineering problems related to soils - Nature of soil - Simple definitions - Phase relationships - Classification - IS Classification system. Compaction - Factors affecting compaction - Laboratory and field compaction methods. **(9)**

## SOIL WATER

Principles of water flow - Darcy's law - Permeability - Laboratory Methods - Field measurement of permeability - Effective stress concept - Dry and saturated soils. **(9)**

## STRESS DISTRIBUTION AND CONSOLIDATION

Stress distribution in soil media - Boussinesq's Analysis - Westergaard's Analysis - Intensity of vertical stress using influence charts. Consolidation - measurement of compressibility - e-log P curves - Terzaghi's one dimensional consolidation theory - Determination of coefficient of consolidation. **(9)**

## SHEAR STRENGTH

Shear at a point - Mechanism of shear resistance - Mohr- Coulomb failure criterion - measurement of shear strength - Direct shear test - Triaxial shear test - Unconfined compression strength test - Vane shear test - Shear strength of clay soil - Shear strength of sand. **(9)**

## STABILITY OF SLOPES:

Types of slopes - Stability of infinite slope - Stability of Finite slope - Total stress Analysis - Swedish circle method - Use of Taylor's stability number - Slope failure mechanism - Effect of Tension cracks. **(9)**

**Total : 45**

## TEXT BOOKS :

1. *Gopal Ranjan and Rao, ASR, "Basic and Applied Soil Mechanics" New Age International (P) Limited Publication, New Delhi, Second Edition, 2010.*

2. Venkataramaiah, "Geotechnical Engineering", New Age International Ltd., New Delhi Third Edition, 2012.
3. Punmia, B.C, "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2005.

**REFERENCE BOOKS:**

1. Alam Singh, "Modern Geotechnical Engineering", IBS Publications, New Delhi, 2010.
2. Muni Budhu, "Soil Mechanics and Foundation Engineering", Wiley India Publication, New Delhi, Second Edition, 2010.
3. Braja M. Dass and Khaled Sobhan "Principles of Geotechnical Engineering" Cengage learning, 2013.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1		x		x	x		x				x				x
2	x	x	x		x		x			x		x			
3	x	x		x		x				x					
4	x	x	x	x	x		x		x	x	x			x	

# 13CE54 - DESIGN OF R.C STRUCTURAL ELEMENTS

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

The course will focus on explaining the background of current design specifications for reinforced concrete structures.

### COURSE OUTCOMES :

- CO1** : The students will be able to define problems for design of reinforced concrete elements that meet code requirements based on strength, stiffness and serviceability considerations.
- CO2** : The students will be able to design slabs as per IS codal Provisions
- CO3** : The students will be able to understand the concepts on detailing and various methods in design

## INTRODUCTION

Materials for concrete - Stress - Strain curve for concrete in compression - Concrete mix proportioning - Design concrete mix and nominal concrete mix - Types of reinforcement Specifications as per IS1786 : 2008 - Plain and deformed bars - Stress - strain curve for reinforcing steel. Concept of WSD (No problems) and LSD - Difference between WSD and LSD - Characteristic loads and strengths - partial safety factor - Various limit states. Design for Flexure by LSD - Design of singly and doubly reinforced rectangular and flanged sections - Design of lintels - detailing. (9)

## DESIGN FOR SHEAR, BOND AND TORSION:

Design for shear - concept of bond and anchorage - Design for torsion - IS code provision for the design of beams - Design of continuous beams using B.M. and S.F. coefficients as per IS code - detailing. (9)

## DESIGN OF SLABS:

Types of slabs - IS code regulations - Stiffness requirements - Design of one-way simply supported and continuous slab using BM and SF co-efficient as per IS code - Principles of Rankine - Grashof's method (no problems) - design of two way, simply supported and continuous slab as per IS code - Detailing. Design of staircase slab - Design of waist slab for dog-legged stair case - Detailing of Tread- Riser type of stair case (Concept only) - Detailing. Design of flat slab as per IS 456-2000-Detailing. (9)

## DESIGN OF COLUMNS

IS-code regulations - Design of short rectangular and circular columns subjected to axial compressive load - Design of short columns subjected to combined axial compressive load and uni-axial and biaxial bending moments using Design Aids (SP 16) - Design of long columns - Detailing. (9)

## DESIGN OF FOOTINGS

Design of wall footings - Design of isolated, square and rectangular footings. - Combined rectangular and trapezoidal footings - Detailing. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS:**

1. *Unnikrishna Pillai and Devados Menon, "Reinforced Concrete Design", Tata Mc Graw Hill Publishing Co, New Delhi, 2011.*
2. *Ashok K Jain, "Reinforced Concrete Limit State Design". New Chand Bros, Roorkee, 2012.*

**REFERENCE BOOKS:**

1. *Purusothaman.P, "Reinforced Concrete Structural Elements Behaviour Analysis and Design", Tata McGraw hill Publishing Co., Limited, New Delhi, 1987.*
2. *Park.R and Paulay T., " Reinforced Concrete Structures", John Wiley and Sons, New York, 1975.*
3. *Sinha, N.C., and Roy, S.K., "Fundamentals of Reinforced Concrete", S.Chand and Company, New Delhi, 2013.*
4. *Sinha,S.N., "Reinforced Concrete Design", Tata Mc Graw - Hill Publishing Co, Ltd., New Delhi, 2012.*
5. *MacGregor J.G., "Reinforced Concrete Mechanics and Design", Prentice Hall, New Jersey, 2011.*
6. *Varghese,P.C, "Limit State Design of R.C.Structures", Prentice Hall of India, 2001.*
7. *Mallick,S.K., and Gupta, A.P., "Reinforced Concrete", Oxford & IBH Publishing Co., New Delhi, 2012.*
8. *IS: 456 - 2000 Indian Standard Code of Practice for Reinforced Concrete, Bureau of Indian Standards, New Delhi.*
9. *SP- 16 - 1980 Design Aids for reinforced Concrete, Bureau of Indian Standards, New Delhi.*
10. *SP - 34 - 1987, Hand Book on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x			x			x				
2	x	x	x					x			x				x
3	x	x	x					x			x				x

## 13CE41 - NUMERICAL METHODS

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

To develop effective understanding, formulation and solving skills of Numerical methods to apply into civil engineering field.

#### **COURSE OUTCOMES :**

**CO1** : The students will be able to solve various linear equations using numerical methods

**CO2** : The Students will be able to solve differential equations and apply in various civil engineering problems

**CO3** : The Students will be able to work with numerical methods to solve integration problems in civil engineering

**CO4** : The Students will be able to solve for Eigen values and Eigen vectors, and apply in Civil Engineering Problems.

#### **LINEAR SIMULTANEOUS ALGEBRAIC EQUATION**

Direct methods: Gauss-elimination, Gauss-Jordon, Cholesky and Partition methods. Iterative methods: Jacobi and Gauss-Siedel methods. (9)

#### **FINITE DIFFERENCE METHODS**

Applications: Shear force, Bending moment and Deflection variation in statically determinate beams - Deflection in Statically indeterminate beams - Vibration of beams - Bending of laterally loaded thin plates. (9)

#### **NUMERICAL INTEGRATION**

Trapezoidal Rule, Simpson's one third Rule - Gaussian quadrature formula - Application of quadrature rule to deflection of non - prismatic simple beams. (9)

#### **EIGEN VALUES AND EIGEN VECTORS**

Iterative method (Power method) - Jacobi method - Applications: Principal stresses and Principal planes -Principal moment of inertia and principal axes - Application of finite difference in eigen value problems to buckling of columns. (9)

#### **ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**

Ordinary Differential Equations: Taylor series method - modified Euler's method - Runge-kutta method of fourth order - Milne's predictor - corrector method. Partial Differential Equations:

Finite difference approximation - solution of partial differential equations - Laplace equation - Liebmann's iteration process- Poisson's equation - parabolic equation - Bender-schmidt and Crank-Nicholson scheme - Hyperbolic equation. (9)

**Total : 45**

**TEXT BOOKS:**

1. Krishna Raju, N. and Muthu K.U., "Numerical Methods for Engineering Problems", Macmillan India Limited, 2011.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Numerical Methods", S. Chand & Company Limited, 2005.

**REFERENCE BOOKS:**

1. Jain.M.K, Iyengar.S.R.K, and Jain.R., "Numerical Methods for Scientific and Engineering Computation", New Age International (P) Ltd, Publishers, 2004.
2. Scarborough.J.B, "Numerical Mathematical Analysis", Oxford and IBH Publishing Company, 1992.
3. Rajasekaran.S., " Numerical Methods in Science and Engineering (A Practical approach )", A.H. Wheeler & Co.1987.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X										
2	X	X			X										
3	X	X			X										
4	X	X			X						X				



## 13CE51 - TRANSPORTATION ENGINEERING I

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To impart basic concepts in highway planning, geometrics, construction and traffic engineering.

#### COURSE OUTCOMES :

- CO1** : The students will be able to analyse the present situation of the road network and to rectify the realignment according to the necessary condition
- CO2** : The students will be able to compute the highway geometrical design
- CO3** : The students will be able to analyse the various characteristics of highway materials and test this quality
- CO4** : The students will be able to determine the present and future demand of the road traffic
- CO5** : The students will be able to apply the various traffic measures and control in real world.

### HIGHWAY PLANNING

Role of IRC, CRRI and NHAI-Classification of roads-Road patterns-Planning Surveys-Master Plan and Phasing of master plan- Highway alignment -Factors -Engineering surveys-Drawings and reports -Highway project-New and re alignment project. Maximum dimension of road vehicles and loaded weight-Passenger Car Units- Pavement failures -Flexible and rigid-Types-Causes-Maintenance- Pavement evaluation. **(9)**

### HIGHWAY GEOMETRIC DESIGN

Cross section elements -Friction, roughness, light reflecting characteristics-camber-Width of carriage way, medians-Kerbs-Road margins-Cross section of roads in embankment and cutting -Width of formation IRC standards-Right of way-Recommended road width for different classes of roads-Sight distance-Design of Horizontal Alignments-Design Speed-Radius of Horizontal Curves-Super elevation- Widening of pavement on horizontal curves-Transition curves-Types- Length-Examples. Design of vertical alignment-Gradient-Types-Gradient for different terrains-Vertical curves -Summit curves, Valley curves- Examples. **(9)**

### MATERIALS

Properties of road aggregates and tests - Bituminous materials - Types- Requirements - Tests- Bituminous mixes- Pavements -Flexible -Rigid -comparison-Soil subgrade, sub base and base course, wearing course and their evaluation. Highway construction - Earthwork and preparation of subgrade- Bituminous pavements - Types -Construction procedure. Construction of cement concrete pavement. **(9)**

### TRAFFIC ENGINEERING

Scope- Characteristics- Road user-Vehicle-Traffic studies - Volume, Speed, Origin and Destination, Capacity, Parking and Accidents. **(9)**

## TRAFFIC OPERATIONS

Traffic regulations- Traffic control devices - Traffic signs - Traffic signals - Road markings - Traffic islands - Control of access on highways - Design of intersections - Grade separated intersections - Express ways.

(9)

Total : 45

## TEXT BOOK :

1. Khanna.S.K and Justo. C.E.G., "Highway Engineering", Khanna Publishers, Roorkee, 2001.

## REFERENCE BOOKS :

1. Sharma S.K., "Principles, Practice and Design of Highway Engineering", S.Chand&co., New Delhi, 2012.
2. Kadayali., "Principles, Practice and Highway Engineering", Khanna Publishers, New Delhi, 2007.
3. Smith T.N and Hurd E.W "Traffic Engineering", McGraw Hill, New Delhi, 2003.
4. IRC Codes 15-2002, 37-2001, 38-1988, 52-1988, 62-1976, 66-1976, 73-1980, 58-2002 & IRC SP 23-1993.

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X					X	X	X	X		
2	X	X			X							X	X		
3	X	X			X						X	X	X		
4	X	X			X							X	X		
5	X	X	X		X			X			X	X	X	X	

## 13CE62 - STRUCTURAL ANALYSIS II

L	T	P	C
3	1	0	4

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*At the end of the course the student should be able to understand the moment distribution methods, slope deflection methods, matrix flexibility and matrix stiffness method and basics of finite element method.*

#### COURSE OUTCOMES :

- CO1** : *The students will be able to understand the analysis of statically indeterminate beams and plane frames using slope deflection method and moment distribution method.*
- CO2** : *The students will be able to explain the analysis of simple determinate and indeterminate beams, frames and trusses using matrix flexibility method.*
- CO3** : *The students will be able to analyse simple determinate and indeterminate beams, frames and trusses using matrix stiffness method.*
- CO4** : *The students will be able to explain the basic concepts in finite element method.*

#### SLOPE DEFLECTION METHOD

Application of slope deflection method to the analysis of statically indeterminate beams and rigid jointed plane frames - Effects of settlement of supports for beams only (Examples on structures having Kinematic indeterminacy not exceeding three). **(9)**

#### MOMENT DISTRIBUTION METHOD

Stiffness and carry over factors for prismatic and non prismatic members - Application of the method to the analysis of continuous beams and rigid jointed plane frames - effects of settlement of supports - Symmetric and skew symmetric loadings - Two cycle method - Substitute frame.

Building Frames - Lateral load analysis - Portal method and Cantilever method. **(9)**

#### MATRIX FLEXIBILITY METHOD

Element flexibility - Structure flexibility - Formulation of Structure flexibility matrix - Determination of forces / displacements - Application to simple determinate and indeterminate beams, frames and trusses. **(9)**

#### MATRIX STIFFNESS METHOD

Element stiffness - Structure stiffness - Formulation of Structure stiffness matrix - Application to simple determinate and indeterminate beams, frames and trusses. **(9)**

#### INTRODUCTION TO FINITE ELEMENT METHOD

Basic steps - Concept of an element - Various element shapes - Application of FEM - Limitations - Element stiffness matrix for one dimensional members - Procedure of assembly and solving equations (No problems). **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS :**

1. Gupta.S.P and Pandit.G.S, "Theory of Structures, Vol. I & II", Tata McGraw Hill, New Delhi, 2012.
2. Rajasekaran.S and Sankarasubramanian. G., "Computational Structural Mechanics" Prentice Hall of India, New Delhi, 2012.

**REFERENCE BOOKS :**

1. Bhavikatti.S.S, "Structural Analysis" Vol. I& II, Vikas Publishing House (P) Ltd., New Delhi, 2011.
2. Prakash Rao., D.S., "Structural Analysis", Universities Press, Hyderabad, 2001.
3. Armenakas.A.E., "Classical Structural Analysis" Mc-Graw Hill Book Co., New York, 1995.
4. Reddy.C.S, "Basic Structural Analysis", Tata Mc-Graw Hill, New Delhi, 2012.
5. Junnarkar and Shah., "Mechanics of Structures" Vol.II, Charotar Publishing House, Anand, 2012.
6. Punmia.B.C and A.K.Jain "Strength of Materials and Theory of Structures", Vol.II, Laxmi Publications, New Delhi, 2005.
7. Wang.C.K, "Intermediate Structural Analysis", Tata Mc-Graw Hill, New Delhi, 2010.
8. Krishnamoorthy C.S., Finite Element Analysis, Theory and Programming - Tata McGraw Hill Company, 2000.
9. Reddy.J.N., "An Introduction to the Finite Element Method", Tata McGraw Hill Company, NewDelhi, 2005.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x			x					
2	x	x	x		x		x			x					
3	x	x	x		x		x			x					
4	x	x	x		x		x			x					

## 13CE63 - FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*At the end of this course student acquires the capacity to investigate the soil condition and to design suitable foundation.*

#### **COURSE OUTCOMES :**

- CO1** : *The students will be able to plan and carryout soil Investigation programmes for different engineering projects.*
- CO2** : *The students will be able to compute the bearing capacity and settlements of foundations.*
- CO3** : *The students will be able to judge suitable foundation for different site conditions.*
- CO4** : *The students will be able to analyse and design the suitable foundation and earth retaining structures.*

### **SOIL INVESTIGATION AND CHOICE OF FOUNDATION**

Methods of Soil Exploration - Boring - Sampling - Disturbed and undisturbed Sampling - Sampling techniques - Bore log and soil investigation report - Function and requirements of good foundation - Choice of foundation based on soil conditions. **(9)**

### **BEARING CAPACITY AND SHALLOW FOUNDATIONS**

Location and depth of foundations- Bearing capacity of shallow foundations on homogeneous deposit - Terzaghi's Theory - IS Code method - Field tests - Factors influencing Bearing Capacity - Settlement of foundations - Components of settlement - Allowable and maximum differential settlement - Proportioning of footing (No structural design) - Methods of improving bearing capacity - Methods of minimizing settlements. **(9)**

### **PILE FOUNDATIONS**

Need for deep foundations -Types of piles - classification of piles - Load carrying capacity of piles in granular and cohesive soils -Static and Dynamic formulae - Pile carrying capacity by field tests - Pile load test - Group Capacity - Settlement of Pile groups - Negative skin friction. **(9)**

### **EARTH PRESSURE AND RETAINING WALLS**

Earth pressure theory - Plastic equilibrium in soils - active and passive state - Rankine's theory - Coulomb's wedge theory - Earth pressure on retaining walls of simple configurations - Stability of retaining wall - Culmann's graphical method for determining earth pressure. **(9)**

### **FOUNDATIONS ON EXPANSIVE SOILS AND GROUND IMPROVEMENT METHODS**

Shrinkage and expansion of clays - Identification of expansive soils - Measurement of swell and swell pressure - Principles of design of foundations in expansive soils - Ground improvement methods - Preloading - Soil replacement - Densification - Stabilization - Soil reinforcement. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Varghese P.C., "Foundation Engineering", Prentice Hall of India, 2005.
2. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New age International (P) Ltd Publications, New Delhi, Second Edition, 2010.

**REFERENCE BOOKS :**

1. Venkataramaiah.C, "Geotechnical Engineering", New Age International Ltd., New Delhi,2008.
2. Alam Singh., "Modern Geotechnical Engineering", IBS Publications, New Delhi, 2012.
3. Punmia.B.C., "Soil Mechanics and Foundation Engineering", Laxmi Publications, New Delhi, Sixteenth Edition, 2005.
4. Braja M. Dass, "Principles of Foundation Engineering", Thomson Brooks Gole, Singapore, 2005.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1			x	x	x		x			x					x
2	x	x	x		x		x		x	x				x	x
3			x		x	x			x					x	x
4		x	x				x		x		x			x	x

# 13CE65 - DESIGN OF REINFORCED CONCRETE STRUCTURES

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

At the end of this course the student should be able to design rigid frames, retaining walls, water tanks, bridges and further understand the plastic theory of RCC.

### COURSE OUTCOMES :

**CO1** : The students will be able to understand the conceptual design of rigid frames for vertical and horizontal loading, retaining wall, water tank, bridges

**CO2** : The students will be able to design bridges as per IRC codes

**CO3** : The students will be able to explain design concepts of deep beams and corbels.

### YIELD LINE THEORY

Introduction to yield line theory of slabs - Application to square and rectangular slabs with simply supported or fixed boundary conditions subjected to uniformly distributed and central concentrated loads (by upper bound theorem). Concept of corner lever. Limit Analysis of RCC structures - Fundamental principles, Concept of moment redistribution - moment rotation characteristics - permissible rotation capacity - cambridge method - A.L.L. Baker's method of Limit analysis (Assumptions and procedures only, qualitative treatment). **(9)**

### RETAINING WALLS

Design of cantilever and counterfort retaining walls for level surface filled with/without uniform surcharge - stability requirements - Description of inclined backfill (no problems). Design of RC walls **(9)**

### GROUND WATER TANK

Classifications - based on shapes, levels and functions - Principles of design - IS code provision - no tension basis - Design of underground rectangular tank. **(9)**

### OVERHEAD WATER TANK

Design of overhead rectangular and circular tanks. Design of staging for rectangular tank. - Descriptions of Intz type tank (no problems). **(9)**

### BRIDGES AND DEEP BEAMS

Types of bridges - IRC loadings - design of single span slab bridges for class A (or) class AA loadings only - concept of skew slab bridge. (no problems). Design of deep beams - Design of corbels. **(9)**

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS :**

1. *Unnikrishna Pillai and Devados Menon, "Reinforced Concrete Design", Tata Mc Graw Hill Publishing Co, New Delhi, 2011.*
2. *Ashok K Jain, " Reinforced Concrete Limit State Design" ,New Chand Brothers, Roorkee, 2012.*
3. *Purusothaman.P, "Reinforced Concrete Structural Elements Behaviour Analysis and Design", Tata McGraw hill Publishing Co., Limited, New Delhi, 1987.*
4. *Park.R and Paulay T., " Reifnorced Concrete Structures", John Wiley and Sons, New York, 1975.*

**REFERENCES BOOKS :**

1. *Design aids for Reinforced Concrete to IS : 456 - 1978, Bureau of Indian Standards, New Delhi.*
2. *Reynolds.C.E., "Reinforced Concrete Designer's HandBook" Cement and Concrete Association, London, 2002.*
3. *Johnson Victor D., "Essentials of Bridge Engineering" Oxford and IBH Publishing Company, New Delhi, 2003.*
4. *Sinha, N.C., and Roy, S.K., "Fundamentals of Reinforced Concrete", S.Chand and Company, New Delhi, 2013.*
5. *Sinha,S.N., "Reinforced Concrete Design", Tata Mc Graw - Hill Publishing Co, Ltd., New Delhi, 2012.*
6. *Varghese,P.C, "Limit State Design of R.C.Structures", Prentice Hall of India, 2001.*
7. *I.S.456 - 2000 Code of Practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi.*
8. *I.S.3370 (Part I to IV) - 1965 (Reestablished :1999) - Code of Practice for Concrete Structures for the Storage of Liquids, Bureau of Indian Standards, New Delhi.*
9. *IRC:5 - 1998 - Standard Specification and Code of Practice for Road Bridges (Section I), Bureau of Indian Standards, New Delhi.*
10. *IRC:6 - 1966 - Standard Specification and Code of Practice for Road Bridges (Section II), Bureau of Indian Standards, New Delhi.*
11. *IRC:21 - 2000 - Standard Specification and Code of Practice for Road Bridges (Section III), Bureau of Indian Standards, New Delhi.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x			x			x				
2	x	x	x							x			x		
3	x	x	x			x		x		x			x		



# 13CE55 - WATER SUPPLY ENGINEERING

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*This course aims at exposing the students of Civil Engineering about the Water Quality and its perspectives in dwelling regions.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to understand various water supply perspectives.*

**CO2** : *The students will be able to demonstrate various sources of water and their yield.*

**CO3** : *The students will be able to explain ways of transmitting water and their treatment.*

**CO4** : *The students will be able to understand various methods of storage and distribution of water.*

## WATER SUPPLY PERSPECTIVES

Objectives of public water supply scheme - Components of water supply project and scheme - Planning and financial aspects - Design period - Water quality parameters: physical, chemical, and biological - MTFT and MFT tests - MPN and Thomas formulae- Water analysis and drinking water standards of India - Population forecasts: short and long term methods - Water demands and variation in demand pattern- Fire demand and MUDM formulae. **(9)**

## SOURCES OF WATER

Surface and ground water sources - Factors to be considered - Assessment of capacity of impounding reservoirs: Mass in-flow curve and analytical methods- Elementary ground water hydrology -

Assessment of yield of wells by steady-state methods (no derivation) - Field testing of wells for the yield - Construction, development and sanitary protection of wells - Intake structures and their selection. **(9)**

## TRANSMISSION OF WATER

Different categories of pipes used in transmission - Analysis and design of pressure pipes - Application of nomograms in the design - Pipe materials and their selection - Laying, jointing and testing of pipes - Pumping of water and selection of pumps - HP requirements and operating point of pumps - pumping station and its requirement - Various valves used in transmission. **(9)**

## TREATMENT OF WATER

Unit operations and unit processes - Conventional and unconventional treatment units - Objectives, principles, operation, analysis and design of flash mixer, flocculator, sedimentation and rapid- sand filtration units - Objectives and principles of disinfection - Chlorination and its methods - Principles, objectives, and operation of aeration, water softening, iron and manganese removal and fluoride removal. **(9)**

## STORAGE AND DISTRIBUTION OF WATER

Necessity and classification of storage tanks - Ground level and elevated reservoirs - Balancing and distribution reservoirs- Location and assessment of capacity of distribution reservoir - Methods and systems of distribution of water - Objectives, requirements and functions of a distribution network-Application,

merits and demerits of various types of distribution networks - Analysis and design of distribution network by equivalent pipe method and Hardy-Cross method of balancing - Maintenance and leak detection - Corrosion and its control - Langelier saturation index(LSI) - Appurtenances in distribution network and in buildings. **(9)**

**Total : 45**

**TEXT BOOKS:**

1. Garg S.K. "Environmental Engineering (Vol-I) Water Supply Engineering", Khanna Publishers, New Delhi, 2010.
2. Birdie G.S, "Water Supply and Sanitary Engineering", Dhanapat Rai Publications, New Delhi, 2000.

**REFERENCE BOOKS :**

1. Raju, B.S.N, "Water Supply and Waste Water Engineering", Tata McGraw - Hill Co, New Delhi, 1995.
2. Duggal, K.N., "Elements of Environmental Engineering", S. Chand & Co, New Delhi, 2002.
3. Punmia B.C, Ashok Jain and Arun Jain, "Water Supply Engineering", Laxmi Publications - Pvt. Ltd., New Delhi, 2004.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x	x	x	x		x	x				
2	x	x	x		x	x	x	x		x	x				
3	x			x	x	x	x	x		x	x	x		x	
4	x			x	x	x	x	x		x	x	x		x	

## 13CE61 - TRANSPORTATION ENGINEERING II

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To impart the engineering concepts in railways, airport and harbour.

#### COURSE OUTCOMES :

**CO1** : The students will be able to analyse the present situation of the rail network alignment and to study the realignment according to the necessary condition

**CO2** : The students will be able to compute the Railway geometrical design

**CO3** : The students will be able to determine the runway wind flow diagram and runway geometrics

### INTRODUCTION AND ELEMENTS OF RAILWAY ENGINEERING

Comparison of railway and highway transport - organization of Indian railways - Railway board - Zonal railways, different production units, undertakings, organizations, divisions- railway terminology - Permanent way - Gauges - Railway Track cross section - coning of wheels - Rails - Sections - Length - failures, wear on rails - Long Welded Rails - Rail joints - Creep - effects- remedies - Sleepers - Track fitting and fastenings -Ballast - Sub grade and Embankment - Track alignment- Surveys. **(9)**

### GEOMETRIC DESIGN OF RAILWAY TRACK

Gradients - speed, degree of curves, super elevation and cant deficiency - Negative super elevation- Curves - points and crossings -necessity -Turnouts - Switches - types of switches crossing -components, types - Sleeper at points and crossings. **(9)**

### SIGNALS AND CONTROLS OF RAILWAY

Stations and yards - requirements, classification, layout of station - Platform - Loops, siding and level crossing - Loco sheds - Derailing switches, Fouling marks, Butter stop - Sand hump - Signalling - Object engineering principles - classification and types - interlocking of signals and points. **(9)**

### AIRPORT

Role of ICAO, FAA, DGCA and AAI - Aircraft characteristics - Airport site selection - Surveys - Drawings - Orientation of Runway, wind rose diagram - ICAO classification of Airports - Runway geometrics - corrections for length - Taxiway geometrics - Layout of airports, Apron, Hangar - Airport markings and Lightings - Air traffic control - ILS. **(9)**

### HARBOUR

Definitions: Harbour, port, marine terminal, offshore mooring, anchorage area, turning basin, length, beam, draft, load line, dead weight tonnage, warehouse, Transit shed - Planning, site selection - layout of harbours - classification of harbours - Break water classification and sections of different types of break waters - Docks - Jetty, quay, quay wall - Dolphins - fenders - navigational aids- necessity and types. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Saxena.S.C and Arora.S.P, "A Text book of Railway Engineering", Dhanpat Rai Publications, New Delhi, 2005.
2. Khanna.S.K. and Arora M.G., "Airport Planning and Design", Nem Chand and Bros., Roorkee, 1994.
3. Oza and Oza., "Elements of Dock and Harbour Engineering", Charotar Publishing House, Anand, 1992.

**REFERENCE BOOKS :**

1. Robert Horonjett., "The Planning and Design of Airports", McGraw Hill Book Co., 1963.
2. Quinn, "Design and Construction of Port and Marine Structures", McGraw Hill, 1956.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X					X	X	X	X		
2	X	X			X							X	X		
3	X	X			X							X	X		

# 13CE64 - DESIGN OF STEEL STRUCTURES

L	T	P	C
3	1	0	4

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

The aim of this course is to impart knowledge in the design of steel structure as per the current code of practice.

### COURSE OUTCOMES :

- CO1** : The students will be able to design the steel structural elements in limit state method as per the latest IS code.
- CO2** : The students will be able to understand the concepts about bolted and welded connections
- CO3** : The students will be able to understand about the requirements of industrial structures like truss and chimney.

## BOLTED AND WELDED CONNECTIONS

Beam to beam connection - framed connection. Beam to column connection - Unstiffened seat connection - stiffened seated connections - single and double stiffener angle. (9)

### COLUMNS :

Design of built-up compression members - Design of lacings and battens - Eccentrically loaded column - column splices - column bases for axial and eccentric loads. (9)

### BEAMS :

Built-up Beams - cross sections - beams with restrained and unrestrained compression flange. Welded Plate girder - elements of plate girder - design - curtailment of flange - stiffeners and splices. (9)

## INDUSTRIAL STRUCTURES AND ROOF TRUSSES

Requirements of industrial structures - Design of gantry girder. Analysis and design of single bay gable frame with Knee bent. Types of roof trusses for different spans - Design of roof trusses for dead, live and wind loads - connections at the Supports - design of purlins. (9)

### CHIMNEY

Types of steel chimneys - forces acting on the chimney - effective height - load combinations - joints. Design of a self supporting steel chimney -thickness of steel plates and lining - Breech opening for flue gases- Design of Base plate and anchor bolts - design of chimney foundation. (9)

**Theory : 45**

**Tutorial : 15**

**Total : 60**

**TEXT BOOKS :**

1. *Subramanian. N, "Design of Steel Structures", Oxford University Press, New Delhi, 2008.*
2. *Bhavikatti. S.S. "Design of Steel Structures by Limit State Design", I.K International Pvt.Ltd., New Delhi, 2009.*
3. *Ramchandra, VirendraGehlot, "Limit State Design of Steel Structures", Scientific Publishers, Jodhur, 2010.*

**REFERENCE BOOKS :**

1. *Duggal S.K. "Limit state design of steel structures", Tata McGrawhill Publising Company Ltd., New Delhi, 2000.*
2. *Dayaratnam. P, "Design of steel structures", S. chand & Co. Ltd., 2004.*
3. *IS 800-2007, Code of Practice for use of Structural Steel in General Building Construction, Bureau of Indian Standards, New Delhi.*
4. *I.S. 6533 - 1971 Code of Practice for Design and Construction of Steel Chimney, Bureau of Indian Standards, New Delhi., 1986.*
5. *SP6(6) ISI Hand Book for "Structural Engineers and Application of Plastic Theory in Design of Steel Structures", 1972.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x			x	x				x
2	x	x	x		x		x			x	x				x
3	x	x	x		x		x			x	x				x

# 13CE72 - IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To impart knowledge about utilization of water for Irrigation and idea about irrigation system.

### COURSE OUTCOMES :

**CO1** : The students will be able to demonstrate irrigation practices and irrigation water requirement

**CO2** : The students will be able to analyze and demonstrate source and supply of water

**CO3** : The students will be able to conceive, plan and manage any type of irrigation project efficiently

## WATER REQUIREMENTS

Irrigation - Necessity - Advantages - ill-effects - Types - Methods - Quality of water - Standards - Crops - Seasons - Definitions related to agriculture and irrigation - Rotation of crops - Crop water requirements - Base period - Duty - Delta - Consumptive use - Irrigation Efficiencies - Assessment of irrigation water - Water logging - Causes and effects - Remedies - Drainage - Necessity - Advantages - Types. **(10)**

## SOURCES OF WATER

Surface hydrology - Precipitation - Types, forms, Measurement - Evaporation - Transpiration - Infiltration - Run-off - Hydrograph - Unit Hydrograph for single peaked storm - S-curve technique - Flood Estimation. **(8)**

## CANAL ENGINEERING

Canals - Classification - Alignment (Theoretical aspect only) - Distribution network - Cross sectional details - Sedimentation in canals - Silt theories - Design of canals based on silt theories and use of charts - Balancing depth of cutting - Design procedure for fixing longitudinal section - Canal losses - Canal maintenance - Canal lining - types - Design of lined canals. **(10)**

## RESERVOIR PLANNING

Reservoir - Types, Investigations for reservoir planning - Zones of storage - Capacity - Yield - Mass curve analysis - Capacity for specific demand and yield for given capacity - Fixing reservoir capacity - Reservoir Operation - Economic height of a dam - Reservoir sedimentation and control - Selection of site for reservoir. **(9)**

## WATER RESOURCES PLANNING AND MANAGEMENT

India's Water Resources - Water use scenario - Purpose and classification of water resources development projects - Water resources project formulation and evaluation - Planning and management strategies - on farm development works - Participatory approach: Farmer's organization and turn over - WUA - Economical aspects of irrigation. **(8)**

**Total : 45**

**TEXT BOOK :**

1. Garg.S.K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 2001.

**REFERENCE BOOKS :**

1. Punmia, B. C. and Pande B. B. Lal, "Irrigation and Water Power Engineering", Laxmi Publications, New Delhi, 2001.
2. Micheal, A.M., "Irrigation - theory & Practice", Vikas publishing house, New Delhi, 1990.
3. Sharma, R.K., "Irrigation Engineering & Hydraulic Structures", Oxford and IBH Publishing Company, New Delhi, 1994.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x	x	x	x		x	x				
2	x	x	x		x	x	x	x		x	x				
3	x			x	x	x	x	x		x	x	x		x	



## 13CE67 - CONCRETE LABORATORY

L	T	P	C
0	0	3	2

### ASSESSMENT : PRACTICAL

#### COURSE OBJECTIVE :

To study the fresh and hardened properties of concrete.

#### COURSE OUTCOMES :

**CO1** : The students will be able to perform various tests on fresh and hardened concrete.

**CO2** : The students will be able to understand different methods as per Bureau of Indian Standards

**CO3** : The students will be able to explain the usage of various equipments

#### TESTS OF CONCRETE

Testing equipment - Concrete mixer - Needle vibrator - Table vibrator - Moulds - Proving ring - Jacks - Dial gauges. Normal consistency and setting time of cement - Strength test for cement - Soundness test for cement - Workability tests - Slump test - Compacting factor test, Kelly ball test, Vee-bee consistometer test. Compression test on cube and cylinder - Split tension test on cylinder - Modulus of rupture of concrete.

**TOTAL : 45**

#### REFERENCE BOOKS:

1. Shetty. M.S, "Concrete Technology", S.Chand & Co, New Delhi, 2005.
2. I.S:516-1959, "Methods of Test for Strength of Concrete", Bureau of Indian Standards, New Delhi.
3. I.S:4031-1968, "Method of Physical Tests for Hydraulic Cement", Bureau of Indian Standards, New Delhi.

#### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x	x	x			x	x				
2	x	x	x		x					x	x			x	
3	x	x	x		x					x	x			x	

## 13CE73 - SANITARY ENGINEERING

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*This course aims at exposing the students of Civil Engineering about the perspectives and management of Sewage in dwelling regions.*

#### **COURSE OUTCOMES :**

**CO1** : *The students will be able to understand various perspectives of sewage disposal.*

**CO2** : *The students will be able to explain various sewerage systems*

**CO3** : *The students will be able to demonstrate and design various methods of sewage treatment*

### **SEWAGE DISPOSAL PERSPECTIVES**

Definitions, systems, and classifications of sewage - Necessity and current problems in India - Quantity of dry weather flow (DWF) and factors affecting its generation- Storm water and its assessment: rational and empirical methods - Concept of time of concentration - Fluctuations in flow pattern - Design flow of sewage - Characteristics of sewage: physical, chemical, and biological - Microbiology of sewage - BOD, COD and TOC of sewage - Sewage analysis and BOD calculations - Population equivalents. **(9)**

### **HOUSE DRAINAGE AND SEWERAGE SYSTEM**

Principles and general layout of house drainage - Traps and other appurtenances - One pipe and two pipe systems - Anti siphonage pipe and street connection - Systems and layout of sewerage -

Separate and combined systems - General considerations in the design of sewers - Design of sewers under various flow situations - Sewer materials and sections - Laying, jointing, and testing of sewers - Sewer appurtenances and storm relief works - Pumping of sewage and HP requirements - Pumping stations and its locations. **(9)**

### **PRELIMINARY AND PRIMARY TREATMENT OF SEWAGE**

Objectives of treatment - Conventional and unconventional treatment units - Objectives, principles, operation, analysis, and design of bar-rack, gritchamber and primary sedimentation units - Velocity control devices in grit chamber - Disposal of rackings, grittings, and primary sludge. **(9)**

### **BIOLOGICAL TREATMENT OF SEWAGE**

Necessity - Systems and Processes - Aerobic, anaerobic and anoxic processes -Objectives, principles, operation, analysis, and design of conventional activated sludge process and trickling filter - Modifications of CASP - Standard and high rate trickling filters - Low cost treatments: stabilization ponds, oxidation ditch and aerated lagoons - Rural sanitation -Objectives, principles, operation, analysis and design of septic tanks and dispersion trenches - Objectives and principles of secondary sedimentation tank - Sludge volume index (SVI) and sludge density index (SDI) - Introduction to RBC and UASB processes. **(9)**

### **SLUDGE TREATMENT AND EFFLUENT DISPOSAL**

Objectives of sludge treatment - Types and characteristics of sludge in a typical plant - Essential relationships - Integrated sludge treatment flow sheet - Objectives, principles, operation, analysis and

design of conventional and high rate digestors - Energy recovery aspects with respect to methane - Sludge dewatering and drying - Unconventional methods of disposal -Effluent disposal aspects: sewage farming,land application and dilution methods into lakes, rivers, estuaries and oceans - Self purification and oxygen sag-curve analysis - Trophic status of aquatic bodies. **(9)**

**Total : 45**

**TEXT BOOK :**

1. Garg S.K. "Sewage Disposal and Air Pollution Engineering"., Khanna Publishers, New Delhi, 2001.

**REFERENCES BOOKS**

1. Raju, B.S.N, "Water Supply and Waste Water Engineering", Tata McGraw - Hill Co, New Delhi, 1995.
2. Metcalf and Eddy, "Waste Water Engineering Treatment, Disposal, and Reuse", McGraw-Hill Publishing Co; Indian Edn; New Delhi, 2005.
3. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Urban Development, GOI, New Delhi, 1985.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x			x							
2	x	x			x					x	x				
3	x		x		x						x				

# 13CE82 - HYDRAULIC STRUCTURES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To impart knowledge about various structures for storage and distribution of water.

### COURSE OUTCOMES :

- CO1** : The students will be able to design various hydraulic structures associated with water resources engineering.
- CO2** : The students will be able to demonstrate the construction of various hydraulic structures associated with water resources engineering.
- CO3** : The students will be able to the explain the maintenance process of various hydraulic structures associated with water resources engineering.

## RIVER STRUCTURES

Diversion Head Works - Brief description of component parts - their functions - Design principles - Seepage Theories - Weir, Barrage and impervious floor as a part of diversion head work and their design based on seepage theories - River training works - types (Theoretical aspects only) **(9)**

## CANAL STRUCTURES

Canal regulators - Types - Functions - Parts of a regulator - Canal falls - Types - Brief Description - design aspects of notch-type canal fall - Cross Drainage works - Types - selection - Design aspects of siphon aqueducts. - Canal outlets and fumes (Theoretical aspects only). **(9)**

## STORAGE STRUCTURES - GRAVITY DAMS

Gravity Dams - Description - Forces acting - Elementary and Practical profile - Design (procedure only) of high and low gravity dam - Zoning of gravity dam - Galleries - Types - Joints, Waterstops and Keyways - Types - Spillways - Types - Functions. **(9)**

## STORAGE STRUCTURES - EARTHEN DAMS

Earth dams - Various types of sections - Cross-sectional Details - Design data of components - Causes of failure - Typical cross sections to suit site conditions and available materials - Phreatic line - Determination by graphical method - Seepage control in earthen dams. **(9)**

## OTHER STORAGE STRUCTURES

Arch Dams - Types (Description only) - Buttress dams - Types (Description only). Tanks - Classification - Components of tanks - Types of bunds - Design aspects of bunds - Tank surplus weir - tower head sluice - wing wall type sluice (Description only) - Tank regulation arrangements. **(9)**

**Total : 45**

**TEXT BOOK:**

1. Garg.S.K, "Irrigation Engineering and Hydraulic Structures", Khanna Publishers, New Delhi, 2001.

**REFERENCE BOOKS:**

1. Punmia.B.C,Pande, B.B.Lal., "Irrigation and Water Power Engineering", Laxmi Publicatiions, New Delhi, 2001.
2. SahasraBudhe S.R., "Irrigation Engineering and Hydraulic Structures Including Hydrology and Water Power Engineering", S.K. Kataria Publications, Sixth Edition, 1996 (Reprint 2000).

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x		x	x		x	x				
2	x	x			x		x	x		x	x				
3	x				x		x	x		x	x				

## 13CE66 - DESIGN AND DRAWING

L	T	P	C
2	0	4	4

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*At the end of this course the student should be able to draw as well as understand the structural detailing of structures like slab, beam, staircase, retaining wall, water tank, foundation, plate girder, roof trusses, etc., This can be achieved by them by preparing the detailing manually.*

#### **COURSE OUTCOMES :**

- CO1** : *The students will be able to prepare and understand manually structural drawings like R.C Slabs, R.C Beams, R.C Columns, R.C Footings, R.C Stairs, Concrete retaining wall and concrete water tank.*
- CO2** : *The students will be able to understand grillage foundation, plate girders, columns, OHT and roof trusses.*
- CO3** : *The student will gain the confidence in working out the quantity of raw materials needed to be procured for fabrication the structures.*

### **CONCRETE**

Detailed design, drawing and bar bending schedule for the following concrete structures are to be prepared.

1. One way floor slab/two way floor slab
2. Continuous beams.
3. Columns with footing.
4. Flat slab.
5. Joints (Beam to Column & Column to Footing).
6. Ground level circular water tank.
7. Over head rectangular water tank.
8. Dog legged staircase.
9. Cantilever retaining wall.
10. Counterfort retaining wall.

**(15 + 23)**

### **STEEL**

Detailed design and drawing of the following steel structures.

1. Plate girder (Welded).
2. Columns with lacings on gusseted base.
3. Industrial Roof truss.
4. Bridge through truss.
5. Chimney.

6. Industrial bent.
7. Gantry girder.
8. Canopy.
9. Light weight purlins.

(15+22)

**Total : (30 + 45) = 75**

**TEXT BOOKS :**

1. Krishnamurthy. D., "Structural Design and Drawing" Vol.II, (Concrete Structures) CBS Publishers and Distributors, Delhi, 2008.
2. Krishnamurthy. D. "Structural Design and Drawing" Vol.III (Steel Structures), CBS Publishers & Distributors, New Delhi, 2008.

**REFERENCE BOOKS :**

1. Vazirani, V.N. and Ratwani.N.M, "Design of Steel Structures", Khanna Publishers, Delhi, 1985.
2. Krishnaraju. N., "Structural Design and Drawing", Oxford University Press, 2004.

\* **NOTE** : Final Examination is of 4 hours duration. Two questions will be asked from Part A and two questions from Part B, out of which students have to answer one question in each part. Continuous Assessment pattern will be followed.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x	x	x		x				x		x		x
2	x	x	x		x			x		x	x		x		x
3	x	x	x	x						x	x		x		

# 13CE71 - EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To know about the fundamentals of Dynamics of structures and Earthquake Resistant Design of structures as per IS codes.

### COURSE OUTCOMES :

**CO1** : Students will be able to understand the dynamic concepts

**CO2** : Students will be able to understand the origin, various terminologies and behavior of earthquakes

**CO3** : Students will be able to do the analysis and design of structures for earthquake forces as per IS 1893.

**CO4** : Students will be able to understand behavior of masonry structures and design as per IS 13827 and IS13828

## STRUCTURAL DYNAMICS

Introduction - Fundamentals of structural dynamics - Single degree of freedom system - Free vibration - forced vibration - Damping - Introduction to multi-degree of freedom system. **(10)**

## ENGINEERING SEISMOLOGY

Elements of Engineering seismology - Definitions - Plate tectonics - Seismic waves - Earthquake History - Behaviour of Structures in past earthquakes -Elastic rebound theory - Seismograph and Accelerograph - Seismic Zoning map of India. **(8)**

## SEISMIC ANALYSIS

Calculation of base shear as per IS 1893-2002 - Static and Dynamic method - Seismic Design concepts. **(8)**

## EARTHQUAKE RESISTANT DESIGN

Design of Beams, Columns - Shear wall - Types of Shear wall - Design of Rectangular Shear wall with boundary elements as per IS 13920 -1993. **(9)**

## IS CODE PROVISIONS

Ductility - Assessment of Ductility - Member / Element Ductility - Structural Ductility - Factors affecting Ductility- Ductile detailing of beams, column, joint and footings and special confining reinforcements - as per IS 13920 - 1993.Behaviour and Design of Masonry Structures as per IS 13827 and IS13828. **(10)**

**Total : 45**

## TEXT BOOKS :

1. Pankaj Agarwal and Manish Shirikhande, 'Earthquake Resistant Design of Structures', Prentice Hall of India Pvt. Ltd., New Delhi, 2006.
2. Duggal.S.K., "Earthquake Resistant of Structures", Oxford University Press, New Delhi, 2007.



**REFERENCE BOOKS :**

1. Anil K.Chopra, 'Dynamics of Structures - Theory and Applications to Earthquake Engineering', Prentice Hall of India Pvt. Ltd., New Delhi, 2003.
2. Park and Priestly, 'Seismic Design of Reinforced Concrete and Masonry Buildings', John Wiley & Sons, 1982.
3. IS 1893 -2002, Indian Standard Code of Practice for Earthquake Resistant Design of Structures, Bureau of Indian Standards, New Delhi.
4. IS 13920 - 1993, Indian Standard Code of Practice for Ductile Detailing of RC Structures, Bureau of Indian Standards, New Delhi.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x			x	x		x				x		x		x
2	x	x			x			x		x	x				x
3	x	x	x	x						x	x				
4	x	x	x	x			x	x					x		x

# 13CE81 - CONSTRUCTION MANAGEMENT

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### **COURSE OBJECTIVE :**

*To impart knowledge about management principles and functions used in construction management. It imparts knowledge related to planning, scheduling and execution of construction projects and maintaining accounts.*

### **COURSE OUTCOMES :**

**CO1** : *The students will be able to explain various aspects of construction management principles.*

**CO2** : *The students will be able to understand about scheduling of work.*

**CO3** : *The students will be able to improve leadership qualities.*

## **CONSTRUCTION PLANNING**

Importance - Scope of construction management - Functions of management - Management levels - Types of business organizations - Objectives of planning- steps in planning - Principles of planning - Advantages and Limitations of planning - Stages of planning - Types of plans- Stages of plan by different agencies - Planning by owner - Planning by contractor. **(8)**

## **EXECUTION OF WORKS**

Construction contracts - contract documents - Types of contract - Contractual obligations - specifications - Tender - Tender notice - Types of tenders - Tender documents - Earnest money deposit - Security deposit - Scrutiny and acceptance of tender - Contract agreements. **(8)**

## **CONSTRUCTION SCHEDULING**

Forms of scheduling : Bar charts - Milestone charts - Network analysis - CPM Network construction: Activities and Events, Fulkerson's rule for numbering events - logic and interdependence in network- Time computations, Floats, Critical path

PERT Network: Time estimates, Beta distribution, expected time, standard deviation, variance, probability of achieving desired time targets for projects.

Resource allocation: Resource aggregation diagrams as per early start and late start- resource smoothing -levelling of resources according to constraints - Minimum project duration subject to resource constraints.

Time cost optimization: Direct and indirect cost related to time - Activity crashing - Normal and crashed duration and corresponding cost - Cost slope- Crashing of network to optimize cost and duration of a project - time and motion studies. **(11)**

## **CONSTRUCTION FINANCING AND CONTROL**

Costs associated with constructed facilities -Estimates - Design estimates, Bid estimates, Control estimates - Effect of scale on construction cost - Means of financing - Cost control- Financial accounting systems - Financial control. **(9)**

## **CONSTRUCTION PERSONNEL MANAGEMENT**

Introduction to the field of people management - basic individual psychology - creativity and innovation - Motivation - Motivation theories- leadership - Theories of leadership - Functions of leadership - Communication - Barriers in communication. **(9)**

**Total : 45**

### **TEXT BOOKS:**

1. *Seetharaman.S" Construction Engineering and Management", Umesh publications, New Delhi,2011.*
2. *V.S.Bagad " Principles of Management", Technical publications, Pune, 2009.*
3. *Subramanian. K, "Construction Management", Anuradha Publications, 2009.*

### **REFERENCE BOOKS :**

1. *Memoria, C.B., and S.V. Kankar, Personnnel Management, Himalaya publishing co,1997*
2. *Mahesh varma.,"Construction Equipments" MetroplolitanBookCo., 1985*
3. *Harpal Singh., " Construction Management and Accounts", Tata McGraw Hill, New Delhi, 1981*

## 13CE88 - PROJECT WORK & VIVA VOCE

L	T	P	C
0	0	6	6

### ASSESSMENT : PRACTICAL

#### COURSE OBJECTIVE :

*To inculcate and apply Civil Engineering knowledge and work with team members for sharing ideas and knowledge transfer. Gain project management skills and enhance the technical report writing ability. Decide and agree with peers towards a common goal and to sustain diverse acts with partners for successful completion of a project.*

#### COURSE OUTCOMES :

- CO1** : *The students will be able to apply design techniques in the project and experience their outcome in their own project scenario.*
- CO2** : *The students will be able to enhance the management skills to achieve the project goal by working as a team and also enhances technical writing skills.*
- CO3** : *The students will be able to demonstrate the technical skills acquired to provide feasible solutions for real-life problems.*
- CO4** : *The students will be able to effectively communicate and collaboratively work in peer groups to develop optimized solutions for problems.*

#### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x	x	x				x	x		x	
2			x	x		x	x	x				x		x	
3	x	x	x		x		x		x	x					x
4				x			x	x	x		x	x	x	x	x

# 13CEE01 - PRESTRESSED CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To impart knowledge about the behaviour, analysis and design of prestressed concrete structures.

### COURSE OUTCOMES :

**CO1** : The student will be able to explain basic concepts in prestressing.

**CO2** : The student will be able to understand various losses in prestressing.

**CO3** : The student will be able to design various structural elements using prestressing.

## INTRODUCTION

Difference between reinforced and prestressed concrete. Principles of prestressing - Methods and systems of prestressing - Principles of Electrothermal prestressing & chemical prestressing - Classification of prestressed concrete structures - Materials - High strength concrete and High strength steel - Stress - Strain diagrams.

## LOSSES IN PRESTRESS

Loss due to elastic shortening in pretensioned and post tensioned beams. Loss due to creep, shrinkage, relaxation, friction - Approximate percentage of various losses in pretensioned and post tensioned beams.

**(10)**

## DESIGN OF BEAMS

Theory and behaviour of prestressed concrete beams in bending - Design of prismatic prestressed concrete members for bending for working loads by Magnel's graphical method - Check for ultimate load stage (Limit State Design)

**(9)**

## DEFLECTION AND END BLOCK DESIGN

Simple cable profiles - calculation of deflections - Design of beams for shear in working and ultimate loads - Design of Anchorage Zone by Guyon's method (simple problems) - Concept of Magnel's method, IS 1343 recommendations.

**(10)**

## TENSION AND COMPRESSION MEMBERS

Design of tension and compression members - Columns subjected to bending moment and axial compression.

## COMPOSITE BEAMS

Composite prestressed concrete beams - Design procedure - Calculation of stresses at important stages both for propped and unpropped constructions - Design of shear connectors - Shrinkage stresses.

**(8)**

## STATICALLY INDETERMINATE STRUCTURES

Statically indeterminate structures - continuous beams - Concept of concordant cable and linear transformations - Sketching of pressure lines (simple problems). Partial and circular prestressing (Principles only)

**(8)**

**Total : 45**

**TEXT BOOKS :**

1. *Sinha, N.C. and Roy, S.K., "Fundamentals of Prestressed Concrete", S.Chand and Co., 1987.*
2. *Krishna Raju, N. "Prestressed Concrete", Tata McGraw Hill, New Delhi, 2012.*
3. *IS 1343:2012 - Code of Practice for Prestressed Concrete, Bureaus of Indian Standards, New Delhi.*

**REFERENCE BOOKS:**

1. *Lin T.Y.&Burns,N., "Design of Prestressed Concrete Structures". John Wiley & Sons, 1992.*
2. *Dayaratham,N, "Prestressed Concrete Structures". Oxford & IBH Company, New Delhi, 2004.*
3. *Kachaturian,N. and Gurfinkel,G. - "Prestressed Concrete", McGraw Hill Book Co., Newyork, 1975.*
4. *Antoine, E.Naaman - "Prestressed Concrete Analysis and Design - Fundamentals", McGraw Hill Book Co., Newyork, 1982.*
5. *Rajagopalan- "Prestressed Concrete", Narosa Publishers, New Delhi, 2013.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x		x				x				
2	x				x		x				x				
3	x	x	x		x		x				x				

## 13CEE02 - ADVANCED CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The course aims to make the students to gain expertise in the design of special Civil Engineering structures, namely deep beams, flat slabs, prefabrication and tall structures.

#### COURSE OUTCOMES :

- CO1** : The student will be able to explain the construction of precast structural members.
- CO2** : The student will be able to analyse and design various tall structures.
- CO3** : The student will be able to analyse and design various special structures such as chimneys and grid floors.

#### CHECK FOR SERVICEABILITY

Check for deflection and cracking as per IS 456-2000 (8)

#### PREFABRICATION

Principles of precast construction - Merits and Demerits - Dimensioning and detailing of joints for different structural connections - Construction and expansion joints - Production - Transportation - Erection. (8)

#### TALL STRUCTURES

Analysis of R.C.Chimneys by Elastic theory - Design by LSD.Design of square bunker using Rankine's theory. Design of circular silo using Jansen's theory - and Airy's theory. (Derivation not required for both theories). (10)

#### DESIGN OF CHIMNEY

Types of chimney - Design of self supporting chimney and Guyed chimney - Design of chimney foundation. (10)

#### DESIGN OF FLOOR SLAB

Design of voided slab - Analysis and design of grid floor. (9)

**Total : 45**

#### TEXT BOOKS :

1. Ashok K.Jain., "Reinforced concrete - Limit State Design", Nem Chand Brothers, Roorkee, 2006.
2. Krishnaraju N., "Advanced Reinforced Concrete Design", C.B.S Publishers and Distributors, New Delhi, 2013.

**REFERENCE BOOKS:**

1. Jain and Jai Krishna., "*Plain and Reinforced Concrete*", Nem Chand Brothers, Roorkee, 2007.
2. Mallick and Gupta., "*Reinforced Concrete Design*", Oxford and IBH, Publishers, Delhi, 1996.
3. *Design Aids to I.S. 456 - 1980 (SP 16)*, Bureaus of Indian Standards, New Delhi.
4. Code of "*Practice for Plain and Reinforced Concrete*" IS456 - 2000, Bureaus of Indian Standards, New Delhi.
5. Glover.C.W., "*Structural Precast Concrete*", Asia Publishing House, Bombay, 1967.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x		x				x				
2	x		x		x		x				x				
3	x		x		x		x				x				



## 13CEE03 - ADVANCED STEEL STRUCTURES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To develop technical competence in the design of light gauge sections, industrial buildings, Bunkers, Silos and Plastic design.

#### COURSE OUTCOMES :

**CO1** : The student will be able to analyze and design the light gauge structural members

**CO2** : The student will be able to analyze and design towers and industrial buildings

**CO3** : The student will be able to analyze Acquire knowledge on various types of connections

**CO4** : The student will be able to analyze and design bunkers and silos

#### LIGHT GAUGE STEEL MEMBERS

Light gauge sections - types of sections, material - local buckling of thin elements - stiffened and multiple stiffened compression members - Unstiffened elements - Laterally supported and unsupported flexural members - connections. **(10)**

#### STEEL TOWERS

Transmission line towers - Micro Wave Towers - Loads on towers - Shape, Sag and Tension in Uniformly loaded conductors - Analysis of towers - Design of member in towers - Design of tower foundations. **(10)**

#### CONNECTIONS:

Connections - flexible, semi rigid and rigid or moment resisting connections. Multistoreyed framed structures - Analysis for Vertical and lateral loads for frames with moment resistant connections only - Design for composite construction. **(9)**

#### INDUSTRIAL BUILDINGS:

Industrial Building frames - General, framing, bracing, Crane Girders and columns - Analysis of Trussed bents - Canopy design. **(8)**

#### BUNKERS AND SILOS:

Pressure on side walls of bunkers and silos - Jansen's and Airy's theories - complete design of circular silos. **(8)**

**Total : 45**

#### TEXT BOOKS:

1. Subramanian. N, "Design of Steel Structures", Oxford University Press, New Delhi, 2008.
2. Bhavikatti. S.S. "Design of Steel Structures by Limit State Design", I.K International Pvt.Ltd., 2012.

**REFERENCE BOOKS :**

1. Ramchandra, "Design of Steel Structures" - Vol. I and II, Standard Publishers Distributers, New Delhi, 2002.
2. Bresler and Lin, "Design of Steel Structures", Wiley Eastern Pvt. Ltd., New Delhi. 1980.
3. Vazirani, V.N. and Ratwani, N.M., Honey Mehra "Design and Analysis of Steel Structures", Khanna Publishers, New Delhi, 2000.
4. IS: 800, Code of Practice for use of Structural Steel in General Building Construction, Bureau of Indian Standards, New Delhi, 2007.
5. IS 801:1975, Code of Practice for use of Cold Formed Light Gauge Steel Structural Members in General Construction, Bureaus of Indian Standards, New Delhi.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x		x				x				
2	x	x			x					x	x				
3	x		x		x						x				
4	x	x	x				x				x				

## 13CEE04 - EXPERIMENTAL STRESS ANALYSIS

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*At the end of this course the student should be able to understand the measurement of strain for the experiments to be conducted in the laboratory and also understand modeling and distress on a structure.*

#### COURSE OUTCOMES :

- CO1** : *The students will be able to understand the working principles of different strain gauges and the force applied on the structure.*
- CO2** : *The students will be able to understand application of rosette for the determination and construction of stress circle.*
- CO3** : *The students will be able to understand the concept and practical application of force and vibration measurement.*
- CO4** : *The students will be able to explain the model analysis and photo elastic concepts & the distress measurements.*

### STRAIN GAUGES

Definition of gauge length, sensitivity and range - Characteristics of an ideal strain gauge - Different types of mechanical strain gauges (Huggenberger tensometer, Amslers' Extensometer, Amslers' mirror extensometer, Unwins compressometer) - Mechanical optical strain gauges (Tuckermans' gauge) - Optical strain gauge - Acoustic strain gauge - Pneumatic strain gauge - Merits and demerits. **(9)**

### ELECRICAL STRAIN GAUGES

Inductance, capacitance and piezo electric gauges -Electrical resistance gauges and their application in stress analysis - Fixing techniques and measurement of strains - Rosettes - Determination of principal stresses using rosettes - Construction of stress, strain circles - Analytical solution. **(9)**

### FORCE AND VIBRATION MEASUREMENTS

Hydraulic jacks and pressure gauges - Load cells - Proving rings - Transducer for velocity and acceleration measurements - Vibration meter - Vibration analyzer - Display and recording of signals - Digital data acquisition systems. **(9)**

### PHOTO ELASTICITY

Basics of optics and stress optic law - Plane and circularly polarised light and their use in photo elasticity - Polariscope - Diffusion type polariscope - Isoclinics and Isochromatics - Calibration methods for finding material fringe values - Model fringe values - Examples of beam flexure and diametrically loaded circular plates. **(9)**

### MODEL ANALYSIS AND DISTRESS MEASUREMENT

Direct and indirect models - Laws of structural similitude - Choice of scales - Limitation of model studies - Model materials - Begg's deformeter and its use - Simple design of direct and indirect models - Crack observation and measurement - Corrosion of reinforcement in concrete - Half cell, construction and use. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Srinath, L. S, "Experimental Stress Analysis", Tata McGraw Hill Book Company, New Delhi.,2007.
2. Roy, T. K, "Experimental Analysis of Stress and Strain", S Chand & Co, New Delhi, 2006.

**REFERENCE BOOKS :**

1. Dally J.W. and Riley W.F., "Experimental Stress Analysis", McGraw Hill Book Co., 1985.
2. Dove and Adams, "Experimental Stress Analysis and Modern Measurement", Prentice Hall of India Ltd.1986.
3. Hetenyi M, "Hand Book of Experimental Stress Analysis", John Wiley and Sons, Inc. Newyork, 1980.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x				x				
2	x	x	x		x					x		x			x
3	x	x		x				x				x			
4	x	x	x		x		x				x			x	

## 13CEE05 - HEALTH MONITORING OF STRUCTURES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To enable the students to learn the need for quality control in concreting, types of distresses in structures and their remedial measures, various materials and methods available for rehabilitation and also about the various non destructive techniques.

#### COURSE OUTCOMES :

- CO1** : The students will be able to diagnose various distresses in structures and their causes.
- CO2** : The students will be able to explain various materials and techniques available for rehabilitation of structures.
- CO3** : The students will be able to understand various type of crack in concrete.
- CO4** : The students will be able to understand the different types of repair materials in concrete and diagnose the different repairing and demolition techniques of concrete.

### SERVICEABILITY AND DURABILITY OF CONCRETE

Quality assurance for concrete construction - concrete preparation - strength, permeability, thermal properties - effects due to climate, temperature, chemicals, corrosion - strength evaluation of existing structures by NDT (Rebound, UPV, Flow detector). (9)

### MAINTENANCE AND REPAIR STRATEGIES

Maintenance, Repair and Rehabilitation, facets of maintenance, importance of maintenance - various aspects of inspection, Assessment procedure for evaluating a damaged structures, causes of deterioration. (9)

### CRACKS

Cracks in concrete - intrinsic cracking and structural cracking - causes and remedies - plastic cracks and remedies - Thermal contraction cracks - Long term drying shrinkage cracks - Sulphate attack cracks - Alkali aggregate reaction cracks. (9)

### MATERIALS FOR REPAIR

Material for Repair: Concrete chemicals, special elements for accelerated strength gain - Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferrocement - Fibre reinforced concrete. (9)

### REPAIR TECHNIQUES

Repair techniques: Rust eliminators and polymer coating for steel bars during repairs - formed concrete, mortar and dry pack - Vacuum concrete - Gunite, shotcrete and Grouting - Epoxy injection - Mortar repair for cracks - shoring and under pinning.

### DEMOLITION TECHNIQUES

Engineered demolition techniques for dilapidated structures - Case studies. (9)

**Total : 45**

**TEXT BOOK :**

1. *DensionCampell, Allen and Harold Roper., "Concrete Structures", Materials, Maintenance and Repair", Longman Scientific and Technical, U.K. 1987.*

**REFERENCE BOOKS :**

1. *Allen R.T., and Sc Edwards., "Repair of Concrete Structures", Blakie and sons", U.K. 1987.*
2. *Neville A.M., "Properties of Concrete", The English Language Book Society and Pitman publishing, London, 2000.*
3. *Guha P.K., " Maintenance and Repairs of Building", New Central Book Agency (P) Ltd., Calcutta, 1998*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x	x			x				
2	x	x	x		x					x		x			x
3	x	x		x				x				x			
4	x	x	x		x		x				x			x	

## 13CEE06 - PREFABRICATED AND INDUSTRIAL STRUCTURES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To gain knowledge about the modern trends in building construction, role of prefabricated structures and the basic functional requirements of industrial structures.

#### COURSE OUTCOMES :

**CO1** : The students will be able to explain the various functional requirements of an industrial building.

**CO2** : The students will be able to explain the basic principles involved in prefabrication.

**CO3** : The students will be able to demonstrate the manufacturing techniques of precast elements.

#### GENERAL

Specific requirements for industries like Engineering, Textile, Chemical-site layout and external facilities-classification of industries minimum standards, internal circulation-materials-works. **(9)**

#### FUNCTIONAL REQUIREMENTS

- i) Selection of site
- ii) Lighting - Natural and Artificial-Protection from the sun and sky
- iii) Services, layout, wiring fixtures, cable and pipe bridges-electrical installations-lighting substations-Effluent
- iv) Ventilation and fire protection, air conditioning and air ventilation, Fire escapes and chutes, fire alarms, Extinguishers and hydrants. **(9)**

#### GENERAL PRINCIPLES OF PREFABRICATION

Types of prefabrication - Advantages of prefabrication - Site and plant prefabrication - Economy of prefabrication - Modular coordination - Standardisation - Disuniting of structures - Various prefabricated elements roof and floor panels-wall panels. **(9)**

#### PRECASTCONCRETE-MANUFACTURING TECHNIQUES

Cycle of precasting - Preparation and transportation of concrete, Reinforcement - Preparation of moulds-Production tolerances - Equipments for handling the precast elements - Standard practices and techniques of handling. **(9)**

#### JOINTS AND CONNECTIONS

Types of precast connections - Joints for different structural connections - Effective water proofing at the joints - Expansion joints in precast construction - Precast connections for seismic resistance - Provision for non structural fixtures and fastenings. **(9)**

**Total : 45**

**TEXT BOOKS :**

- 1) Glover.C.W, "Structural Precast Concrete" Asia Publishing House, Bombay. 1967.
- 2) Haas.A.M, "Precast Concrete- Design and Applications" Applied Science Publishers, London and NewYark, 1983.

**REFERENCE BOOKS:**

- 1) Dunham, "Planning of industrial Structures" Metropolitan Book Company, 1980.
- 2) SP32-1986, HandBook on Functional Requirements of Industrial Buildings (Lighting and Ventilation) Bureau of Indian Standards, New Delhi, 1990.
- 3) Structural Design Manual, Precast concrete Connection Details, Society for the Studies in the use of Precast Concrete, Netherland BehorVerlag, 1978.
- 4) Proceedings of the Advanced Course on Design and Construction of Prefabricated Residential Buildings organized by SERC, Madras, 1974.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x		x				x				
2	x		x		x		x				x				
3	x		x		x		x				x				



# 13CEE07 - ANALYSIS AND DESIGN OF DEEP FOUNDATIONS

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*The student will be exposed to the design of piles, pile groups and caissons with respect to vertical and lateral loads for various field conditions.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to understand the classifications of piles for various applications.*

**CO2** : *The students will be able to analyse axially loaded pile/ pile groups for different soil conditions.*

**CO3** : *The students will be able to analyse laterally loaded piles.*

**CO4** : *The students will be able to design piles and pile groups for given site specific conditions.*

**CO5** : *The students will be able to acquire knowledge of deep foundations for special situations.*

## PILE CLASSIFICATIONS

Function - classification of piles - Factors governing choice of pile foundation - Load transfer principles - piling equipments and methods - changes in soil condition during installation of piles - requirement of code of practice - responsibility of engineer and contractor. **(9)**

## AXIALLY LOADED PILES AND PILE GROUPS

Allowable load evaluation of piles and pile groups - Static method - cohesive - cohesionless soil - time effects - Dynamic method - pile driving formulae - Wave equation application - modeling - theoretical analysis - Interpretation of field test results and pile load test results - Settlement of Piles and Pile groups. **(9)**

## LATERAL AND UPLIFT LOAD EVALUATION

Piles subjected to Lateral loads - Broms method, elastic -p-y curve analyses - Batter piles - response to moment - pile subjected to uplift loads - load -deformation behaviour - Lateral and uplift load test data interpretation. Foundation on weak compressible - collapsible soil - case studies. **(10)**

## STRUCTURAL DESIGN OF PILE AND PILE GROUPS

Pile foundation - structural design - pile cap analysis, pile - raft system basic interactive analysis - pile and pile groups subjected to vibrations - fundamental solutions. **(9)**

## CAISSONS

Caissons types - Stability of caissons - principles of analysis and design, seismic influences - IRC Guidelines. **(8)**

**TOTAL : 45**

## REFERENCES BOOKS:

1. *Das, B.M., Principles of Foundation Engineering, Design and Construction, Fourth Edition, PWS Publishing, 1999.*
2. *Poulos, H.G., Davis, E.H., Pile foundation analysis and design, John Wiley and Sons, New York, 1980.*
3. *Tomlinson, M.J. Foundation engineering, ELBS, Longman Group, U.K. Ltd., England 1995.*
4. *Cernica, J.N. Geotechnical Engineering Foundation Design, John Wiley and Sons, Inc. 1995.*
5. *Bowles, J.E., Foundation Analysis and Design, Fifth Edition, McGraw Hill, New York, 1996.*
6. *Donald, P., Coduto, Foundation Design Principles and Practices, Prentice Hall, Inc. Englewood Cliffs, New Jersey, 1996.*

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1					x		x							x	
2	x		x		x		x			x				x	
3	x	x			x		x			x				x	
4	x	x			x					x				x	
5	x	x					x			x				x	

## 13CEE08 - SOIL STRUCTURE INTERACTION

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To understand the mechanism of soils, their interactive behaviour, analysis, its influences in the design parameters through design charts and software packages.*

#### **COURSE OUTCOMES :**

**CO1** : *The students will be able to understand and demonstrate soil structure interaction.*

**CO2** : *The students will be able to analyse various foundations for given soil response conditions.*

**CO3** : *The students will be able to analyse various foundations for given soil response conditions.*

### **SOIL-FOUNDATION INTERACTION**

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis, soil response models, Winkler, Elastic continuum, Two parameter elastic models, Elastic - plastic behaviour, Time dependent behaviour. **(8)**

### **BEAM ON ELASTIC FOUNDATION - SOIL MODELS**

Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness - Analysis through application packages. **(9)**

### **PLATE ON ELASTIC MEDIUM**

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions, Analysis of braced cuts - Application packages. **(9)**

### **ELASTIC ANALYSIS OF PILE**

Elastic analysis of single pile, Theoretical solutions for settlement and load distribution, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap - pile raft - Application packages. **(10)**

### **LATERALLY LOADED PILE**

Load deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, and pile raft system, solutions through influence charts and Application packages. **(9)**

**TOTAL : 45**

### **REFERENCES BOOKS:**

1. Saran, S, *Analysis and design of substructures*, Taylor & Francis Publishers, 2006
2. Hemsley, J.A, *Elastic Analysis of Raft Foundations*, Thomas Telford, 1998.

3. Poulos, H.G., and Davis, E.H., *Pile Foundation Analysis and Design*, John Wiley, 1980.
4. Murthy, V.N.S., *Advanced Foundation Engineering*, CBS Publishers, New Delhi, 2007
5. McCarthy, D.F. *Essentials of Soil Mechanics and Foundations, Basic Geotechnics, Sixth Edition*, Prentice Hall, 2002.
6. Selvadurai, A.P.S., *Elastic Analysis of Soil Foundation Interaction*, Elsevier, 1979.
7. Scott, R.F. *Foundation Analysis*, Prentice Hall, 1981.
8. *Structure Soil Interaction - State of Art Report*, Institution of structural Engineers, 1978.
9. *ACI 336, Suggested Analysis and Design Procedures for Combined Footings and Mats*, American Concrete Institute, Delhi, 1988.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x										
2	x		x		x		x				x				
3	x	x	x		x		x				x				x

## 13CEE09 - ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*To impart the knowledge and skills to identify, assess and mitigate the environment and social impacts of development projects to give exposure to students about the assessment of environmental impacts due to major civil projects and their management.*

#### COURSE OUTCOMES :

- CO1** : *The students will be able to understand the necessity to study the impacts and risks that will be caused by projects or industries.*
- CO2** : *The students will be able to understand the methods of impacts identifications & methods to overcome the impacts.*
- CO3** : *The students will be able to understand about the legal requirements of environmental assessment for projects.*

### IMPACT ASSESSMENT PERSPECTIVES

Impact assessment introduction -Historical perspective -Scope and goals of EIA and EMP -Organization responsible for EIA -International treaties and agreements on the environment and natural resources -Global warming -Climate change -Ozone depletion -Acid rain -National committee on environmental planning and co-ordination -Tiwari committee, Department of environment. **(9)**

### COMPONENTS AND METHODS

Management of Environmental Assessment-Review and project appraisal- Environmental clearance-procedure for clearance- List of projects requiring clearance- Composition of expert committee- Public hearing- EIA amendments- Schedule- Forms- Checklist- NRBT criteria for EIA consultants- Environmental statements and standards. **(9)**

### ASSESSMENT AND MONITORING

Contents of EIA and EMP- Baseline and inventory studies- Description of existing and proposed environment- Flora, Fauna, Social, and Cultural aspects- Environmental Impact Statement (EIS), Decision making tool- Adverse impacts- Project alternation- Mitigate measures- Assessment methodologies; ad hoc, Overlays, network, matrix, checklist- Environmental auditing and cost- Benefit analysis. **(9)**

### CASE STUDIES

Case studies -Water related projects, Air related projects, soil and solid waste related projects - Environmental quality -Public and socio economic welfare -New ways towards environmental management -Changing concept of environmental management -Cleaner production -Environmental Management System. **(9)**

## LEGISLATIVE PERSPECTIVES

Hazardous waste management and handling rules, 1989 and Manufacture, Storage, Import and export of Hazardous/Micro-organism/Genetically engineered organisms or cells rules 1989 -Biomedical waste (Management and Handling) rules -1998 -Coastal regulation zone notification 1991. (9)

**Total : 45**

## REFERENCES BOOKS:

1. Rao, J.G., and Wotten, D.C., "Environmental Impact Analysis, Handbook", McGraw-Hill, 1980.
2. Van Nostr, and Reinhold, J.E. Heer, Hagerty, D. J., "Environmental Assessment and Statement", 1977.
3. Canter, L.W., "Environmental Impact Assessment", McGraw-Hill, New York, 1996.

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x		x				x			
2	x				x	x		x							
3	x				x	x		x							

# 13CEE10 - SOLID AND HAZARDOUS WASTE MANAGEMENT

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*The prime motive behind this course is to appropriately create, deep interest about the solid and hazardous wastes and their impact on the components of the environment. Also, to facilitate the students about the best available and strategic techno-economic management tools for noise pollution control.*

### COURSE OUTCOMES :

- CO1** : *The students will be able to understand the characteristics of different types of solid and hazardous wastes and factors affecting variation.*
- CO2** : *The students will be able to gain knowledge about the important concepts in the field of solid waste management and suggest suitable technical solutions for the treatment of municipal and hazardous waste.*
- CO3** : *The students will be able to apply the basic scientific principles for solving practical waste management.*
- CO4** : *The students will be able to explain the role of legislation and policy in waste management.*

## PERSPECTIVES OF SOLID WASTE

Definition, sources, and types of solid waste - Comparison of waste generation in India and other developed countries - Per capita generation rates - Sampling and characterization of solid waste - Composition of solid waste: physical (Individual contents, size, moisture content and density) and chemical (energy and chemical content) - Typical composition of Indian MSW - Functional elements of SWM system Legislation and responsibilities. **(9)**

## COLLECTION AND TRANSPORT OF SOLID WASTE

Estimation of solid waste and factors affecting generation rates - On-site handling, storage, and processing - Collection services: municipal and commercial - Industrial services - Collection systems: Hauled-container system (HCS) and stationary container system (SCS) - Vehicle and labour assessment - Assessment of collection route - Transfer and transport - Transfer station location- Means and methods of transfer. **(9)**

## PROCESSING AND DISPOSAL OF SOLID WASTE

Definition and necessity - Volume reduction: manual separation, mechanical, and thermal -Land filling method: site selection methods and operations, leachate and gas generations and movement and control of gas and leachate - Operations of landfills- Land farming, deep well injection, and ultimate disposal techniques - Composting: aerobic and anaerobic - Resource and energy recovery schemes - Vermi composting application - Integrated solid waste facilities. **(9)**

## PERSPECTIVES OF HAZARDOUS WASTE

Definitions and Identifications of hazardous waste - Origin and characterization of hazardous solid waste - Typical hazardous wastes in MSW - Hazardous waste management: minimization, collection, storage, handling, transport, and compatibility - Typical industrial regulations - National and International legislation for hazardous waste management. **(9)**

## TREATMENT AND DISPOSAL OF HAZARDOUS WASTE

Necessity and types of treatment - Objectives, principles, operations, relevant analytical equations without derivations (no design), of solidification, encapsulation, chemical oxidation, and incineration techniques - Planning, operation, and design of hazardous waste landfills - One or two case studies. **(9)**

**Total : 45**

### TEXT BOOK :

1. Tchobanoglous, G. et al., "Integrated Solid Waste Management", McGraw-Hill Publication., N.Y., 1993.

### REFERENCES BOOKS:

1. Peavy, SH, Rowe, RD and Tchobanoglous, G, "Environmental Engineering", McGraw-Hill Inter Edition. 1985.
2. Charles, A.W., "Hazardous Waste Management", McGraw-Hill Pub., 2002.

### Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x		x							
2	x			x	x			x			x				
3	x				x			x			x				
4	x				x	x					x	x			



# 13CEE11 - BUILDING SERVICES AND SYSTEMS ENGINEERING

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*This subject covers the various aspects of building services involved in Civil Engineering practice. The basic concepts in building services are imparted.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to understand various system requirements in a building.*

**CO2** : *The students will be able to demonstrate various machineries, electrical systems and air conditioning systems in a building.*

**CO3** : *The students will be able to explain regulations involved in fire safety installations.*

## MACHINERIES

Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers - DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity. **(9)**

## ELECTRICAL SYSTEMS IN BUILDINGS

Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - Earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations. **(9)**

## PRINCIPLES OF ILLUMINATION & DESIGN

Visual tasks - Factors affecting visual tasks - Modern theory of light and colour - Synthesis of light - Additive and subtractive synthesis of colour - Luminous flux - Candela - Solid angle illumination - Utilisation factor - Depreciation factor - MSCP - MHCP - Lamps of illumination - Classification of lighting - Artificial light sources - Spectral energy distribution - Luminous efficiency - Colour temperature - Colour rendering.

Design of modern lighting - Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types. **(9)**

## REFRIGERATION PRINCIPLES & APPLICATIONS

Thermodynamics - Heat - Temperature, measurement transfer - Change of state - Sensible heat - Latent heat of fusion, evaporation, sublimation - saturation temperature - Super heated vapour - Subcooled liquid - Pressure temperature relationship for liquids - Refrigerants - Vapour compression cycle - Compressors - Evaporators - Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers - Window type and packaged air-conditioners - Chilled water plant - Fan coil systems - Water piping - Cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems. **(9)**

## FIRE SAFETY INSTALLATION

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types - Heat and smoke detectors - Fire alarm system, snorkel ladder - Fire lighting pump and water storage - Dry and wet risers - Automatic sprinklers.

(9)

**TOTAL : 45**

## TEXT BOOKS :

1. *E.R.Ambrose, "Heat Pumps and Electric Heating", John and Wiley and Sons, Inc., New York, 1968.*
2. *Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.*
3. *Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.*

## REFERENCES BOOKS:

1. *R.G.Hopkinson and J.D.Kay, "The Lighting of buildings", Faber and Faber, London, 1969.*
2. *William H.Severns and Julian R.Fellows, "Air-conditioning and Refrigeration", John Wiley and Sons, London, 1988.*
3. *A.F.C. Sherratt, "Air-conditioning and Energy Conservation", The Architectural Press, London, 1980.*
4. *National Building Code.*

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x		x			x				
2	x				x	x		x			x				
3	x				x	x		x			x				

# 13CEE12 - RENEWABLE ENERGY RESOURCES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*This course aims at expertising the students of civil engineering about the various unconventional and renewable energy resources available in India.*

### COURSE OUTCOMES :

- CO1** : *The students will be able to assimilate the basic knowledge pertaining to unconventional and renewable energy resources.*
- CO2** : *The students will be able to describe the challenges and problems associated with the use of various energy sources with regard to future supply and the environment.*
- CO3** : *The students will be able to collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.*

## ENERGY PERSPECTIVES

Conventional and non conventional energies - Global energy perspectives - Energy and sustainable development - Current energy scenario in India - Energy consumption pattern in rural and urban regions - Energy efficiency and economy - Energy losses and its control - Future of energy in India. **(9)**

## SOLAR ENERGY PERSPECTIVES

Concept of solar energy - Solar energy to light and to thermal conversions - Total energy and necessary infrastructure - Units and measurement of solar radiation - Temperature dependent collecting devices and their efficacies - Design aspects - Typical applications: heating, cooling, lighting, power generation and cooking. **(9)**

## WIND ENERGY PERSPECTIVES

Wind potential in India - Wind machines and their types - Merits and demerits - Wind power and appropriate coefficient - Efficiency and performance of wind machines -Energy conversion and storage - Synchronous invertors - Various storage aspects : battery, fly wheel, hydrogen and compressed air. **(9)**

## BIOMASS ENERGY PERSPECTIVES

Biomass potential in India - Gobar gas and producer gas - Characteristics of biomass - Operation and design of biogas plants - Objectives, principles and operational aspect of biogassifiers - Pyrolysis and incineration - Incineration of MSW and industrial Sludges - Application of biodiesel plants - Fuel cells. **(9)**

## TIDAL ENERGY PERSPECTIVES

Tidal aspects in coastal India - Tidal energy conversion system: mechanical to electrical and thermal to electrical - Tidal force calculation and power generation - conceptualization and potential of geothermal energy - Geothermal vents. **(9)**

**Total : 45**

**TEXT BOOK :**

1. Sukathme, S.P, " Solar Energy", Tata McGraw -Hill Book Co., New Delhi, 1993.

**REFERENCE BOOKS :**

1. Rai, G.D., "Solar Energy Utilization", Khanna Publishers, New Delhi, 1993.
2. Angrist, S.W, "Direct Eney Conversion", Allied Publishers Ltd., Boston, 1971.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x		x			x				
2	x			x	x			x			x				
3		x		x							x		x		x

## 13CEE13 - TOWN PLANNING AND ARCHITECTURE

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*To introduce the fundamentals of architecture, development plans and development control rules for the overall development of a city in a scientific and systematic way.*

#### COURSE OUTCOMES :

**CO1** : *The students will be able to understand the various elements of architecture and principles of orientation,*

**CO2** : *The students will be able to understand about developing plans and planning regulations.*

**CO3** : *The students will be able to explain various development control rules in town planning.*

#### ELEMENTS OF ARCHITECTURE

(9)

Introduction of architecture - definition - Evaluation of geometric forms - function and history - Sphere, Cube, Pyramid, Cylinder and Cone - aesthetic qualities of Architecture - Proportion, Scale, Balance, Symmetry, Rhythm and axis - Contrast in Form - Harmony.

#### PRINCIPLES OF ORIENTATION AND PLANNING OF BUILDINGS

(9)

Factors affecting orientation - Sun-Wind-Rain - Orientation criteria for Indian conditions - Principles governing the theory of planning - Planning of residential buildings.

#### DEVELOPMENT PLAN

(9)

Principles of city planning - levels of planning- scope and contents of regional plan, master plan, detailed development plan and structure plan - preparation and implementation - planning of new towns - slum clearance and urban renewal.

#### PLANNING LEGISLATION

(9)

Planning legislation and administration - review of planning legislation relating to city planning and housing in India - Tamil Nadu Town and Country planning Act, Tamil Nadu Housing Board Act, Tamil Nadu slum clearance and Improvement Act.

#### DEVELOPMENT CONTROL RULES:

(9)

Zoning regulations - sub division regulations - building regulations - Floor Space Index - minimum plot sizes and building frontage - open spaces - minimum standard dimensions of building elements - organisation and administration of Planning agencies at national, state, regional, local and metropolitan levels.

**Total : 45**

#### TEXT BOOKS:

1. Rangwala.S.C., "Town Planning", Charotar Publishing House, Anand, 2013.
2. Francis.D.K.,Ching, "Architecture Form, Space and Order", Oxford University Press, 2005.

**REFERENCE BOOKS :**

1. Donald Helper and Wallach. "Architectural Drafting and Design", McGraw Hill Book Company, New Delhi, 2004.
2. Arnold Whittick., "Encyclopedia of Urban Planning", McGraw Hill Book, Company, New Delhi, 2003.
3. Pickering.E., "Architectural Design", John Wiley & Sons, London, 2012.
4. Hiraskar, G.K, "Fundamentals of Town Planning", Dhanpat Rai and Sons, Delhi, 2005.
5. Arthur B.Gallion and Simon Eisner, "The Urban Pattern - City Planning and Design", CBS Publishers and Distributors, Delhi, 1980.
6. G.K.Hiraskar, "The Great Ages of World Architecture," Dhanpat Rai Publications (P) Ltd., New Delhi, 2010.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x			x						x	
2	x	x			x		x				x			x	
3	x	x			x		x				x			x	

## 13CEE14 - CONSTRUCTION EQUIPMENTS AND TECHNIQUES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To introduce the various construction equipments used in the construction and various techniques of construction.*

#### **COURSE OUTCOMES :**

- CO1** : *The students will be able to acquire knowledge in using constructions equipments effectively in different construction aspects*
- CO2** : *The students will be capable to analyse the problems in construction processes and can find the remedy to solve with the modern equipments usage*
- CO3** : *The students will be able to develop solutions to well-defined project management problems within civil or construction engineering.*

### **EARTHWORK AND MATERIAL HANDLING EQUIPMENTS**

Fundamentals of earth work operations - Selection of equipment for earth work- Types of earth work equipment - Tractors, Motor graders, Scrapers, Front end waders, Earth movers. Material handling equipment - Forklifts and related equipment- Portable material bins - conveyors-hauling equipment. **(9)**

### **EQUIPMENTS FOR AGGREGATE PRODUCTION AND CONCRETING**

Crushers- Feeders- screening equipment - handling equipment- batching and mixing equipment- hauling, pouring and pumping equipment.RMC equipment. **(9)**

### **OTHER CONSTRUCTION EQUIPMENTS**

Foundation and pile driving equipment - Equipment for compaction - Equipment for dewatering and grouting - Equipment for demolition. **(9)**

### **SUBSTRUCTURE CONSTRUCTION**

Techniques for box jacking, pipe jacking, diaphragm wall construction - piling techniques - driving well and caisson - cofferdam - sheet piles - dewatering and stand by plant equipment for underground open excavation. **(9)**

### **SUPERSTRUCTURE CONSTRUCTION**

Vacuum dewatering for concrete flooring- Techniques for continuous concreting operations - Concrete paving technology - Erection techniques of tall structures - pre stressing in high rise structures - aerial transporting. **(9)**

**Total : 45**

**REFERENCES BOOKS:**

1. *Sharma S.C Construction equipment and Management, Khanna publishers, New Delhi 1988*
2. *Peurifoy. R.L., Ledbetter, W.B and Schexnayder, C., Construction Planning, Equipment and Methods, McGraw Hill, Singapore,2006*
3. *Arora S.P. and Bindra S.P., Building construction, Planning and Techniques and Method of construction, Dhanpatrai and sons, 1997*
4. *Varghese, P.C Building construction, Prentice Hall of India Pvt. ltd, New Delhi*
5. *Deodhar, S.V. "Construction Equipment and Management", Khanna publishers, New Delhi, 1988*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x			x	x		x				x
2	x	x	x						x		x	x		x	x
3	x	x	x			x			x	x	x	x	x		x



## 13CEE15 - WATER POWER ENGINEERING

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To make the students understand the various sustainable sources of hydraulic energy available for generation of power and the system for power generation.*

#### **COURSE OUTCOMES :**

**CO1** : *The students will be able to understand status of power and methods for power generation.*

**CO2** : *The students will be able to explain various processes involved in power generation.*

**CO3** : *The students will be able to understand the power house planning and distribution.*

### **WATER POWER**

Introduction - Sources of energy - Status of power in world - Hydro Power - Transmission voltages and Hydro power - Estimation of Water Power Potential.

### **ELECTRICAL LOAD ON HYDRO TURBINES**

General - Load curve - Load factor - capacity factor - Utilisation factor - Diversity factor - Load duration curve - Firm power - Secondary power - Prediction of load - Illustrative examples. **(9)**

### **HYDRO POWER PLANTS**

Classification of hydel plants - Run-of-River Plants - General arrangements - Valley dam plants - Diversion canal plants - High head diversion plants - storage and pondages. Pumped storage plants - Types - Advantage - two unit arrangement, Three unit arrangement - Reversible pump turbines - Problems in operation - Efficiency of pumped storage plants. **(9)**

### **WATER CONVEYANCE**

Penstock - Types - Design criteria - Anchor Blocks - Valves, Bends and Manifolds - Intakes - Types - Losses - Aeration - Forebays - canals - Tunnels, - Water Hammer - Surge tanks. **(9)**

### **TIDAL POWER**

Tidal Phenomenon - Tidal power - Basic principle - Location - Difficulties - Components - Modes of generation - Constructional aspects - Estimation of energy and power - Regulation of power output - Corrosion control and quality of concrete. **(9)**

### **POWER HOUSE PLANNING:**

Surface power stations - Power House structure - Dimensions - Lighting and ventilations - Design variations - Underground power stations - Location - Types - Advantages - Components - Layout types - Limitations - Environmental impact of Hydel power projects - Introduction to economic analysis of Hydro Power projects. **(9)**

**Total : 45**

**TEXT BOOK :**

1. Dandekar.M.M and Sharma, K.N., "Water Power Engineering", DandekarVikas Publishing House Pvt. Ltd., New Delhi, 1998.

**REFERENCE BOOKS :**

1. Creager. W.P and Justin.J.D, "Hydro Electric Hand Book", John Wiley Sons, London, 1981.
2. Desmukh. M.M "Water Power Engineering", Dhanpat Rai Publications, New Delhi, 1977.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x		x		x	x		x			x				
2	x		x		x	x		x			x				
3	x		x		x	x		x			x				

# 13CEE16 - ENGINEERING HYDROLOGY

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVES :

To impart an in-depth knowledge about

- the rainfall and runoff processes that contributes to the surface and subsurface water for utilization for drinking and irrigation
- the behavior, availability and utilization of subsurface water and methods of acquiring the same

### COURSE OUTCOMES :

**CO1** : The students will be able to analyze the rainfall-runoff data and predict the quantity of water that can be derived from nature

**CO2** : The students will be able to design wells for utilizing the ground water

**CO3** : The students will be able to demonstrate the construction of wells for utilizing the ground water.

## GENERAL HYDROLOGY AND PRECIPITATION

Hydrology - weather - general circulation - watershed hydrology - geomorphology - effect of land use in hydrology.

Precipitation -Types - forms - measurement - rainfall data analysis - abstraction and losses from precipitation such as evaporation - infiltration and transpiration - their estimation. **(9)**

## RUN-OFF

Rainfall-Runoff process - runoff estimation through empirical formulae - hydrograph theory and its applications. **(9)**

## FLOOD AND STREAM FLOW MEASUREMENTS

Flood estimation - routing - flood control. Stream flow measurements - methods - Stage Discharge Relation - Stream gauging Network. **(9)**

## GROUND WATER AND WELLS

Ground water sources - aquifers - yield - storage coefficient - permeability - transmissibility - measurement. Wells -Construction and maintenance of open and tube wells - water divining **(9)**

## WELL HYDRAULICS

Darcy's law - yield of confined and unconfined aquifer under equilibrium and non-equilibrium condition - Dupuit's theory - Theis's theory - Theim's theory - Recuperation and Pumping Tests **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Raghunath, H.M. "Hydrology: Principles, Analysis and Design", New Age International (Pvt) Ltd., New Delhi, 2nd Revised Edition 2007
2. Raghunath, H.M. "Ground Water", New Age International (Pvt) Ltd., New Delhi, 2nd Edition, Reprint 2003

**REFERENCE BOOKS:**

1. Jayarami Reddy, P, "A Text Book of Hydrology" University Science Press, (Unit of Laxmi Publications) New Delhi, 3rd Edition, 2011
2. David Keith Todd and Larry W. Mays, "Ground Water Hydrology" John Wiley Publications, 3rd Edition, 2005
3. Subramanya K, "Engineering Hydrology", Tata McGraw Hill Publishing Company Ltd., 2000.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x			x			x			x				
2	x	x	x		x						x				
3	x	x			x			x			x				

# 13CEE17 - FINITE ELEMENT METHOD

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To study the energy principles, finite element concept, stress-strain analysis and applications.

### COURSE OUTCOMES :

- CO1** : The students will be able to understand the computational concepts in terms of geometrical and material properties.
- CO2** : The students will be able to understand three dimensional stress analyses, Torsion problems, Thermal analysis and Free vibration analysis
- CO3** : The students will be able to analyze trusses, beams and frames
- CO4** : The students will be introduced to Finite element packages and their usage

## INTRODUCTION AND BASICS

General description - Basic element shapes - Discretization process - Node numbering - Mesh generation - Energy principles - Variational methods - Raleigh Ritz method - Galerkin Method - Least squares approach. (9)

## ANALYSIS OF TRUSSES, BEAMS AND FRAMES

Stiffness matrix for an axial element - transformation of vectors - plane truss analysis - beam stiffness - solution for beam problems - Two Dimensional beam element - rigid plane frames - inclined or skewed supports - analysis of grids. (9)

## PLANE STRESS AND PLANE STRAIN PROBLEMS

Basic concepts of plane stress and plane strain - derivation of stiffness matrix for constant - strain, linear strain triangular elements - rectangular elements - iso parametric elements - Lagrange and Serendipity elements - static condensation - axisymmetric elements. (9)

## PLATE BENDING PROBLEMS

Basic concepts - derivation of element stiffness matrix - four noded, eight noded rectangular and isoparametric elements - shear deformation in plates - computer applications. (9)

## OTHER APPLICATIONS

Three dimensional stress analysis - Torsion problems - Free vibration analysis - Buckling problems - Heat transfer - Fluid flow problems - Thermal analysis - Finite element packages. (9)

**Total : 45**

## TEXT BOOKS :

1. Daryl L.Logan, "Finite Element Method", Thomson Canada Ltd., India Edition, 2007.

**REFERENCES BOOKS:**

1. Singiresu.S.Rao, "The Finite Element Method in Engineering", Butterworth-Heinemann, India Edition, 2001.
2. Krishnamoorthy.C.S, "Finite Element Analysis", Tata Mc Graw Hill Publishing Co., New Delhi, 2008.
3. Rajasekaran.S, "Finite Element Analysis in Engineering Design", S.Chand and Company Ltd., 2003.
4. Larry.J.Segerlind, "Applied Finite Element Analysis", John Wiley and Sons, New York, 2010.
5. Robert.D.Cook, David.S.Malkus, "Concepts and Applications of Finite Element Analysis", John Wiley and Sons, India Edition, 2007.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x					x	x				x
2	x		x				x					x	x		
3	x	x			x			x		x	x				
4	x				x					x	x		x		x

# 13CEE18 - THEORY OF PLATES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

To study the behaviour and analysis of thin plates and the behaviour of thick plates and its computer application.

### COURSE OUTCOMES :

**CO1** : The students will be able to understand the theory of plates and its behavior

**CO2** : The students will be able to understand classical methods and approximate methods

**CO3** : The students will be able to understand the Engineering approach to design of Rectangular floor slabs and Computer Applications

## INTRODUCTION

Thin and thick plates - Plate behaviour - Material behaviour - Isotropic and orthotropic Materials. (9)

## SMALL DEFLECTION THEORY AND CLASSICAL METHODS

Differential equation of plates in Cartesian co-ordinate system - boundary conditions - Rigorous solution - Navier's Method - Levy's Method.

## SYMMETRICAL BENDING OF CIRCULAR PLATES

Differential equation for symmetrical bending of laterally loaded circular plates - Simply supported edges - Clamped edges - Circular plate with a circular hole at the centre - Circular plate concentrically loaded. (9)

## APPROXIMATE METHODS

Energy methods - Galerkin's Method - Ritz Method, Method of Images - Plate strip - Influence surfaces - Membrane and Various Analogies - Simultaneous Bending and Stretching. (9)

## NUMERICAL METHODS

Finite difference method - Improvements for solution, matrix displacement analysis of Grids - introduction to Finite Element Method. Computer Applications. (9)

## PLATES OF OTHER SHAPES

Triangular plates - Elliptic plates - Sector plates - Skew plates - Plates on elastic foundation - Continuous plates. Computer Applications

## ADVANCED TOPICS

Large Deflection theory - Thermal stresses - Multilayered plates. - Mindlin's theory of plates - Flat slabs - Engineering approach to design of Rectangular floor slabs. Computer Applications. (9)

**Total : 45**

**TEXT BOOKS :**

1. Rudolph Szilard, "Theory and Analysis of Plates - Classical and Numerical Methods", Prentice Hall, 1995.
2. Timoshenko.S and Krieger.S.W, "Theory of Plates and Shells", Mc-Graw Hill Book Company, New York, 1990.

**REFERENCES BOOKS:**

1. Donnel.L.H, "Beams, Plates and Shells", McGraw Hill Inc., US, 1976.
2. Chandrashekhara, K., "Theory of plates", University Press(India) limited, Hyderabad, 2001
3. Bairagi.N.K, "A Text Book of Plate Analysis", Khanna Publishers, New Delhi, 1996.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x			x	x					x	x				x
2	x		x		x		x			x			x		
3	x				x			x			x				x



## 13CEE19 - OPTIMIZATION IN CIVIL ENGINEERING

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The student should be able to understand different optimization techniques with reference to variable and also apply the concept of optimization for few civil engineering systems.

#### COURSE OUTCOMES :

**CO1** : The students will be able to understand the constraints, interpret the results and provide better engineering solution in terms of analysis and design.

**CO2** : The students will be able to diagnose the problems and find the optimal solution by using various optimization techniques.

**CO3** : The students will be able to solve using calculus and tabulation methods.

**CO4** : The students will be able to design pipes, steel beams and portal frames for the optimal function.

#### INTRODUCTION

Design vector, constraints, design surface - objective function - classification of optimization problems - Problem formulation. (9)

#### CLASSICAL OPTIMIZATION

Single variable - Multivariable problems - Equality constraints - Lagrangian Multipliers - Inequality constraints - Khun - Tucker conditions - Graphical method for two variable problem. (9)

#### LINEAR PROGRAMMING

Graphical solution - Simplex Algorithm - Primal - dual concept - Transportation problem - Assignment problem. (9)

#### NON - LINEAR PROGRAMMING

One dimensional minimization - search methods - Exhaustive search - Dichotomous search - Fibonacci method - Golden section method - Descent methods - Cauchy's method - Fletcher - Reeves method. Constrained optimization : Penalty Function method. (9)

#### DYNAMIC PROGRAMMING

Concept of sub optimization - Bellman's principle of optimality - calculus and tabulation methods.

#### APPLICATIONS

Application in design of pipes - plastic design of steel beams - simple portal frames. (9)

**Total : 45**

**TEXT BOOK :**

1. Rao.S.S., "Optimization Theory and Applications", New Age International Publishers, New Delhi, 1999.

**REFERENCE BOOKS :**

1. Stark, R.M and Nichols., "Mathematical Foundation for Design of Civil Engineering Systems", Mc Graw Hill, Newyork, 1995.
2. Ossenbruggen, P.J., "Systems Approach to Civil Engineering Planning and Design", John Wiley & Sons, Canada, 1987.
3. Jewell, T.K., "Systems Approach to Civil Engineering Planning and Design", Harper & Row, Publishers, New York, 1991.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x	x		x		x	x			x				
2	x	x	x		x					x		x			x
3	x	x		x				x				x			
4	x	x	x		x		x				x			x	

# 13CEE20 - SMART MATERIALS AND STRUCTURES

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*This course is designed to give an insight into the latest developments regarding smart materials and their use in structures. Further, this also deals with structures which can self adjust their stiffness with load.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to explain the concepts of smart materials, function and response, Chemical and biochemical sensing in structural assessment*

**CO2** : *The students will be able to understand the concepts of Actuation of structural components*

**CO3** : *The students will be able to demonstrate the concepts of Role of actuators and Actuator Materials*

## INTRODUCTION

Introduction to Smart Materials and Structures - Instrumented structures functions and response - Sensing systems - Self diagnosis - Signal processing consideration - Actuation systems and effectors.

## PROPERTIES OF MATERIALS

Piezoelectric Materials - Piezoelectric properties - Actuation of structural components - Shape Memory Alloys - Constitutive modeling of the shape memory effect - vibration control - Embedded actuators - Applications of shape memory alloys. **(9)**

## ER AND MR FLUIDS

Electro rheological and magneto rheological fluids - Mechanisms and Properties - Applications of ER and MR fluids - Fiber Optics - Fiber characteristics - Fiber optic strain sensors - Applications of optical fibers. **(8)**

## CONTROL OF STRUCTURES

Control modeling of structures - Control strategies and limitations - classification of control systems - Classical control - Modern control - Optimal control and Digital control - Active structures in practice. **(9)**

## SENSORS

Sensing Technology - Types of Sensors - Physical Measurement using Piezo Electric Strain measurement - Inductively Read Transducers - The LVOT - Fiber optic Techniques.

Chemical and Bio-Chemical sensing in structural Assessment - Absorptive chemical sensors - Spectroscopes - Fibre Optic Chemical Sensing Systems and Distributed measurement.

## ACTUATORS

Actuator Techniques - Actuator and actuator materials - Piezoelectric and Electrostrictive Material - Magnetostructure Material - Shape Memory Alloys - Electro rheological Fluids- Electromagnetic actuation - Role of actuators and Actuator Materials. **(10)**

## SIGNAL PROCESSING AND CONTROL SYSTEMS

Data Acquisition and Processing - Signal Processing and Control for Smart Structures - Sensors as Geometrical Processors - Signal Processing - Control System - Linear and Non-Linear.

## BIOMIMETICS

Characteristics of natural structures, Biomimetic structural design, Biomimetic sensing, Challenges and opportunities for Biomimetics, Chemical and biochemical sensing in structural assessment, Absorptive chemical sensors, Spectroscopes. **(9)**

**Total : 45**

## TEXT BOOKS :

1. *Brian Culshaw - Smart Structure and Materials Artech House - Borton. London-1996.*
2. *Srinivasan,A.V., and Michael McFarland.D., Smart Structures - Analysis and Design, Cambridge University Press, 2001.*

## REFERENCE BOOKS:

1. *Brian Culshaw, "Smart Structures and Materials", Artech House, Boston, 1996*
2. *Gandhi. M.V and Thompson. B.S,"Smart Materials and Structures", Chapman and Hall, NewYork, 1992*
3. *Mel. M Schwartz, Encyclopedia of Smart Materials, John Wiley and Sons Inc. 2002*

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x			x		x			x	x				
2	x			x								x			x
3	x						x			x			x		

## 13CEE21 - DISASTER MANAGEMENT

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The students are exposed to various disasters, which may strike periodically or once in a decade or century. Further, they will be taught disaster management skills, to tackle various types of disaster.

#### COURSE OUTCOMES :

**CO1** : The students will be able to explain the concepts of Remote sensing, GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation- disaster mapping

**CO2** : Students will be able to prepare disaster management plans.

**CO3** : The students will be able to demonstrate the management of disasters.

#### NATURAL DISASTERS :

Cyclones, Floods, Drought and Desertification - Earthquake, Tsunami, Landslides and Avalanche. (9)

#### MAN MADE DISASTERS :

Chemical industrial hazards, major power breakdowns, traffic accidents, Fire, War, Atom bombs, Nuclear disaster.- Forest Fire-Oil fire -accident in Mines. (9)

#### GEOSPATIAL TECHNOLOGY :

Remote sensing, GIS and GPS applications in real time disaster monitoring, prevention and rehabilitation- disaster mapping. (9)

#### RISK ASSESSMENT AND MITIGATION :

Hazards, Risks and Vulnerabilities. -Disasters in and India, Assessment of Disaster Vulnerability of a location and vulnerable groups- Preparedness and Mitigation measures for various Disasters- Mitigation through capacity building -Preparation of Disaster Management Plans. (9)

#### DISASTER MANAGEMENT :

Legislative responsibilities of disaster management- Disaster management act 2005- post disaster recovery & rehabilitation, Relief & Logistics Management; disaster related infrastructure development- Post Disaster, Emergency Support Functions and their coordination mechanism. (9)

**TOTAL : 45**

#### TEXT BOOKS:

1. Khanna B K, "All You Wanted To Know About Disasters", New India Publishing Agency, New Delhi, 2005.
2. Ramana Murthy, "Disaster Management", Dominant, New Delhi, 2004.
3. Rajdeep Dasgupta, Disaster Management and Rehabilitation, Mittal Publishers, New Delhi, 2007.

**REFERENCES BOOKS:**

1. *Disaster Management in India- A Status Report- Published by the National Disaster Management Institute, Ministry of Home Affairs, Govt. of India.2004.*
2. *Murthy D B N, "Disaster Management: Text and Case Studies", Deep and Deep Publications (P) Ltd., New Delhi, 2007.*
3. *Sundar I and Sezhiyan T, "Disaster Management", Sarup and Sons, New Delhi, 2007.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x	x				x			x	
2	x		x				x						x		
3		X	X		X	X				X					

## 13CEE22 - PAVEMENT DESIGN

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To impart knowledge in various IRC guidelines for designing rigid and flexible pavements. Further, to assess quality and serviceability conditions of roads.

#### COURSE OUTCOMES :

- CO1** : The students will be able to analyse the pavement strength by conducting various tests on pavement
- CO2** : The students will be able to compute the rigid and flexible pavement design
- CO3** : The students will be able to gain knowledge on various IRC guidelines for designing rigid and flexible pavements
- CO4** : The students will be able to assess quality and serviceability conditions of roads
- CO5** : The students will be able to apply the various design procedure of pavement design in real time.

### PRINCIPLES OF PAVEMENT DESIGN

Types of pavement-flexible and rigid- Components of pavement and their functions, Provisions of IRC Guidelines for each component, Comparison between highway and airport pavements, Factors influencing pavement stability: Vehicle and traffic factors-ESWL and Wheel Load Factor- Moisture and climate, soil-CBR, Hveem stabilometer method, Plate Bearing method for finding modulus of subgrade reaction and North Dakota Cone method- and stress distribution factor- Boussinesq and Burmister theories. (9)

### DESIGN OF FLEXIBLE PAVEMENT

Empirical method based on classification-Group Index method- Methods based on arbitrary strength-CBR method-Provisions of IRC 37- North Dakota Cone method, Hveem Stabilometer method, Plate Bearing method (US Navy method for airfields), Theoretical and semi-theoretical methods-Kansas and Texas triaxial methods, Burmister Design method. (9)

### STRESSES IN RIGID PAVEMENT

Advantages and Disadvantages of rigid pavement, Stresses in rigid pavement due to wheel load-Westergaard, Older, Bradbury and Kelly theories- Stresses due to change in temperature-warping stress-theory by Bradbury- Stress due to subgrade restraint, Critical combination of stresses. (8)

### DESIGN OF RIGID PAVEMENT

Modulus of Rupture of concrete, Design of airport pavement-Portland Cement Association (PCA) method and Corps of Engineers method- Design of rigid highway pavement- IRC 58 method and PCA method.

### JOINTS IN RIGID PAVEMENT

Types of joints, Types of rigid pavement based on reinforcement, Design of reinforcement in longitudinal and transverse direction, tie bars and dowel bars. (10)

## PAVEMENT DISTRESS, EVALUATION AND REHABILITATION

Flexible pavement distress - rigid pavement distress - condition surveys - Types of roughness - present serviceability index - skid resistance - structural evaluation - Bituminous and flexible overlays on rigid pavements - Rigid overlays on rigid pavements - Bounded concrete overlay on rigid pavements - Rigid overlays over existing flexible pavements.

## STABILISATION OF PAVEMENTS

Stabilisation with special reference to highway pavements, Choice of stabilisers, Testing and Field control, Use of Geosynthetics (geotextiles and geogrids) in roads. **(9)**

**Total : 45**

## TEXT BOOKS :

1. *Kadiyali, L.R., "Principles and Practice of Highway Engineering", Khanna Tech Publications, New Delhi, 1989.*
2. *Sharma S K, "Principles, Practice and Design of Highway Engineering", S Chand and Company Ltd., New Delhi, 1985.*
3. *Yoder E J and Witezak M W, "Principles of Pavement Design", John Wiley and Sons Inc., New York, 1975.*

## REFERENCES BOOKS:

1. *IRC: 37-2001, Guidelines for the Design of Flexible pavements, Indian Road Congress, New Delhi, 2001.*
2. *IRC: 58-2002, Guidelines for the Design of Rigid Pavements for Highways, Indian Road Congress, New Delhi, 2002.*

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X					X	X	X	X		
2	X	X			X							X	X		
3	X	X			X						X	X	X		
4	X	X			X							X	X		
5	X	X	X		X			X			X	X	X	X	



## 13CEE23 - DESIGN OF BRIDGES

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To impart knowledge on various types of bridges, their behaviour and designs as per IRC guidelines.*

#### **COURSE OUTCOMES :**

**CO1** : *The students will be able to analyse various types of bridges and bridge components*

**CO2** : *The students will be able to compute the necessary type of bridge based on its loading conditions*

**CO3** : *The students will be able to gain knowledge on various IRC guidelines for designing bridge decks*

**CO4** : *The students will be able to assess quality and serviceability of the bridges*

**CO5** : *The students will be able to choose appropriate bridge structure and design it for given site conditions*

### **INTRODUCTION**

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders **(9)**

### **STEEL BRIDGES**

Design of Pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners. **(9)**

### **REINFORCED CONCRETE SLAB BRIDGES**

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading. **(9)**

### **REINFORCED CONCRETE GIRDER BRIDGES**

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation. **(9)**

### **PRESTRESSED CONCRETE BRIDGES**

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder - Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 1990.
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 1996.

**REFERENCES BOOK:**

1. Phatak D.R., "Bridge Engineering", SatyaPrakashan, New Delhi, 1990

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	X	X			X					X	X	X	X		
2	X	X			X							X	X		
3	X	X			X						X	X	X		
4	X	X			X							X	X		
5	X	X	X		X			X			X	X	X	X	

# 13CEE24 - INDUSTRIAL WASTE WATER TREATMENT AND DISPOSAL

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*This course facilitates the students of civil engineering about the various aspects of treatment and disposal of industrial wastewater.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to assimilate the basic knowledge pertaining to industrial waste water treatment*

**CO2** : *The students will be able to characterise the wastewater for various treatment schemes in industries*

**CO3** : *The students will impart the knowledge about disposal of effluents and the standards for disposal*

## INDUSTRIAL WASTEWATER PERSPECTIVES

Manufacturing and process-based industries - General characteristics of industrial wastewater - Objectives and management of industrial wastewater - Effluent and stream standards for disposal of wastewater - Sewer ordinance - Effects of untreated and/or partially treated wastewater on disposal into land and rivers - DO sag curve and Streeter - Phelp's equation - Joint treatment of municipal sewage and Industrial wastewater - Individual treatments and CETPs. **(9)**

## WASTEWATER MINIMIZATION AND CLEANER PRODUCTION

Necessity of wastewater minimization and basic concepts of cleaner production- Volume and strength of reductions - Housekeeping aspects - 3R concepts - By-product recovery aspects - Material balance and waste auditing - Raw Material selections. **(9)**

## WASTEWATER TREATMENT TECHNIQUES

Objectives, principles and process description of equalization, neutralization, chemical oxidation, chemical precipitation, adsorption and \ sedimentation facilities -Biological treatment process: aerated lagoon, stabilization ponds, oxidation ditch, RBCs and UASBPs - Principles of RO, ultra and nano filtrations in TDS removal. **(9)**

## INDUSTRIAL SLUDGE TREATMENT

Types of industrial sludges -Characteristics and treatment schemes- Toxicity and hazardousness - High-rate digestors and methane recovery - Land application of sludge and acceptable limits - Bioaccumulation potential - Pyrolysis and incineration techniques- Energy conversion and air pollution problems. **(9)**

## WASTEWATER CHARACTERISTICS AND TREATMENT SCHEMES IN INDUSTRIES

Typical manufacturing industries: cement, iron and steel, thermal power plants, sugar, paper and pulp and mining- Typical process industries: tannery, food processing, distilleries, and dairy, textile-Dyeing and petrochemical industries. **(9)**

**Total : 45**

**TEXT BOOK :**

1. Rao, M.N and Datta, A.K. "Waste Water Treatment", Oxford and IBH Publishers Co; New Delhi, 1995.

**REFERENCE BOOKS:**

1. Eckenfelder, W.W.(jr)", *Industrial Water Pollution Control*", McGraw- Hill Book Co, NewYork,2000.
2. Metcalf and Eddy", *Wastewater Engineering Treatment, Disposal and Reuse*", McGraw-Hill Publishing Co, Indian Edition, New Delhi,2005.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x	x			x	x	x			x	x			x	
2	x	x			x	x	x			x	x			x	
3	x	x			x	x	x			x	x			x	

# 13CEE25 - POLLUTION AND CONTROL ENGINEERING

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*The prime motive behind this course is to appropriately create deep interest about the air pollution, noise pollution and various deleterious effects on the components of environment. Also, to facilitate the students about the best available and strategic techno-economic management tools for pollution control.*

### COURSE OUTCOMES :

**CO1** : *The students will be able to explain the principles of pollution prevention.*

**CO2** : *The students will be able to understand the suitable technologies for prevention of air pollution.*

**CO3** : *The students will be able to design the devices for control of particular matter.*

**CO4** : *The students will be able to understand the concepts of noise pollution and their control.*

## AIR QUALITY AND EFFECTS OF AIR POLLUTANTS

Definitions - Sources and classification of pollutants - Natural and anthropogenic - Units and measurements - Air quality standards - Meteorology and air pollution - Atmospheric stability and inversions - Mixing height and plume behavior - Effects of air pollution on human beings, vegetation, animals, materials and climate. (9)

## SAMPLING AND MODELLING OF AIR POLLUTION

Concept and objectives of sampling - Averaging principle - Standard methods for major air pollutants in ambient air - Isokinetic sampling - objectives of modeling - Types and uses of models - Design of stack height - Principles and application of Fixed-box, Gaussian dispersion and multiple-cell models (no derivations). (9)

## CONTROL OF PARTICULATE MATTER

Basic devices of control - Objectives, applications, principles, process descriptions, relevant analytical equations without derivations (no design), essential considerations, performances, limitations and modifications of gravity settler, cyclone separator, ESP, fabric filter, and co-flow venture scrubber. (9)

## BASIC CONCEPTS OF SOUND AND NOISE

Definitions of sound and noise- Sources of sound - Propagation of sound in air and hearing mechanism by ear- Relationship between sound pressure, power, and intensity- Types of noise: structure-borne, air-borne, and impact - Near and far fields- Periodic and aperiodic sounds- Effects of noise on human being. (9)

## NOISE CONTROL STRATEGIES

Source, transmission path, and destination strategies- Outdoor noise propagation- Attenuating factors- Noise control criteria- vibration control methods. (9)

**Total : 45**

**TEXT BOOKS :**

1. *Nevers, N.D., "Air Pollution Control Engineering", 2nd Edn., McGraw-Hill International Editions, N.Y., 2000.*
2. *White, R.G. and Walker, J.G., "Noise and Vibration", Ellis Horwood Publishers, N.Y. 1982.*

**REFERENCES BOOKS:**

1. *Sincero, A.P., and Sincero, G.A., "Environmental Engineering-A Design Approach", PHI Pub., New Delhi, 1996.*
2. *Anjaneyulu, D., "Air Pollution Control Technologies", Allied Publishers, Mumbai, 2002.*
3. *Rao, M.N., and Rao, H.V.N., "Air Pollution Control", Tata McGraw-Hill Book Co., New Delhi, 1996.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x			x							
2	x	x			x					x	x				
3	x		x		x						x				
4	x							x							

## 13CEE26 - PRINCIPLES OF SUSTAINABLE DEVELOPMENT

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

To provide the concept of sustainable development, their global impact and assessment.

#### COURSE OUTCOMES :

- CO1** : The students will be able to understand the responsibility of individual in maintaining sustainability.
- CO2** : The students will be able to understand the sustainable strategies for social improvement and economical growth.
- CO3** : The students will be able to understand the integrated approaches for resource management and their protection.
- CO4** : The students will be able to understand the rate of legislation and policy in maintaining sustainable development.

### GLOBAL RESPONSE TO SUSTAINABLE DEVELOPEMENT

Historical emergence and various definitions -Environmental issues and crisis -Industrial growth and resource depletion -Components and factors affecting the sustainable development -Complexly of growth and equity -International summits, conventions, and agreements -Tran boundary issues -Action plan for implementing sustainable growth. (9)

### SUSTAINABLE DEVELOPEMENT OF SOCIO-ECONOMIC SYSTEMS

Socio-economic policies for sustainable development -Strategies for implementing eco development programmes -Sustainable development through trade -Economic growth -Carrying capacity -Ecological footprint -Public participation. (9)

### NATIONAL POLICY AND GLOBAL SUSTAINABLE DEVELOPEMENT

Judicial systems -Relationship between developing and developed countries in sustainable development -Demographic dynamics and sustainability -Integrated approach to resource protection and management. (9)

### CLEANER PRODUCTION ASSESSMENT

Necessity and overview of CP assessment -Necessary procedure -Steps and skills, flow and material balance, and process and treatment flow sheets -Feasible CP options -Typical case studies. (9)

### LIFE CYCLE ASSESSMENT

Definition and necessity -Elements of LCA -Life cycle cost -Green chemistry -Eco labeling -Design for the environment -International environmental standards -ISO 14001 series -Environmental audit. (9)

**Total : 45**

**REFERENCES BOOKS:**

1. Bishop, P., "Pollution Prevention: Fundamentals and Practice", McGraw-Hill International Edn., New York, 2000.
2. World Bank Group, "Pollution Prevention and Abatement Hand Books towards Cleaner Production", World Bank and UNEP, Washington, D.C., 1998.
3. Kirkby, J.O., Keefe, P., and Timberlake, "Sustainable Development", Earthsean Pub., London, 2001.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x			x							
2	x				x		x							x	
3	x				x									x	
4	x				x		x							x	



## 13CEE27 - SAFETY ENGINEERING

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*To provide on concept of safety in industry, principle of accident prevention, major hazards, consequences and concept of reliability.*

#### **COURSE OUTCOMES :**

**CO1** : *The students will be able to explain basic concepts in industrial safety engineering.*

**CO2** : *The students will be able to demonstrate fire explosion control in various industries.*

**CO3** : *The students will be able to understand safety standards in construction industry.*

### INTRODUCTION TO CONCEPTS

Concept of safety - Evolution of modern safety concept- Safety policy - Safety Organization - line and staff - functions for safety- Safety Committee- budgeting for safety. Techniques- Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit. **(9)**

### OCCUPATIONAL HEALTH AND HYGIENE

Physical hazards - Noise, noise exposure regulation, occupational damage, risk factors, and permissible exposure limit. Ionizing radiation, types, effects, monitoring instruments, control programs, control measures. Chemical hazards - Recognition of chemical hazards-dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, Methods of Control. Concept and spectrum of health - functional units and activities of occupational health services, pre employment and post-employment medical examinations - occupational related diseases, levels of prevention of diseases. **(9)**

### FIRE ENGINEERING AND EXPLOSION CONTROL

Fire chemistry - Dynamics of fire behavior - Fire properties of solid, liquid and gas - Fire spread - Toxicity of products of combustion. Building evaluation for fire safety - Fire load -Fire resistance materials and fire testing -Structural Fire protection - Exits and egress. Statutory Rules and Techniques of fire fighting - Indian Explosive acts and rules -Techniques of fire fighting and demonstration. **(9)**

### SAFETY IN CONSTRUCTION

General safety consideration - analyzing construction jobs for safety - Contract document -Safety certificate for statutory authorities for old building and construction. Safety in Erection and closing operation - Construction materials -Specifications - suitability - Limitations. Safety in typical civil structures - Dams-bridges-water Tanks-Retaining walls-Critical factors for failure-Regular Inspection and monitoring. **(9)**

### SAFETY IN MATERIAL HANDLING

General safety consideration in material handling - Ropes, Chains, Sling, Hoops, Clamps, Arresting gears. Selection, operation and maintenance of Industrial Trucks - Mobile Cranes - Tower crane -Checklist - Competent persons. **(9)**

**TOTAL : 45**

**TEXT BOOKS :**

1. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay, 1997
2. Accident Prevention Manual for Industrial Operations", N.S.C.Chicago, 1982

**REFERENCES BOOKS:**

1. Handbook of Occupational Health and Safety, NSC Chicago, 1982
2. James, D., Fire Prevention Handbook, Butterworths, London, 1986.
3. Gupta R.S., Handbook of Fire Technology, Orient Longman, Bombay, 1997.
4. Fulman, J.B., Construction Safety, Security, and Loss Prevention, John Wiley and Sons, 1979.
5. Alexandrov, M.P., Material Handling Equipment, Mir Publishers, Moscow, 1981.
6. Rudenko N., Material Handling Equipments, Mir Publishers, Moscow, 1981.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x				x	x		x			x				
2	x				x	x		x			x				
3	x				x	x		x			x				

## 13CEE28 - PRINCIPLES OF ECONOMICS

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The objective of this course is to familiarize the prospective engineers with elementary principles of economics. It also deals with acquainting the students with standard concepts and tools that they are likely to find useful in their profession when employed in the firm/industry/corporation in public or private sector. It also seeks to create and awareness about the status of the current economic parameters / indicators/ policy debates. All of this is a part of the quest to help the students imbibe soft skills that will enhance their employability.

#### COURSE OUTCOMES :

- CO1** : The students will be able to demonstrate basic concepts of economics
- CO2** : The students will be able to improve project planning, construction and management skills.
- CO3** : The students will be able to understand the knowledge of Cause and effect of Economic factors which reflect in the society.
- CO4** : The students will be able to use technical, financial and managerial skills in industry, management and business.

### BASICS OF ECONOMICS

Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. (9)

### PRINCIPLES AND METHODOLOGY

Demand/Supply - elasticity -Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes - Cost & Cost Control -Techniques, Types of Costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. (9)

### PUBLIC SECTOR ECONOMICS

Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank - Monetary Aggregates; Commercial Banks & their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy.- Inflation and Phillips Curve. (9)

### BUSINESS/MANAGERIAL ECONOMICS

Elements of Business/Managerial Economics and forms of organizations. Investment Analysis - NPV, ROI, IRR, Payback Period, Depreciation, Time value of money. Business Forecasting - Elementary techniques. Statements - Cash flow, Financial. Case Study Method. (9)

### INDIAN ECONOMY

Brief overview of post independence period - plans. Post reform Growth, Structure of productive activity. Issues of Inclusion - Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment- Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors. (9)

**Total : 45**

**TEXT / REFERENCE BOOKS :**

1. *Mankiw Gregory N., Principles of Economics, Thompson Asia, 2002.*
2. *V. Mote, S. Paul, G. Gupta, Managerial Economics, Tata McGraw Hill, 2004.*
3. *Misra, S.K. and Puri, Indian Economy, Himalaya, 2009.*
4. *Pareek Saroj, Textbook of Business Economics, Sunrise Publishers, 2003.*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1				x	x							x	x		x
2				x	x										
3				x					x				x		x
4					x							x	x		

## 13CEE29 - PUBLIC ADMINISTRATION

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*The objective of the course is to expose the students to administration in India.*

#### COURSE OUTCOMES :

**CO1** : *The students will be able to explain impact of liberalization and privatization in India.*

**CO2** : *The students will be able to understand the union government and administration policies.*

**CO3** : *The students will be able to understand district administration and rural development.*

### PUBLIC SECTOR UNDERTAKINGS

Public sector in modern India; Forms of Public Sector Undertakings; Problems of autonomy, accountability and control; Impact of liberalization and privatization. **(9)**

### UNION GOVERNMENT AND ADMINISTRATION

Executive, Parliament, Judiciary - structure, functions, work processes; Recent trends; Intragovernmental relations; Cabinet Secretariat; Prime Minister's Office; Central Secretariat; Ministries and Departments; Boards; Commissions; Attached offices; Field organizations. **(9)**

### STATE GOVERNMENT AND ADMINISTRATION

Union-State administrative, legislative and financial relations; Role of the Finance Commission; Governor; Chief Minister; Council of Ministers; Chief Secretary; State Secretariat; Directorates. **(8)**

### DISTRICT ADMINISTRATION SINCE INDEPENDENCE

Changing role of the Collector; Union state- local relations; Imperatives of development management and law and order administration; District administration and democratic decentralization. **(9)**

### LAW AND ORDER ADMINISTRATION

British legacy; National Police Commission; Investigative agencies; Role of central and state agencies including paramilitary forces in maintenance of law and order and countering insurgency and terrorism; Criminalisation of politics and administration; Police- public relations; Reforms in Police

### RURAL DEVELOPMENT

Institutions and agencies since independence; Rural development programmes: foci and strategies; Decentralization and Panchayati Raj; 73rd Constitutional amendment. **(10)**

**Total : 45**

### TEXT BOOKS :

- 1) *Sharma, M.P.: Public Administration-Theory and Practice*
- 2) *White: Introduction to Public Administration*

- 3) *Bhambari, C.P.: Public Administration*
- 4) *Awasthi & Mahaeshwari: Public Administration (Hindi& English)*
- 5) *Prasad, D.R. & Others: Administrative Thinkers*

**REFERENCE BOOKS :**

- 1) *Frank Marini (en.): Towards New Public Administration*
- 2) *Sharma, R.D.: Advanced Public Administration*
- 3) *RumkiBasu: Public Administration-Concept and Theories*
- 4) *Albert Lepawski: Administration*
- 5) *Mohit Bhattacharya: Public Administration : Structure, Process and Behaviour*

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1				x	x	x		x					x		
2				x	x	x		x					x		
3				x	x	x		x					x		

## 13CEE30 - INDIAN ECONOMY

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

The objective of the course is to expose the students to Indian economic scenario, to understand the basics of Indian economy.

#### COURSE OUTCOMES :

**CO1** : The students will be able to explain the structure of Indian economy.

**CO2** : The students will be able to understand about socio-economic developments.

**CO3** : The students will be able to understand the economic conditions in agriculture, industries and tertiary sectors.

### STRUCTURE OF THE INDIAN ECONOMY

Features of Indian Economy - factors responsible for development - a comparison between Indian and other developed economies - India's Share in World GDP - Demographic dynamics and sustainability - Changes in the demographic features. **(9)**

### PLANNING AND ECONOMIC DEVELOPMENT

Planning in India - A brief review of the achievements of various Five Year Plans - Meaning of development and growth - Determinants of socio-economic development - India as a developing economy - Causes of inflation. **(9)**

### AGRICULTURE IN THE NATIONAL ECONOMY

The place of agriculture in Indian economy - Causes and effects of low Agricultural productivity - Measures to increase productivity - Causes and consequences of small Agricultural holdings - Land Reforms - Estimates of irrigated area - Green revolution - Agricultural Marketing, Defects in Agricultural Marketing in India - Remedial Measures - Role of NABARD. **(9)**

### INDIAN INDUSTRIES

The role of industrialisation - Small Scale Industry - Large Scale Industries - Trends in industrial production and productivity - Industrial Sickness - causes and measures; Industrial Policy Resolutions (of 1956, 1985 & 1991) - WTO and Industry. **(9)**

### THE TERTIARY SECTOR IN THE INDIAN ECONOMY

Importance of Tertiary sector in economic development - Increasing role of transport, banking and insurance - Role of infrastructure in economic development - Special Economic Zones. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. RudarDutt& K.P.M Sundaram, *Indian Economy*, S. Chand & Co.,

**REFERENCE BOOKS :**

1. M.L. Jhigan, *Economics of Development & Planning*, Konark Publishers, New Delhi.
2. Dr. S. Sankaran, *Indian Economy*, Margham Publications, Chennai.
3. Velayutham, *Foreign Trade, Theory & Practice*, S. Chand & Co.,

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1					x	x		x				x			x
2					x	x		x				x			x
3					x	x		x				x			x



## 13CEE31 - PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### **COURSE OBJECTIVE :**

*Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.*

#### **COURSE OUTCOMES :**

- CO1** : *The students will be able to demonstrate the Fundamental management concepts.*
- CO2** : *The students will be competent in planning, controlling and executing different types of Engineering projects.*
- CO3** : *The students will be able to demonstrate Organisation culture and their functional aspects.*
- CO4** : *The students will be able to understand the leadership qualities, attitudes and acquire skills to be an effective leader in their chosen field.*

### **HISTORICAL DEVELOPMENT**

Definition of Management - Science or Art - Management and Administration - Development of Management Thought - Contribution of Taylor and Fayol - Functions of Management - Types of Business Organisation. **(9)**

### **PLANNING**

Nature & Purpose - Steps involved in Planning - Objectives - Setting Objectives - Process of Managing by Objectives - Strategies, Policies & Planning Premises- Forecasting - Decision-making. **(9)**

### **ORGANISING**

Nature and Purpose - Formal and informal organization - Organization Chart - Structure and Process - Departmentation by difference strategies - Line and Staff authority - Benefits and Limitations - De-Centralization and Delegation of Authority - Staffing - Selection Process - Techniques - HRD - Managerial Effectiveness. **(9)**

### **DIRECTING**

Scope - Human Factors - Creativity and Innovation - Harmonizing Objectives - Leadership - Types of Leadership Motivation - Hierarchy of needs - Motivation theories - Motivational Techniques - Job Enrichment - Communication - Process of Communication - Barriers and Breakdown - Effective Communication - Electronic media in Communication. **(9)**

### **CONTROLLING**

System and process of Controlling - Requirements for effective control - The Budget as Control Technique - Information Technology in Controlling - Use of computers in handling the information - Productivity -

Problems and Management - Control of Overall Performance - Direct and Preventive Control - Reporting  
 - The Global Environment - Globalization and Liberalization - International Management and Global theory  
 of Management. **(9)**

**Total : 45**

**TEXT BOOKS :**

1. Harold Kooritz & Heinz Wehrich "Essentials of Management", Tata McGraw-Hill, 1998
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

**REFERENCE BOOKS :**

1. Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Resources Management", Prentice Hall of India, 1996
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1			x	x	x			x	x			x		x	
2				x	x			x							
3			x	x					x			x			
4			x	x				x						x	

# 13CEE32 - ENGINEERING RISK AND BENEFIT ANALYSIS

L	T	P	C
3	0	0	3

## ASSESSMENT : THEORY

### COURSE OBJECTIVE :

*The objective of the course is to impart skills in risk and benefit analysis.*

### COURSE OUTCOMES :

- CO1** : *The students will be better prepared to analyse projects in terms of risk and management due to uncertainty.*
- CO2** : *The students will be able to identify, formulate and solve engineering problems.*
- CO3** : *The students will be able to use decision analysis to solve complex problems and to improve the quality of the resulting decision.*
- CO4** : *The students will be able to understand the relationship between benefit and risk analysis.*

## INTRODUCTION

Knowledge and Ignorance, Information Uncertainty in Engineering Systems, Introduction and overview of class; definition of Engineering risk; overview of Engineering risk analysis. Risk Methods: Risk Terminology, Risk Assessment, Risk Management and Control, Risk Acceptance, Risk Communication, Identifying and structuring the Engineering risk problem; developing a deterministic or parametric model. (9)

## SYSTEM DEFINITION AND STRUCTURE

System Definition Models, Hierarchical Definitions of Systems, System Complexity. Reliability Assessment: Analytical Reliability Assessment, Empirical Reliability Analysis Using Life Data, Reliability Analysis of Systems. (9)

## CONSEQUENCE ASSESSMENT

Types, Cause-Consequence Diagrams, Microeconomic Modelling, Value of Human Life, Flood Damages, Consequence Propagation. Engineering Economics: Time Value of Money, Interest Models, Equivalence. (9)

## DECISION ANALYSIS

Risk Aversion, Risk Homeostasis, Influence Diagrams and Decision Trees, Discounting Procedures, Decision Criteria, Tradeoff Analysis, Repair and Maintenance Issues, Maintainability Analysis, Repair Analysis, Warranty Analysis, Insurance Models. (9)

## FORENSIC ENGINEERING

Forensic - linguistics, materials engineering, polymer engineering and vehicular accident reconstruction. (9)

**Total : 45**

**TEXT BOOK :**

1. *Risk Analysis in Engineering and Economics*, B. M. Ayyub, Chapman-Hall/CRC Press, 2003.

**REFERENCE BOOKS:**

1. *Probability, Statistics, and Reliability for Engineers and Scientists*, Ayyub & McCuen, 2003.
2. *Probabilistic Risk Assessment and Management for Engineers and Scientists*, by H. Kumamoto and E. J. Henley, Second Edition, IEEE Press, NY, 1996.
3. *Bedford, T. and Cooke, R. Probabilistic Risk Analysis: Foundations and Methods*. New York: Cambridge University Press, 2001.
4. *Normal Accidents, Living with High-Risk Technologies*, C. Perrow, Princeton University Press, 1999.
5. *Accident Precursor Analysis and Management - Reducing Technological Risk Through Diligence*, National Academy of Engineering, the National Academies Press, Washington, DC, 2004.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1					x	x		x		x					
2	x			x	x										
3					x	x	x								
4				x	x										

## 13CEE33 - ACCOUNTING FOR ENGINEERS

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*The objective of the course is to expose the students to basic concepts in accounting.*

#### COURSE OUTCOMES :

**CO1** : *The students will be able to understand financial management, fund and cash flow statements, sources of finances and investment decisions.*

**CO2** : *The students will be able to explain about cash flow and sources of finance.*

**CO3** : *The students will be able to explain basic concepts in managing current assets.*

### MANAGEMENT ACCOUNTING

Meaning - Nature and Scope - Functions - Limitations - Need - Financial Accounting vs. Management Accounting.

### FINANCIAL STATEMENTS

Characteristics - Limitations - Financial Statement Analysis - Ratio Analysis.

### FUND FLOW STATEMENT

Meaning and Concept of Flow of Funds - Meaning of a Fund Flow Statement - Differences between Fund Flow Statement and Income Statement - Preparation and Interpretation of Fund Flow Statement. **(9)**

### CASH FLOW STATEMENT

Meaning of a Cash Flow Statement - Classification of Cash Flows - Preparation and Interpretation of Cash Flow Statement.

### FINANCIAL MANAGEMENT

An Overview - Nature and Scope - Finance Functions - Goals of Financial Management - Financial Manager's Role - Agency Problems, Agency Cost - Economic Value Added. **(10)**

### SOURCES OF FINANCE

Long Term Finance - Ordinary Shares - Right Issue of Equity Shares - Preference Shares - Debentures - Term Loan - Asset Based Financing - Hire Purchase - Leasing - Venture Capital Financing - Short Term Finance - Trade Credit - Bank Credit - Bill Discounting - Commercial Paper.

### TIME VALUE OF MONEY

Concept - Future Value - Present Value - Single Cash Flows - Annuity - Uneven Cash Flows - Multi Period and Continuous - Yield Calculation. **(9)**

### INVESTMENT DECISION

Capital Budgeting Decisions - Evaluation of Capital Budgeting - Discounted and Non Discounted - Cash Flows Methods - Simple Problems. **(8)**

## FINANCING AND DIVIDEND DECISION

Capital Structure - Financial Leverage - Operating Leverage - Only Concepts - Capital Structure Theories - Dividend Theories.

## WORKING CAPITAL

Policies for Financing Current Assets.

## RECEIVABLES MANAGEMENT, INVENTORY MANAGEMENT AND CASH MANAGEMENT

Basic Concepts Only.

(9)

**Total : 45**

## TEXT BOOK :

1. Damodaran Aswath, "Corporate Finance-theory and Practice", Tata McGraw-Hill, New Delhi, 2005.

## REFERENCE BOOKS :

1. Ross S A, Westerfield R W and Jordan B D, "Fundamentals of Corporate Finance", Tata McGraw-Hill, New Delhi, 2006.
2. Myers Brealey, "Principles of Corporate Finance", Vikas Publishing House P Ltd, 2005.
3. Pandey IM, "Financial Management", Ninth Edition, Vikas Publishing House P Ltd, 2005.
4. Prasanna Chandra, "Financial Management", Tata McGraw-Hill, New Delhi, 2004.

## Mapping of Course Outcomes with Programme Outcomes

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	x			x	x			x				x			
2	x	x	x	x	x									x	
3	x	x	x	x	x									x	

## 13CEE34 - INFRASTRUCTURE PLANNING AND MANAGEMENT

L	T	P	C
3	0	0	3

### ASSESSMENT : THEORY

#### COURSE OBJECTIVE :

*The objective of the course is to expose the students to various strategies of infrastructure planning and management.*

#### COURSE OUTCOMES :

- CO1** : *The students will be able to demonstrate basic concepts related to infrastructure*
- CO2** : *The students will be able to understand the benefits of infrastructure privatization*
- CO3** : *The students will be able to understand the challenges involved in successful infrastructure planning and management.*
- CO4** : *The students will be able to demonstrate the strategies for successful infrastructure planning and implementation.*

### AN OVERVIEW OF BASIC CONCEPTS RELATED TO INFRASTRUCTURE

Introduction to Infrastructure - An Overview of the Power Sector in India - An Overview of the Water Supply and Sanitation Sector in India - An overview of the Road, Rail, Air and Port Transportation Sectors in India - An overview of the Telecommunications Sector in India - An overview of the Urban Infrastructure in India - An overview of the Rural Infrastructure in India - An Introduction to Special Economic Zones - Organizations and Players in the field of Infrastructure - The Stages of an Infrastructure Project Lifecycle - An Overview of Infrastructure Project Finance. **(9)**

### PRIVATE INVOLVEMENT IN INFRASTRUCTURE

A Historical Overview of Infrastructure Privatization - The Benefits of Infrastructure Privatization - Problems with Infrastructure Privatization - Challenges in Privatization of Water Supply (with a case study) - Privatization of Infrastructure in India - Privatization of Road Transportation Infrastructure in India. **(9)**

### CHALLENGES TO SUCCESSFUL INFRASTRUCTURE PLANNING AND IMPLEMENTATION

Mapping and Facing the Landscape of Risks in Infrastructure Projects - Economic and Demand Risks - Political Risks - Socio-Environmental Risks - Cultural Risks in International Infrastructure Projects - Legal and Contractual Issues in Infrastructure - Challenges in Construction and Maintenance of Infrastructure. **(9)**

### STRATEGIES FOR SUCCESSFUL INFRASTRUCTURE PROJECT IMPLEMENTATION

Risk Management Framework for Infrastructure Projects - Shaping the Planning Phase of Infrastructure Projects to mitigate risks - Designing Sustainable Contracts - Introduction to Fair Process and Negotiation - Negotiating with multiple Stakeholders on Infrastructure Projects - Sustainable Development of Infrastructure - Information Technology and Systems for Successful Infrastructure Management. **(9)**

### INFRASTRUCTURE MANAGEMENT

Innovative Design and Maintenance of Infrastructure Facilities - Infrastructure Modelling and Life Cycle Analysis Techniques - Capacity Building and Improving the Governments Role in Infrastructure

Implementation - An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions. **(9)**

**Total : 45**

**TEXT BOOKS:**

1. Joshi P, "Law Relating to Infrastructure Projects", Taxmann Publishers, 2001.
2. Murty G R K, "Infrastructure Projects : Current Financing Trends", Icfai University Press, 2006.
3. Alagiri D, "Infrastructure Growth In India and China : A Comparative Study", Icfai University Press, 2006.
4. 3i Network, "India Infrastructure Report 2007 : Rural Infrastructure", Oxford University Press, 2007.

**REFERENCE BOOKS :**

1. 3i Network, "India Infrastructure Report 2006 : Urban Infrastructure", Oxford University Press, 2006.
2. Raghuram G, "Infrastructure Development and Financing : Towards a Public Private Partnership", Macmillan, 2001.
3. NarindarJethi K, "Infrastructure Development In India", New Century Publications, 2007.
4. AlagiriD, "Infrastructure Development", ICFAI University Press, 2007.
5. Krishnamurthy G G, "Infrastructure Financing", ICFAI University Press, 2007.

**Mapping of Course Outcomes with Programme Outcomes**

Mapping of CO's and PO's															
COs	POs														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1			X				X	X							X
2			X				X	X							X
3			X				X	X							X
4			X				X	X							X



# **COIMBATORE INSTITUTE OF TECHNOLOGY**

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

**COIMBATORE - 641 014, TAMILNADU, INDIA**

**GOLDEN JUBILEE**

(1956 - 2006)



**Department of Civil Engineering**

**B.E. Civil Engineering - Part Time**

**Curriculum and Syllabi**

**FIRST TO SEVENTH SEMESTER SYLLABUS**

(For the students admitted during 2013-2014 onwards)

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