KUMARAGURU COLLEGE OF TECHNOLOGY, COIMBATORE – 641 049

(An Autonomous Institution Affiliated to Anna University, Chennai)

REGULATIONS – 2015

(CBCS)

SYLLABUS FOR III to VIII SEMESTERS

For Academic year 2015-2016

B.E - CIVIL ENGINEERING

SEMESTER III

U15MAT304 PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER ANALYSIS

L	T	P	C
3	2	0	4

Course Outcomes

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

CO1: form partial differential equations and solve certain types of partial differential equations.
CO2: know how to find the Fourier Series and half range Fourier Series of a function
CO3: know how to solve one dimensional wave equation, one dimensional heat equation in steady state using Fourier series.
CO4: apply Fourier Series to solve the steady state equation of two dimensional heat equation in Cartesian coordinates.
CO5: use Fourier series to solve the steady state equation of Circular and Semi-circular disks.
CO6: find the Fourier transform, sine and cosine transform of certain functions and use Parseval's identity to evaluate integrals.

Pre-requisites: Basic concept of Ordinary differentiation, Partial differentiation and Integration.

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M			M				M	M		
CO2	S	M		M								
CO3	S	S	S		S				M	M		
CO4	S	M	M									
CO5	S	M	M		S							
CO6	S	S			S				M	M		

PARTIAL DIFFERENTIAL EQUATION 9+6Hours

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solution of PDE by variable separable method – Solution of standard types of first order partial differential equations (excluding reducible to standard types) – Lagrange's linear equation – Linear Homogeneous partial differential equations of second and higher order with constant coefficients.

FOURIER SERIES 9+6Hours

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine

series – Half range cosine series – Parseval's identity – Harmonic Analysis.

BOUNDARY VALUE PROBLEMS – ONE DIMENSIONAL EQUATIONS 9+6Hours

Classification of second order quasi linear partial differential equations – Fourier series solutions of one dimensional wave equation – One dimensional heat equation: Problems with temperature and temperature gradients.

BOUNDARY VALUE PROBLEMS – TWO DIMENSIONAL EQUATIONS 9+6Hours

Steady state solution of two-dimensional heat equation in Cartesian coordinates: Infinite and finite plates – Steady state solution of two-dimensional heat equation in Polar coordinates: Circular and Semicircular disks – Fourier series solutions.

FOURIER TRANSFORM 9+6Hours

Infinite Fourier transform pair – Infinite Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

Theory:45Hrs **Tutorial: 30Hrs** **Total: 75Hrs**

REFERENCES

1. Grewal B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Veerarajan T., "Engineering Mathematics", Tata McGraw Hill, New Delhi (2001)
3. Kandasamy P., Thilagavathy K. and Gunavathy K., "Engineering Mathematics Volume III", S.Chand & Company ltd., New Delhi, 1996.
4. Ian Sneddon., "Elements of partial differential equations" , McGraw – Hill, New Delhi, 2003.
5. Arunachalam T., "Engineering Mathematics III", Sri Vignesh Publications, Coimbatore 2009.

U15CET301 **FLUID MECHANICS**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: measure the pressure of a fluid and fluid pressure on a plane and curved surface.
CO2: analyze the stability of floating and submerged bodies.
CO3: formulate the functional relationships that exist between dependent and independent variables of fluid flow.
CO4: apply inter-relationship of various properties of fluid in practical problems.
CO5: understand the kinematics that exists in the fluid flow.
CO6: apply the working concepts of various devices used to measure the velocity and discharge of fluid.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		M										
CO3			M									
CO4		M										
CO5	W											
CO6	M											

PROPERTIES OF FLUID & FLUID STATICS **6+6 Hours**

Units of measurement, Newtonian and Non Newtonian fluids; Vapour pressure, compressibility and Elasticity; Surface Tension and Capillarity.Variation of static pressure; Pascal's law; Atmospheric, Absolute and gauge pressure; Pressure measurement by mechanical gauges and manometers; pressure on plane surfaces and curved surfaces.

BUOYANCY AND FLOATATION **4+4Hours**

Buoyancy; Buoyant and Centre of Buoyancy; Stability of submerged bodies and floating

bodies; Metacentre; Determination of Metacentric height- Experimental and Theoretical methods.

DIMENSIONAL ANALYSIS AND FLUID FLOW **6+6Hours**

Rayleigh's method – Buckingham's π theorem – Geometric, Kinematic, and Dynamic similitudes – Scale effect – Distorted models Discharge and velocity measurements – Laminar and turbulent flows through pipe – Hagen-Poiseuille equation – Darcy-Weishbach equation – Major and Minor losses – Pipes in series and in parallel

DYNAMICS OF FLUID **6 +6Hours**

Euler's equation of motion; Bernoulli's equation – Application of Bernoulli's equation - Discharge through Venturimeter; Discharge through orifice meter; Discharge through flow nozzle: Measurement of velocity by Pitot tube; Energy correction factor; momentum principle; Applications of momentum equation.

KINEMATICS OF FLUID **4+4Hours**

Methods of describing fluid motion; Classification of flow; Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Three, two and one dimensional flows; irrotational and rotational flows; Streamline; path line; Streak line; Equation for acceleration; Continuity equation; Velocity potential and stream function; flow net; Vortex flow-Free vortex and forced vertex flow.

FLOW OVER NOTCHES AND WEIRS **4+4Hours**

Flow through rectangular, triangular and trapezoidal notches and weirs; End contractions; Velocity of approach; Broad crested weir.

Theory:30Hrs **Tutorial: 30Hrs** **Total : 60 Hrs**

REFERENCES

1. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Twentieth Edition 2015, Standard Book House, New Delhi.
2. R.K. Bansal, "Fluid mechanics and hydraulic machines," Laxmi Publications (P) Ltd, 2015
3. K.L. Kumar, "Engineering fluid mechanics," Eurasia publishing house, 1997, Fox and McDonalds.
4. Richardson, Fluid Mechanics, First Edition, 2004, Taylor and Francis Publications
5. Fluid Mechanics and Fluid Power Engineering : Dr R.S.Kumar , S. Chand Publications
6. C.M. White, Fluid Mechanics, Mc Graw Hills Publications.

U15CET302 **SURVEYING**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: carry out area and volume measurements for the given land.
CO2: perform angular measurement and elevation of an object.
CO3: set out the curves of given size on the field.
CO4: conduct hydrographic survey.
CO5: carry out adjustments of survey errors using various methods.
CO6: conduct survey works using total station and GPS.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	M	S										
CO3	M	S										
CO4	M	S										
CO5	M	S										
CO6	M	S			S							M

CONVENTIONAL SURVEYING

6+10 Hours

Definition - Principles - Classification of survey - Survey instruments- Chain – Area & volume , Compass – Local Attraction, Dumpy Level – Level Reduction, Theodolite – Heights and Distance, Tacheometer– Applications

CURVES & HYDROGRAPHIC SURVEY

6+10Hours

Types of curves -Application of Curves - Lay out - Curve ranging - Setting out works - Introduction to hydrographic surveying- Tides-MSL- Sounding methods- Three-point problem

SURVEY ADJUSTMENTS **6+10Hours**

Errors - Sources, precautions and corrections - Classification of errors - True and most probable values - weighted observations - Method of equal shifts - Principle of least squares - Normal equation – Method of Correlates - Adjustment of simple triangulation networks.

TOTAL STATION SURVEYING **6Hours**

Basic Principle-classifications- Infrared and Laser total station instruments. Microwave system, measuring principle, working principle, sources of Error, Microwave Total station instruments,. Care and maintenance of Total Station instruments. Modern positioning systems-Traversing and Trilateration.

GPS SURVEYING **6Hours**

Basic concepts – Different segments- space, control and user segments-satellite configuration-signal structure- orbit determination and representation- anti spoofing and selective availability-Task of control segment- Hand held and Geodetic receivers-data processing-Traversing and triangulation. Fundamentals of Photogrammetry and Remote sensing.

Theory:30Hrs **Tutorial:30Hrs** **Total:60Hrs**

REFERENCES

1. Dr. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain "Surveying (Volume – I)", Lakshmi Publications,17th edition, 2016.
2. Dr. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain "Surveying (Volume – II)", Lakshmi Publications,16th edition, 2016.
3. S.K.Duggal, "Surveying (Volume-I,II) "Tata Mcgraw-Hill Publishing company Ltd. Newdelhi,2007.
4. Surveying and Leveling- 38 th edition.2014, N.N. Basak Tata McGraw Hill
5. AlakDe , "Plane surveying", S.Chand& Company, New Delhi,2002.
6. SatheeshGopi, R.Sathikumar, N.Madhu, " Advanced Surveying - Total station, GIS and Remote sensing", Pearson Education India(2012).
7. Alfred Leick, "GPS satellite surveying", John Wiley & Sons Inc.,4th Edition 2015.

U15CET303 **SOLID MECHANICS**

L	T	P	C
3	2	0	4

Course Outcomes

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

CO1: apply the fundamental concepts of stress and strain in the analysis of various structural components and machines.
CO2: analyze determinate beams to determine shear forces, bending moments.
CO3: find out the design forces in truss members.
CO4: determine the bending, shear stresses and deflection produced in a beam subjected to system of loads.
CO5: analyze and design springs used in vehicles and structures.
CO6: analyze and design shafts to transmit required power.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M									
CO2	M	S	M									
CO3	M	S	M									
CO4	M	S	M									
CO5	M	S	M									
CO6	M	S	M									

STRESS AND STRAIN **8+4Hours**

Stress and strain at a point-Tension, Compression, Shear stress- Hooke's law-Relationship among elastic constants- Stress, strain diagram for Mild steel, TOR steel, Concrete- Ultimate stress-Yield Stress-Factor of safety-Thermal stresses-Strain energy due to axial force-Resilience –stresses due to impact and suddenly applied load- Compound bars- 2 D State of stress -Principal stresses and principal planes Mohr's circle.

CYLINDER AND SHELLS **3+2Hours**

Thin cylinders - shells – Thick cylinders – compound cylinders.

SHEAR AND BENDING IN BEAMS **7+6Hours**

Beams and bending- Types of loads, supports- Shear force and bending moment diagrams for statically determinate beams with concentrated load, UDL, uniformly varying load.

THEORY OF SIMPLE BENDING **6+4Hours**

Theory of simple bending- Analysis of beams for stresses- Stress distribution at a cross section due to bending moment and shear force for cantilever, simply supported and overhanging beams with different loading conditions.

DEFLECTION **7+4Hours**

Double integration method-Macaulay's methods- Area moment method- Conjugate beam method for the computations of slopes and deflections of determinate beams.

TORSION **6+4Hours**

Elastic theory of Torsion –Solid and hollow circular shafts - Combined bending moment and torsion of shafts- strain energy due to torsion- Modulus of rupture- Power transmitted to shaft- Shaft in series and parallel.

SPRINGS **3+2Hours**

Closed and open coiled helical springs- Leaf springs- Springs in series and parallel- Design of buffer springs.

PLANE TRUSSES **5+4Hours**

Plane trusses- Truss analysis - method of joints – method of sections

Theory:45Hrs **Tutorial: 30Hrs** **Total : 75Hrs**

REFERENCES

1. Rajput R.K, "Strength of materials" (Mechanics of Solids), S. Chand (2015).
2. BansalR.K, "Strength of materials", Lakshmi publication (2015).
3. Subramanian R.,"Strength of Materials", Oxford University Press, New Delhi (2013).
4. Premalatha J. Mechanics of solids, Vignesh Publications, Coimbatore (2008).
5. William A.Nash, Theory and Problems of Strength of materials, Schaum's Outline series, Tata McGraw-Hill publishing co., New Delhi, (2011).
6. Popov, E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi,(1999).

U15CET304 **BUILDING CONSTRUCTION**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: suggest a suitable type of foundation for a given building and soil condition.
CO2: supervise for the quality construction of brick and stone masonry works.
CO3: select suitable type of floors and roof as per the field condition.
CO4: select suitable scaffolding and formworks for the construction activity.
CO5: apply the various construction practices in the field.
CO6: select construction equipment for various construction activities.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M									
CO3		S	M									
CO4		S	M									
CO5		S	M									
CO6		S	M		M							

FOUNDATIONS **4 Hours**

Concept of foundations; Factors affecting selection of foundations; Types of foundations – Shallow & Deep foundations; Piles and their classification; Foundation on black cotton soils.

MASONRY **6 Hours**

Brick Masonry - Terminologies; Types of bonds in brick work and their suitability.
Stone Masonry - Terminologies; Types of bonds in Stone masonry and their suitability.

WALLS **4 Hours**

Classification of walls – Load bearing & Non-Load bearing – Hollow – Reinforced Brick Walls

– Construction with fly ash bricks & Light weight bricks – Lintels and sunshade – Types & Construction

FLOORS& ROOFS **6 Hours**

Floors - Types of flooring; Repair of floors.

Roofs - Classification of roofs- Types of Pitched & Flat roofs; Roof covering materials; Drainage on pitched&flat roofs.

SCAFFOLDING, SHORING, UNDERPINNING AND FORM WORK **7 Hours**

Types of scaffolding; types of shoring; Methods of underpinning; Types of formwork; centering.

CONSTRUCTION PRACTICES **9 Hours**

Specifications, details and sequence of activities and construction co-ordination-site clearance-marking-earthwork-construction joints-movement and expansion joints-pre cast pavements-Causes of dampness; Methods of preventing dampness; Damp proofing materials and their classification- weather and water proof courses-roof finishes-acoustic and fire protection.

CONSTRUCTION EQUIPMENT **9Hours**

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

Theory:45Hrs **Total: 45Hrs**

REFERENCES

1. B.C.Punmia, “Building Construction”, Laxmi Publications, New Delhi. 2016.
2. Varghese. P.C. “Building Construction”, Prentice hall of India Pvt.Ltd. New Delhi, 2015.
3. Sharma S.C. “Construction equipment and Management” Khanna Publishers, New Delhi. 2011
4. G.S.Birdie, T.D.Ahuja, “Building Construction and construction materials”, Dhanpatrai publishing company, New Delhi,2012
5. SK Duggal, “Building Materials,” New Age Publications 4th Edition, April, 2014
6. Peurifoy, R.L., Ledbetter, W.B.and Schexnayder, C, “Construction Planning Equipment and Methods ", 5th Edition, McGraw Hill, Singapore, 1995.

U15EET311 ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: acquire basic knowledge on DC and AC circuits.
CO2: identify electronics components and use them to design circuits.
CO3: understand the operation of DC machines, characteristics and their applications.
CO4: understand the operation of AC machines, characteristics and their applications.
CO5: acquire basic knowledge on semiconductor devices and their applications.
CO6: gain basic of knowledge logic gates.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

\CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

Cos	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2	S	S										
CO3	S	M										
CO4	S	M										
CO5	S		W									
CO6	S		M									

ELECTRICAL CIRCUITS **9 Hours**

Ohm's Law – Kirchhoff's Laws – series, parallel DC circuits – Introduction to AC Circuits – Waveforms and RMS Value – Single Phase series RLC circuits- Power and Power factor- solving simple AC circuits.

DC MACHINES **9 Hours**

Construction, Principle of Operation-Types, characteristics - Applications of DC Generators, DC Motors - Principle of Operation- types – back emf – torque equation - speed torque characteristics – speed control of DC motor.

AC MACHINES **9 Hours**

Single Phase Transformer- Construction, Principle of Operation- Types, Emf equation-3 phase Induction Motor -construction– Principle of operation – types – torque equation - speed torque characteristics – 1 phase Induction Motor – Principle of operation- types-Applications.

SEMICONDUCTOR DEVICES AND APPLICATIONS **9 Hours**

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation, Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics.

DIGITAL ELECTRONICS **9 Hours**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion.

Theory:45Hrs **Total: 45Hrs**

TEXT BOOKS:

1. Mittle N., “Basic Electrical Engineering”, Tata McGraw Hill Edition, New Delhi, 1990.
2. Sedha R.S., “Applied Electronics”, S. Chand & Co., 2006.

REFERENCES

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”, Tata McGraw Hill, Second Edition, 2006.
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press 2005.
3. Mehta V K, “Principles of Electronics”, S.Chand& Company Ltd, 1994.
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, 2002.
5. Prem kumar N, “Basic Electrical Engineering”, Anuradha Publishers, 2003.

U15CEP301 **SURVEYING PRACTICAL I**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: conduct surveying using various survey instruments in the field.
CO2: set out curves and marking of buildings on the site
CO3: prepare LS , CS for the road works and contour map for the given area
CO4: measure horizontal and vertical angles and distances using tacheometer.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			M	M							
CO2	M			M	M							
CO3	M			M	M							
CO4	M			M	M							

1. Aligning, Ranging and Chaining
2. Chain and compass Traversing
3. Fly levelling
4. Check levelling
5. LS and CS
6. Contouring
7. Measurement of horizontal angles by reiteration and repetition and vertical angles
8. Heights and distances - Triangulation - Single plane method.
9. Setting out works - Foundation marking - Simple curve (right/left-handed) - Transition curve.

Practical: 45Hrs **Total:45Hrs**

U15CEP302 BUILDING PLANNING AND DRAWING

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: prepare the building plans satisfying the principles of planning and byelaws.
CO2: draw plan, section and elevation for various structures.
CO3: prepare detailed working drawings of doors, windows, roof trusses and staircases.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S						W
CO2					S							W
CO3					S							W

- Building bye laws formulated by local planning authority, Town and country planning authority and Municipal Corporation.
- Plan, section and elevation ofResidential buildings (Flat and sloping roof), Single-storey factory buildings with trusses.
- Detailed working drawings of the component parts- Doors and windows- Roof trusses- staircases.
- Drawing preparation for approval from nodal agencies.

Practical:45Hrs **Total : 45Hrs**

REFERENCES:

1. Shah M.G. Kalec M. &Palki SY Building Drawing ,TataMcgraw Hill, New delhi, 2000.
2. Civil Engg. Drawing & House Planning - B.P. Verma, Khanna publishers, Delhi,2008
3. Building drawing & detailing - Dr. Balagopal& T.S. Prabhu, Spades Publishers, Calicut,2006.
4. AutoCAD Manual – Autodesk Inc., California, USA 2010.
5. NBC, local town planning authority rules and regulations.

U15CEP303 **SOLID AND FLUID MECHANICS LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: find the young's modulus of steel and stiffness of steel and wooden beams.
CO2: determine the stiffness of the helical springs.
CO3: determine the hardness of metals.
CO4:find theoretical discharge in pipes, Venturimeter, orificemeter and notches
CO5: conduct experiment to find characteristic curves of various pumps
CO6: conduct experiment to find characteristic curves of various turbines

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	M											
CO4	M			S								
CO5	M			S								
CO6	M			S								

SOLID MECHANICS

1. Tension test on mild steel
2. Torsion test on mild steel
3. Verification of Maxwell Reciprocal Theorem
4. Tests on helical spring (close coiled and open coiled)
5. Hardness tests (Brinell hardness, Rockwell hardness and Vickers hardness)
6. Double shear test
7. Test for impact resistance (Izod and Charpy tests)

8. Compression test on wood (parallel to grain sand perpendicular to grain)
9. Flexure test on wooden beam

FLUID MECHANICS

Experiments beyond the syllabus will be conducted.

1. Verification Of Bernoulli's Theorem
2. Study Of Friction Losses In Pipes
3. Determination Of Co-Efficient Of Discharge Of Venturimeter
4. Determination Of Co-Efficient Of Discharge Of Orificemeter
5. Determination Of Co-Efficient Of Discharge Of Notches (Rectangular/ Triangular Notch)
6. Performance Characteristics Of Centrifugal Pump (Constant Speed/ Variable Speed)
7. Performance Characteristics Of Reciprocating Pump/ Gear-Oil Pump
8. Performance Characteristics Of Pelton Wheel Turbine
9. Performance Characteristics Of Francis Turbine/ Turgo Wheel Impulse Turbine

Practical: 45Hrs **Total:45Hrs**

U15GHP301 **FAMILY VALUES**

(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	0	1

Course outcomes:

After successful completion of the course, the student would be able to:

1. understand the importance of a family
2. acquire skills in simplified Kundalini yoga for sound health.
3. learn about greatness of womanhood
4. learn about the importance of Blessings and relationship
5. know about simplified Kundalini yoga, its methodology and its benefits

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M		M	S	W		M
CO2						S	M		W			S
CO3						W						M
CO4						M			M			S
CO5						M						M

Course Assessment methods:

Direct	Indirect
1. Individual Assignment 2. Group Assignment 3. Presentation 4. Surprise Test 5. Practical Assessment 6. End Semester Assessment	Attendance and Behavioural Assessment

Introduction to Family Life – An Overall Perspective 1 Period

Personal & Spiritual development through good Family life 1 Period

Importance of Relationships & Blessings	3 Periods
Food as Medicine – Quantum Healing	3 Periods
Greatness of womanhood	2 Periods
Simplified Physical Exercises (Kundalini Exercises)	5 Periods

Total Periods: 15

References Books:

1. Vethathiri's Maharishi's, ***"Yoga for Modern Age"***, The World Community Service Centre, Vedhathiri Publications,2009.
2. Swami Vivekananda, "***The Man Making Message"*** The Ramakrishna Tapovanam, Published 1972.
3. Vethathiri's Maharishi's, ***"Manavalakalai part 1,2&3"*** 1^{1th} edition, The World Community Service Centre, Vethathiri Publications,2005.
4. Brian L Weiss," ***Only Love is Real*****"** by Grand Central Publishing, Published 1997.

SEMESTER IV

U15MAT401 **NUMERICAL METHODS**

L	T	P	C
3	2	0	4

Course Outcomes

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

CO1: solve a set of algebraic equations representing steady state models formed in engineering problems

CO2: fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables

CO3: find the trend information from discrete data set through numerical differentiation and summary information through numerical integration

CO4: predict the system dynamic behaviour through solution of ODEs modeling the system

CO5: solve PDE models representing spatial and temporal variations in physical systems through numerical methods.

CO6: have the necessary proficiency of using MATLAB for obtaining the above solutions.

Pre-requisite: Basic knowledge in differentiation, integration and numerical operations.

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S			M				M	M		
CO2	S		S	S								
CO3	S	S	M		M				M	M		
CO4	S	S		S	M							
CO5	S	S	M	M					M	M		
CO6	S											

INTRODUCTION **3Hours**

Simple mathematical modeling and engineering problem solving – Algorithm Design – Flow charting and pseudocode - Accuracy and precision – round off errors

NUMERICAL SOLUTION OF ALGEBRAIC EQUATIONS **7+6Hours**

Solution of nonlinear equations: False position method – Fixed point iteration – Newton Raphson method for a single equation and a set of non- linear equations Solution of linear system of equations by Gaussian elimination method - Gauss Jordan method - Gauss Seidel method.

CURVE FITTING AND INTERPOLATION **7+6Hours**

Curve fitting – Method of least squares – Regression – Interpolation: Newton's forward and backward difference formulae – Divided differences – Newton's divided difference formula - Lagrange's interpolation – Inverse interpolation.

NUMERICAL DIFFERENTIATION AND INTEGRATION 7+6Hours

Numerical differentiation by using Newton's forward, backward and divided differences – Numerical integration by Trapezoidal and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules – Numerical double integration.

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 10+6Hours

Initial value problems -- Single step methods: Taylor's series method – Truncation error – Euler and Improved Euler methods – Fourth order Runge - Kutta method – Multistep method: Milne's predictor -- corrector method.

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS 11+6Hours

PDEs and Engineering Practice – Laplace Equation derivation for steady heat conduction – Numerical solution of the above problem by finite difference schemes – Parabolic Equations from Fourier`s Law of Transient Heat Conduction and their solution through implicit schemes – Method of Lines – Wave propagation through hyperbolic equations and solution by explicit method.

Use of MATLAB Programs to workout solutions for all the problems of interest in the above topics.

Theory:45Hrs Tutorial: 30Hrs Total : 75Hrs

REFERENCES

1. Steven C.Chapra and Raymond P. Canale, " Numerical Methods for Engineers with Programming and Software Applications", Sixth Edition, WCB/McGraw-Hill, 1998.
2. John H. Mathews and Kurtis D. Fink, "Numerical Methods using Matlab", Fourth Edition, Prentice Hall of India, 2004.
3. Gerald C. F. and Wheatley P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
4. Sastry S.S, "Introductory Methods of Numerical Analysis", Third Edition, Prentice – Hall of India Pvt Ltd, New Delhi, 2003.
5. Kandasamy P., Thilagavathy K. and Gunavathy K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2007.

U15CET401 **BUILDING SERVICES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: plan for essential services for the building.
CO2: choose appropriate equipment for buildings.
CO3: implement wiring systems and prepare the plan for electrical wiring for buildings.
CO4: plan for lighting facilities in the building.
CO5: choose suitable air conditioning system for the building.
CO6: choose fire safety systems for various types of buildings.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S									
CO2		M	S									
CO3		M	S									
CO4		M	S									
CO5		M	S									
CO6		M	S									

MACHINERIES

9Hours

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

ELECTRICAL SYSTEMS IN BUILDINGS

9Hours

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

PRINCIPLES OF ILLUMINATION & DESIGN **9Hours**

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.

REFRIGERATION PRINCIPLES & APPLICATIONS **9Hours**

Refrigerants-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

FIRE SAFETY INSTALLATION **9Hours**

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.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. R.G.Hopkinson and J.D.Kay, “The Lighting of buildings”, Faber and Faber, London, 2000.
2. A.F.C. Sherratt, “Air-conditioning and Energy Conservation”,The Architectural Press, London, 1997.
3. Derek Phillips, “Lighting in Architectural Design”, McGraw-Hill, New York, 2000.
4. E.R.Ambrose, “Heat Pumps and Electric Heating”, John and Wiley and Sons, Inc., New York, 2000.
5. William H.Severns and Julian R.Fellows, “Air-conditioning and Refrigeration”, John Wiley and Sons, London, 1998.
6. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 2001.
7. National building code of India,BIS 2005
8. Arora and Bindra ,”Building construction”, Dhanpatrai &Sons,2012
9. Hand book of Housing Statistics, NBO 2003

U15CET402 **STRENGTH OF MATERIALS**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: find the deflection in beams and frames using Energy theorems.
CO2: analyze indeterminate beams.
CO3: analyze the long and short columns and determine the design loads.
CO4: assess the state of stress in three dimensions.
CO5: analyze the structural members using various theories of failures
CO6: solve problems involving unsymmetrical bending in structural members.

Pre-requisites:

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M									
CO2	M	S	M									
CO3	M	S	M									
CO4	M	S	M									
CO5	M	S	M									
CO6	M	S	M									

ENERGY PRINCIPLES **6+6Hours**

Strain energy and strain energy density-strain energy in traction, problems on suddenly applied loads and impact loads, strain energy in shear, flexure and torsion - Castigliano's theorems - principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorems.

INDETERMINATE BEAMS **6+6Hours**

Propped cantilever and fixed beams - fixed end moments and reactions for concentrated load (central, non-central), uniformly distributed load, triangular load (maximum at centre and

maximum at end), theorem of three moments – analysis of continuous beams - support reactions - shear force and bending moment diagrams for continuous beams.

COLUMNS **6+6Hours**

Eccentrically loaded short columns-middle third rule - core of section - Euler's theory for long columns - critical loads for prismatic columns with different end conditions; Rankine – Gordon formula for eccentrically loaded columns.

STATE OF STRESS IN THREE DIMENSIONS **2+2Hours**

Spherical and deviation components of stress tensor - determination of principal stresses and principal planes (3 dimensions) - volumetric strain.

THEORIES OF FAILURE **4+4Hours**

Theories of failure - principal stress dilatation - principal strain - shear stress - strain energy and distortion energy theories - application in analysis of stress, load carrying capacity and design of members –interaction problems and interaction curves - residual stresses.

ADVANCED TOPICS IN BENDING OF BEAMS **6+6Hours**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – shear flow - shear centre - channel section - curved beams – Winkler Bach formula - stress concentration - fatigue, fracture and creep

Theory:30Hrs **Tutorial: 30Hrs** **Total :60Hrs**

REFERENCES

1. Rajput R.K, "Strength of materials" (Mechanics of Solids), S. Chand (2015).
2. Bansal R.K," Strength of materials", Lakshmi publication (2015).
3. PrakkashRao D.S," Strength of materials", University Press, Hyderabad (2002).
4. Sadhu singh, "Strength of Materials", Khanna Publishers, Delhi (2006).
5. Kazimi S.M.A,"Solid mechanics" Tata Mc- raw-Hill Publications Ltd. New Delhi, (2009).
6. Punmia B.C., Ashok kumarJain,Arunkumar Jain " Theory of structures", Lakshmi publications (P) Ltd, New Delhi, (2011).

U15CET403 **APPLIED HYDRAULICS AND HYDRAULIC MACHINERY**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: design most economical section for an open channel.
CO2: analyze critical flow condition in channels.
CO3: determine GVF profiles under non-uniform flow.
CO4: select appropriate type of turbines for the given conditions.
CO5: suggest the type of pumps required for specific purpose.
CO6: design the characteristics of the pump and turbine for a given efficiency

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S											
CO2		S										
CO3	M											
CO4	M											
CO5	M											
CO6		M										

UNIFORM OPEN CHANNEL FLOW **6+6Hours**

Types and regimes of open channel flow – Velocity distribution in open channel – Wide open channels – Chezy's& Manning's uniform flow equations – Determination of normal depth – Most economical section

CRITICAL FLOW **6+6Hours**

Specific energy – Specific energy diagram – Alternate depths – Critical flow condition in rectangular, triangular, trapezoidal, and circular channels

NON-UNIFORM FLOW **6+6Hours**

Dynamic equation of Gradually Varied Flow (GVF) – Determination of GVF profiles – Direct and standard step methods – Hydraulic jump – Sequent depths - Flow through transitions (local bed rise and width contraction - Introduction to positive and negative surge.

TURBINES **6+6Hours**

Impact of jet on flat and curved plates, stationary and moving – Classification of turbines – Pelton wheel turbine – Francis turbine – Kaplan turbine – Draft tubes.

ROTODYNAMIC AND POSITIVE DISPLACEMENT PUMPS **6+6Hours**

Classification of pumps based on field applications - Centrifugal pump – Single and Multi-stage pumps – Reciprocating pump – Indicator diagram - Air vessels –Cavitation.

Theory:30Hrs **Tutorial: 30Hrs** **Total :60Hrs**

REFERENCES

1. K. Subramanya, "Flow in open channels," Tata McGraw-Hill publishing company limited, 2009
2. R.K. Bansal, "Fluid mechanics and hydraulic machines," Laxmi Publications (P) Ltd, 2015
3. V.T. Chow, "Open channel hydraulics," Blackburn Press, 2009
4. C.M. White, Fluid Mechanics, Mc Graw Hills Publications.
5. P.N. Modi & S.M. Seth, Hydraulics and Fluid Mechanics including Hydraulic Machines, Twentieth Edition 2015, Standard Book House, New Delhi.

U15EST002 INTRODUCTION TO ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: analyse the impact of engineering solutions in a global and societal context

CO2: discuss contemporary issues that results in environmental degradation and would attempt to provide solutions to overcome those problems

CO3: highlight the importance of ecosystem and biodiversity

CO4: ability to consider issues of environment and sustainable development in his personal and professional undertakings

CO5: paraphrase the importance of conservation of resources

CO6: play an important role in transferring a healthy environment for future generations

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M					S		M			
CO2						M				M		
CO3							M					
CO4			W			M	S					M
CO5	M						S					
CO6	M						S					

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES **10 Hours**

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources:

Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

ECOSYSTEMS AND BIODIVERSITY **14 Hours**

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

ENVIRONMENTAL POLLUTION **8 Hours**

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

SOCIAL ISSUES AND THE ENVIRONMENT **7 Hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Consumerism and waste products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness

HUMAN POPULATION AND THE ENVIRONMENT **6 Hours**

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

Field Work

Visit to local area to document environmental assets- river / grassland / hill / mountain, visit to local polluted site- urban / rural / industrial / agricultural, study of common plants, insects, birds, study of simple ecosystems-pond, river, hill slopes etc.,

Theory:45Hrs **Total : 45Hrs**

REFERENCES

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co., 2013
2. Masters G.M., and Ela W.P., Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition.
3. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India., 2002
4. Trivedi R.K and Goel P.K., "Introduction to Air pollution" Techno-science Pubications. 2003
5. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media. 1996
6. Cunningham, W.P., Cooper, T.H.., & Gorhani E., Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001
7. Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998
8. Townsend C., Harper J and Michael Begon, "Essentials of Ecology", Blackwell science Publishing Co., 2003
9. Syed Shabudeen, P.S., Environmental chemistry, Inder Publishers, Coimbatore. 2013

U15ENP401 **COMMUNICATION SKILLS LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes

After successful completion of this course, the students will be able to
CO1: impart the role of communicative ability as one of the soft-skills needed for placement
CO2: develop communicative ability and soft-skills needed for placement
CO3: prepare students for Industry-Ready by inculcating team-playing capacity

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Presentation, Role Play, Mock interview, GD etc.	1. Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										S		M
CO2										S		M
CO3									M	S		M

GRAMMAR IN COMMUNICATION **9 Hours**
Grammar and Usage – Building Blocks, Homonyms, Subject and Verb Agreement, Error Correction - Grammar Application, Framing Questions – Question words, Verbal Questions, Tags, Giving Replies –Types of Sentences, Listening Comprehension –Listening and Ear training

ASSERTIVE COMMUNICATION **9 Hours**
Listening Comprehension in Cross–Cultural Ambience, Telephonic Conversations/Etiquette, Role Play Activities, Dramatizing Situations- Extempore – Idioms and Phrases.

CORPORATE COMMUNICATION **9Hours**
Video Sensitizing, Communicative Courtesy – Interactions – Situational Conversations, Time Management, Stress Management Techniques, Verbal Reasoning, Current Affairs – E Mail Communication / Etiquette.

PUBLIC SPEAKING **9 Hours**
Giving Seminars and Presentations, Nuances of Addressing a Gathering - one to one/ one to a

few/ one to many, Communication Process, Visual Aids & their Preparation, Accent Neutralization, Analyzing the Audience, Nonverbal Communication.

INTERVIEW & GD TECHNIQUES **9Hours**

Importance of Body Language –Gestures & Postures and Proxemics, Extempore, Facing the Interview Panel, Interview FAQs, Psychometric Tests and Stress Interviews, Introduction to GD, Mock GD Practices.

Practical: 45Hrs **Total :45Hrs**

REFERENCES

1. Bhatnagar R.P. & Rahul Bhargava, "English for Competitive Examinations", Macmillian Publishers, India, 1989, ISBN: 9780333925591
2. Devadoss K. &Malathy P., "Career Skills for Engineers", National Book Publishers, Chennai, 2013.
3. Aggarwal R.S., "A Modern Approach to Verbal & Non–Verbal Reasoning", S.Chand Publishers, India, 2012, ISBN : 8121905516

U15CEP401 **SURVEYING PRACTICAL II**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: conduct survey works using total station

CO2: prepare contour maps for the given area

CO3: conduct tacheometric survey for linear and angular measurements.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M			S	S							
CO2	M			S	S							
CO3	M			S	S							

1. SURVEY USING TOTAL STATION
   a. Area Calculation
   b. Traversing
   c. Longitudinal and cross section
   d. Single plane method
   e. Double plane method
   f. Contour
2. Demonstration of Autoplotter.
3. Field observation and calculation of azimuth.
4. Tacheometry - Tangential system - Stadia system - Subtense system.

Experiments beyond the syllabus will be conducted.

Practical:45Hrs **Total : 45Hrs**

U15GHP401 **PROFESSIONAL VALUES**

L	T	P	C
1	0	0	1

Course outcomes:

After successful completion of the course, the student will be able to:

CO1: acquire knowledge on the Clarity, courage, confidence, commitment, compassion this required for a good professional

CO2: understand the concept of Karma Yoga and lead his/her life accordingly

CO3: understand the importance of ethics in one's profession and practice it

CO4: get acquainted with leadership theories and use them in his/her profession appropriately

CO5: learn how to be an empowered professional and how to empower colleagues

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	W			W	M	M	M			M
CO2		W				M	S	M	M			S
CO3					M		S	S	W	W		M
CO4		W				M	M	M	S	W		M
CO5		W				M	M	W	M			M

Course Assessment methods:

Direct	Indirect
1. Individual Assignment 2. Group Assignment 3. Presentation 4. Surprise Test 5. Practical Assessment 6. End Semester Assessment	Attendance and Behavioural Assessment

Introduction to Professional Values	1 Period
Concept of Integral Karma Yoga	3 Periods
Professional Ethics	3 Periods

Eastern and Western Leadership Theories	2 Periods
Empowerment of a Professional	4 Periods
Advanced Contemplative Practices with Demonstrations	2 Periods

Total: 15periods

References Books:

1. Rishabhchand, ***"Integral Yoga of Sri Aurobindo"*,** Sri Aurobindo Ashram Publication Department, Pondicherry, Published 2001.
2. Charles E Harris, **"*Engineering Ethics: Concepts and Cases*",** 4th edition, Western Michigan University, Published 2009.
3. Devdas Menon, **"*Spirituality at Work*",** professor of structural engineering at IIT Madras.
4. Ameeta Mehra, **"*Karma Yoga: Perfection in Work*",** The Gnostic Centre, New Delhi, Published 2000.
5. Winthrop Sargeant,"***The Bhagavad Gita"***, State University of New York, Published 1994.
6. D.R Kiran, ***"Professional Ethics& Human Values"***, The Mc Graw Hill/BSP Books, Published 2013.
7. S. Bhaskar, ***"Professional Ethics& Human Values"***, The Aunradha Agencies, Chennai, Published 2005.
8. Keith Ward & Cliff Bowman, ***"Extraordinary performance from ordinary people",*** Routledge, Published 2007.
9. Stephen Robbins, "Organization Behavior", The Prentice Hall; 15 editions, 2012.

U15CSP401 **PROBLEM SOLVING TECHNIQUES**

(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	2	2

Course Objectives:

To introduce students to the foundations of computing, programming and problem-solving.
To develop basic programming skills necessary for engineering education.

Course Outcomes (CO):

After Successful completion of this course, the students will be able to :

CO1	Write a pseudo code for the identified problem	S
CO2	Translate the pseudo code into an executable program	S
CO3	Validate the program for all the possible inputs.	S
CO4	Identify an appropriate approach to solve the problem	S
CO5	Use different data structures	S

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M					L			
CO2	S	M		M	S				L			
CO3	S	M		M					L			
CO4	S	M		M					L			
CO5	S	M		M					L			

Course Assessment Methods:

Direct	Indirect
• Model Lab Exam • End Semester Practical Exam	• Course Exit Survey

Course Content:

Problem solving

General problem solving concepts, approaches and challenges, problem solving with computers, data structures

Approaches

Solve by analogy, Decompose the task into smaller subtasks, Building block approach, merging solutions, Algorithmic thinking, Choice of appropriate data structures, Implementation of the Pseudo-code, implementing the code, testing the solution

Introduction to program structure

Variables and constants, local and global variables, expressions, control structures, selection structures, arithmetic, relational and logical operators, Conditional and looping statements, programming in manageable pieces: program modules, subprograms, functions and recursion

Problem to code approach

Problem statement, problem analysis, program design, program code, program test

Sorting (Numbers and Strings)

Bubble sort, Insertion sort, Selection Sort

Searching (Numbers and Strings)

Binary search, Random search, Search for Max-Min

References:

1. *R. J. Dromey, How to solve it by Computer, Prentice Hall International, New Jersey, 2007*
2. *Harold Abelson and Gerald Sussman, Structure and Interpretation of Computer Programs, MIT Press, 1996.*
3. *Subhasis Banerjee, S. Arun Kumar, D. Dubhashi, Introduction to Computer Science, McGraw Hill India.*

Theory:15Hrs **Tutorial: 30Hrs** **Total : 45Hrs**

SEMESTER V

U15CET501 **STRUCTURAL ANALYSIS I**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: calculate static and kinematic indeterminacy of structures.
CO2: analyze the pin jointed plane frames using energy and consistent deformation method
CO3: analyze indeterminate structures using slope deflection method.
CO4: analyze indeterminate structures using moment distribution method.
CO5: analyze indeterminate beams with moving loads.
CO6: analyze the arches under external loads, temperature effects and support settlements.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M										
CO2	S	S										
CO3	S	S										
CO4	S	S										
CO5	S	S										
CO6	S	S										

PINJOINTED FRAMES **6+6Hours**

Determinate and Indeterminate Structures - Static indeterminacy – Kinematic indeterminacy. Analysis of pin jointed frames - Principle of virtual work method - Consistent deformation method.

SLOPE DEFLECTION METHOD **6+6Hours**

Analysis of continuous beams - sinking of supports - single storey portal frames (with and

without sway).

MOMENT DISTRIBUTION METHOD **6+6Hours**

Distribution and carryover of moments – Stiffness and carry over factors - Analysis of continuous beams - sinking of supports - single storey portal frames (with and without sway).

MOVING LOADS AND INFLUENCE LINES **6+6Hours**

Introduction – Moving loads for statically determinate structures - Construction of Influence lines for reaction, SF and BM for rolling loads for simply supported and overhanging beams - Computation of load positions for maximum bending moment and maximum shear force - absolute maximum bending moment. Influence lines for member forces in pin-jointed frames. Muller-Breslau's principle, Construction of ILD for continuous beams.

ARCHES **6+6Hours**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged and two hinged parabolic and circular arches- Settlement and temperature effects -– influence lines for three hinged parabolic arches.

Theory:30Hrs **Tutorial: 30Hrs** **Total : 60Hrs**

REFERENCES

1. Punmia B.C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of structures", Laxmi Publications Pvt. Ltd., New Delhi, 2004.
2. Sujit Kumar Roy, SubrataChakrabarty, "Fundamentals of Structural Analysis", S. Chand & Company Ltd. New Delh, 2013.
3. L.S.Negi&R.S.Jangid, "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 6th Edition, 2003.
4. Reddy.C.S., " Basic Structural Analysis", Tata McGraw Hill Education Pvt.Ltd., New Delhi.2011
5. Vaidyanadhan R and Perumal, P, "Comprehensive Structural Analysis-Vol.1 &Vol.2", Laxmi Publications Pvt.Ltd, New Delhi, 2014
6. Bhavikatti.S.S, "Structural Analysis-Vol.1 & Vol.2", Vikas Publishing Pvt Ltd., New Delhi. 2014

U15CET502 **DESIGN OF MASONRY AND REINFORCED CONCRETE ELEMENTS**

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: design masonry walls subjected to axial and eccentric loads.
CO2: design rectangular and flanged reinforced concrete beams under flexure.
CO3: design reinforced concrete staircase.
CO4: design rectangular and flanged reinforced concrete beams shear and torsion.
CO5: design reinforced concrete short and slender columns.
CO6: design isolated and combined footing for columns.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		S	S								
CO2	M		S	S								
CO3	M		S	S								
CO4	M		S	S								
CO5	M		S	S								
CO6	M		S	S								

MASONRY **4+4Hours**

Introduction, Classification of walls, Lateral supports and stability, effective height of wall and columns, effective length of walls, design loads, load dispersion, permissible stresses, design of axially and eccentrically loaded brick walls.

METHODS OF DESIGN OF CONCRETE STRUCTURES **2+2Hours**

Methods of design - advantages of Limit State Method over other methods- Design codes and specification.

DESIGN FOR FLEXURE **6+6Hours**

Analysis and design of singly and doubly reinforced rectangular and flanged beams- Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.-design of staircase

DESIGN FOR BOND, ANCHORAGE, SHEAR & TORSION **6+6Hours**

Behaviour of RC members in bond and Anchorage- Design requirements as per IS code- Behaviour of RC beams in shear and torsion- Design of RC members for combined bending, shear and torsion.

DESIGN OF COLUMNS **6+6Hours**

Types of columns- Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial (using SP16) bending – Design of slender compression members

DESIGN OF FOOTING **6+6Hours**

Design of wall footing – Design of axially and eccentrically loaded rectangular isolated footing– Design of combined footing- rectangular and trapezoidal

Theory:30Hrs **Tutorial: 30Hrs** **Total : 60Hrs**

REFERENCES

1. Gambhir.M.L., Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private limited, New Delhi, 2006.
2. Varghese, P.., "Limit state Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
3. Subramanian, N. Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
4. Punmia, B.C., Ashok Kumar jain, Arun Kumar jain, "Limit state Design of Reinforced concrete, Laxmi Publications Pvt. Ltd., New Delhi, 2007.
5. Sinha, S.N., " Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.
6. I.C.Syal and A.K.Goel, "Reinforced Concrete Structures", S.Chand and Company Ltd, New Delhi, 2012.

U15CET503 IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: assess the irrigation needs of crops.
CO2: plan irrigation projects for the given conditions.
CO3: implement various types of irrigation methods.
CO4: prepare elementary profile and hydraulic design of irrigation structures.
CO5: plan for water management and minimize irrigation water losses.
CO6: design cross drainage works

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO3	M											
CO4	M		S									
CO5	M											
CO6	M		S									

INTRODUCTION **9Hours**

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

8Hours

IRRIGATION METHODS

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation

DIVERSION AND IMPOUNDING STRUCTURES **10Hours**

Weirs – elementary profile of a weir – weirs on pervious foundations - Types of impounding structures - Percolation ponds – Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

CANAL IRRIGATION **10Hours**

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

IRRIGATION WATER MANAGEMENT **8Hours**

Need for optimization of water use – Minimizing irrigation water losses – On farm development works - Participatory irrigation management – Water users associations – Changing paradigms in water management due to climate change – Performance evaluation.

Theory:45Hrs **Total : 45Hrs**

REFERENCES

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers, 2006
2. Dr. B. C. Punmia, Dr. PandeBrijBasiLal, Ashok Kumar Jain, Arun Kumar Jain Irrigation and Water Power Engineering, Laxmi Publishing, New Delhi 2009
3. Michael, A.M, Irrigation Theory and Practical, Vikas Publishing Pvt Ltd, 2009
4. Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd, 2013
5. Sharma R.K.. "Irrigation Engineering", S.Chand& Co. 2007.

U15CET504 GEOTECHNICAL ENGINEERING I

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: identify and classify soils.
CO2: determine the permeability of soil.
CO3: estimate soil stresses and prepare flow net diagram.
CO4: estimate the total settlement and time rate of settlement of the soil.
CO5: analyze shear properties of cohesive and cohesionless soils.
CO6: analyze slope failure problems.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S									
CO2	M	M	S									
CO3	M	M	S									
CO4	M	M	S									
CO5	M	M	S									
CO6	M	M	S									

CLASSIFICATION OF SOIL 7 Hours

Historical development of soil Engineering- Origin and general types of soils- soil structure, clay minerals- Three phase system- Identification and classification of soils (BIS classification).

PERMEABILITY OF SOIL 7 Hours

Soil water-capillary phenomena- concept of effective and neutral stresses- Permeability- determination of coefficient of permeability in the laboratory- Seepage flow- Head, gradient, pressure- steady state flow- two dimensional- flow net.

STRESS DISTRIBUTION **5 Hours**

Vertical stress distribution in soil – Boussinesq and Westergaard's equation- Newmark'sinfluence chart – principle and application - equivalent point load and other approximate methods- pressure bulb.

COMPRESSIBILITY AND CONSOLIDATION **9 Hours**

Compaction, Compressibility and consolidation- Terzaghi's one dimensional consolidation theory – pressure void ratio relationship- pre-consolidation pressure- Total settlement and time rate of settlement- coefficient of consolidation- curve fitting methods.

SHEAR STRENGTH **9 Hours**

Shear strength- Mohr- Coulomb failure criterion- shear strength tests- Different drainage conditions- Shear properties of cohesive and cohesionlesssoils- Use of Mohr's circle- Principle stresses – Stress path – Skempton's pore water pressure parameters.

SLOPE STABILITY **8 Hours**

Slope failure mechanisms- finite slopes and infinite slopes- Swedish circle method- Friction circle method- Stability number problems.

Theory:45Hrs **Total :45Hrs**

REFERENCES

1. Murthy, V.N.S., "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2011.
2. GopalRanjan and rao A.S.R. "Basic and Applied soil mechanics", Wiley eastern ltd, New Delhi, 2014.
3. Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, new Delhi, 2014.
4. Das, B.M, "Principles of Geotechnical Engineering", Thompson Brooks/ Coles Learning, Singapore, 5th Edition, 2002.

U15CET505 **HIGHWAY AND RAILWAY ENGINEERING**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: plan for highway schemes as per IRC standards.
CO2: perform geometric design of urban and rural roads
CO3: design flexible and rigid pavements using IRC methods
CO4: evaluate and carry out maintenance and strengthening of existing pavements.
CO5: perform geometric design of permanent way
CO6: plan for layout of railway station, yards and other amenities

Pre-requisite :Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S								
CO2	S		M									
CO3	S		M	S								
CO4	M											
CO5	S		S									
CO6				S		S						

HIGHWAY PLANNING AND ALIGNMENT 6Hours

Significance of highway planning – Modal limitations towards sustainability – History of road development in India – Classification of highways – Locations and functions – Factors influencing highway alignment – Soil suitability analysis- Road ecology – Engineering surveys for alignment, objectives- conventional and modern methods.

GEOMETRIC DESIGN OF HIGHWAYS 6Hours

Typical cross sections of Urban and Rural roads – Cross sectional elements – Sight distances – Horizontal curves, super elevation, transition curves, widening at curves – vertical curves –

Gradients, Special consideration for hill roads – hairpin bends – Lateral and vertical clearance at underpasses.

DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 6Hours

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

HIGHWAY CONSTRUCTION MATERIALS AND PRACTICE 6Hours

Highway construction materials, properties, testing methods – CBR test for subgrade – tests on aggregate and bitumen – Construction practice including modern materials and methods, Bituminous and concrete road construction, Polymer modified bitumen, Recycling, Different materials – Glass, fiber, plastic, geo-Textiles, Geo- Membrane – Quality control measures- Highway drainage. Highway machineries.

EVALUATION AND MAINTENANCE OF PAVEMENTS 7Hours

Pavement distress in flexible and rigid pavements – Pavement management systems – pavement evaluation, roughnesss, present serviceability index, skid resistance, structural evaluation, and evaluation by deflection measurements – Strengthening of pavements – Types of maintenance – Highway Project formulation.

RAILWAY PLANNING 7Hours

Elements of permanent way – Rails, Sleepers, ballast, rail fixtures and fastenings- Track stress, coning of wheels, creep in rails, defects in rails- Route alignment surveys, conventional and modern methods- Soil suitability analysis- Geometric design of railways, gradient, super elevation, widening of gauge on curves- Points and crossings.

RAILWAY CONSTRUCTION AND MAINTENANCE 7Hours

Earthwork – Stabilization of track on poor soil – Tunneling Methods, drainage and ventilation – Calculation of materials required for track laying – Construction and maintenance of tracks – Modern methods of construction & maintenance - Railway stations and yards and passenger amenities

Theory:45Hrs **Total : 45Hrs**

REFERENCES

1. Khanna.S.K. Justo and Veeraragavan A. Highway Engineering", Nemchand Publishers, 2013.
2. Subramanian K.P., "Highways, railways, Airport and harbor Engineering", Scitech Publications (India) Chennai, 2010.
3. Kadiyali.L.R, "Principles and Practice of Highway Engineering", Khanna Technical Publications, 8th edition Delhi, 2013.
4. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Nineth Impression, South Asia, 2012

U15CEP501 SOIL MECHANICS LABORATORY

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1:assess the index properties of soil
CO2:find out the in-situ density and compaction characteristics of soil
CO3: determine the engineering properties of soil

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	M							
CO2				S	M							
CO3				S	M							

DETERMINATION OF INDEX PROPERTIES

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis
3. Grain size distribution Hydrometer analysis
4. Liquid limit and plastic limit tests
5. Shrinkage limit and Differential free swell tests.

DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

1. Field density Test (Sand replacement method, Core cutter method)
2. Determination of moisture – density relationship using standard Proctor Compaction test.

DETERMINATION OF ENGINEERING PROPERTIES

1. Permeability determination (constant head and falling head methods)
2. One dimensional consolidation test (Determination of co-efficient of consolidation only)
3. Direct shear test in cohesionless soil
4. Unconfined compression test in cohesive soil

5. Laboratory vane shear test in cohesive soil
6. Tri-axial compression test in cohesion-less soil (Demonstration)

Experiments beyond the syllabus will be conducted.

Practical:45Hrs **Total : 45Hrs**

U15CEP502 **CONCRETE AND HIGHWAY LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: to determine the fresh concrete properties
CO2: find the mechanical properties of concrete
CO3: assess the quality of bitumen through laboratory tests.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M											
CO2	M											
CO2				S	W							

CONCRETE

1. TESTS ON FRESH CONCRETE
   (i)Slump cone test &
   (ii)Compaction factor test
   (iii)Flow table test
2. TEST ON HARDENED CONCRETE
   (i) Compressive strength and
   (ii) Split tensile strength
   (iii) Modulus of rupture
   (iv) Young's modulus and poisson's ratio

HIGHWAY LABORATORY

1. Determination of softening point of bitumen
2. Penetration value of bitumen
3. Determination of flash point and fire point of bitumen
4. Determination of ductility of bitumen
5. Determination of California bearing ratio

Practical: 45Hrs **Total : 45Hrs**

U15CEP503 **SURVEY CAMP**

L	T	P	C
0	0	0	1

Course Outcomes

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

CO1:perform survey as per the field condition
CO2:conduct LS and CS by using advanced equipment
CO3:prepare contour map for the given area
CO4: measure inaccessible distance and height using total station

Pre-requisites: Survey Theory and Laboratory courses

Course Assessment methods:

Direct	Indirect
1. Survey report 2. Viva voice examination	Course end survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S	S					M		
CO2				S	S					M		
CO3				S	S					M		
CO4				S	S					M		

One week survey camp carried out over a large area for area measurements, leveling and angular measurements. At the end of the camp, each student will independently complete the office work for the survey works done in the field. The camp record shall include all original field observations, calculation and plots.

a. Conventional surveying for civil Engineering project works
b. Triangulation.
c. Contour Surveying, L.S/C.S for road works.
d. Trilateration
e. Total station surveying to plot a boundary

Evaluation Procedure

1. Internal Marks : 20 marks
2. Evaluation of Survey Camp Report : 30 marks
(Evaluated by the external examiner)
3. Viva voce examination : 50 marks
(evaluated by the internal examiner and external examiner)

U15GHP501 **SOCIAL VALUES**

(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	0	1

Course outcomes:

After successful completion of the course, the student will be able to:

CO1: acquire knowledge about how societies are formed and social values are created
CO2: understand and empathize various social issues and contribute towards finding a solution
CO3: understand the causes of disparity among human beings
CO4: know about social welfare organizations and to use social media effectively
CO5: understand various social parameters that influences individual and society at large

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W				M	W	M	W			M
CO2		W	W			W	M	M		W		M
CO3		W				M	W	S				M
CO4		W				S		M	W	M		S
CO5			W		W	M	W			W		M

Course Assessment methods:

Direct	Indirect
1. Individual Assignment 2. Group Assignment 3. Presentation 4. Surprise Test 5. Practical Assessment 6. End Semester Assessment	Attendance and Behavioural Assessment

Introduction to Social Values – Society	2 Periods
Development of Science, Education, Politics & Economics	3 Periods
Disparity among human beings	3 Periods
Social Issues & Welfare	3 Periods
Social Welfare Organizations	2 Periods
Yogasanas & Meditation	2 Periods

Total Periods: 15

References Books:

1. Swami Vivekananda, "***Prosperous India"*** 1st edition, The Ramakirshna Mission Institute of Culture, 1937.
2. Fritz Schumacher, ***"Small is Beautiful",*** The Blond & Briggs, Published 1973.
3. Vethathiri Maharishi***, "Logical Solutions for the Problems of Humanity",*** The World Community Service Centre, Vethathiri Publications, 1999.
4. Sarvepalli Radhakrishnan, ***"The Source Book on Indian Philosophy"***, Princeton, N.J. : Princeton University Press, 1957.
5. Sarvepalli Radhakrishnan, ***"Religion, Science and Culture",*** The Orient Paperbacks, India, Published 1994.
6. Vethathiri's Maharishi's, ***"Vethathirian Principles of Life"*** The World Community Service Centre, Vethathiri Publications, 2003.

SEMESTER VI

U15CET601 STRUCTURAL ANALYSIS II

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: analyze structures using matrix flexibility method.
CO2: analyze structures using stiffness method.
CO3: perform plastic analysis for indeterminate beams and frames.
CO4: implement basic concepts of finite element analysis.
CO5: analyze Space Truss using tension Coefficient method.
CO6: analyze beams curved in plan and cable suspension bridges.

Pre-requisites : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S										
CO2	S	S										
CO3	S	S										
CO4	S	S										
CO5	S	S										

MATRIX FLEXIBILITY METHOD 6+6Hours

Equilibrium and compatibility- Determinate Vs indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

MATRIX STIFFNESS METHOD 6+6Hours

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacement vectors – Analysis of pin-jointed plane frames, continuous beams and rigid frames

(with redundancy limited to two)

PLASTIC ANALYSIS OF STRUCTURES 6+6Hours

Statically indeterminate axial problems – beams in pure bending – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames- upper and lower bound theorems.

INTRODUCTION TO FINITE ELEMENT ANALYSIS 6+6Hours

Introduction- Steps involved in FEA – Displacement functions – truss element – beam element – plane stress and plane strain – Triangular elements.

SPACE AND CABLE STRUCTURES 6+6Hours

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – suspension bridges with two and three hinged stiffening girders.

Theory: 30Hrs **Tutorial:30Hrs** **Total:60Hrs**

REFERENCES

1. Punmia,B.C., Ashok Kumar and Arun Kumar Jain, " Theory of Structures", Laxmi Publications, 2005.
2. Vaidyanathan, R. and Perumal, P., "Comprehensive structural Analysis – Vol I & II", Laxmi Publications, New Delhi, 2003.
3. Negi L.S &Jangid R.S., "Structural Analysis", Tata McGraw Hill Publications, New Delhi, 2003.
4. Ghali.A, Nebille, A.M. and Brown, T.G, "Structural Analysis" A unified classical and Matrix approach", 6th Edition, Spon Press, London and New York, 2013.
5. Gambhir, M.L., "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2011.
6. William Weaver Jr& James M. Gere, "Matrix Analysis of Framed Structures", CBS Publishers and Distributors, New Delhi, 2004

U15CET602 DESIGN OF REINFORCED CONCRETE STRUCTURES

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: design counter fort and cantilever retaining walls.
CO2: design underground and overhead R.C water tanks for the given capacity.
CO3: analyze and design various types of slabs using yield line theory.
CO4: design bridges as per IRC standards.
CO5: design flat slab as per IS standards.
CO6: apply the concepts of pre-stressing for structural elements analysis.

Pre-requisite: Design of masonry and reinforced concrete elements.

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		S			S						
CO2	M		S			S						
CO3	M		S			S						
CO4	M		S			S						
CO5	M		S			S						
CO6	M	S				S						

RETAINING WALLS **6+6Hours**

Design of Cantilever and Counterfort Retaining walls

WATER TANK **6+6Hours**

Design of rectangular and circular water tanks both below and above ground level- Design of overhead water tank (As per IS 3370(Part I-III))

YIELD LINE THEORY **6+6Hours**

Assumptions – Characteristics of yield line – Determination of collapse load/ plastic moment – Application of virtual work method – square, rectangular, circular and triangular slabs – Design problems

BRIDGESAND FLAT SLAB **6+6Hours**

Types of bridges – IRC loading – design of single span slab bridge, T-beam bridge. Flat slab – Types – design methods , IS code recommendations – Reinforcement details

INTRODUCTION TO PRESTRESS **6+6Hours**

Introduction – Materials – IS Codes – Methods and systems of prestressing – Analysis for Stresses and Losses - Application

Theory:30Hrs **Tutorial: 30Hrs** **Total :60Hrs**

REFERENCES

1. Varghese, P.., " Advanced Reinforced Concrete Design", Prentice Hall of India, Pvt. Ltd., New Delhi, 2012.
2. Gambhir.M.L.," Design of Reinforced Concrete structures", Prentice Hall of India Private limited, New Delhi, 2012.
3. Subramanian, N. Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.
4. Punmia, B.C., Ashok Kumar jain, Arun Kumar jain, " RCC Designs Reinforced Concrete Structures " , Laxmi Publications Pvt. Ltd., New Delhi, 2006.
5. I.C.Syal and A.K.Goel, "Reinforced Concrete Structures", S.Chand and Company Ltd, New Delhi, 2012.

U15CET603 GEOTECHNICAL ENGINEERING II

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: select suitable type of foundation required for the given soil condition.
CO2: analyze the settlement of the foundation on different types of soil
CO3: find the safe overall dimensions for various types of foundations
CO4: assess the load capacity of the group of piles.
CO5: carry out stability analysis of retaining walls.
CO6: implement various ground improvement techniques in the field.

Pre-requisite : Geotechnical Engineering I

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S									
CO2	M	S	S									
CO3	M	S	S									
CO4	M	S	S									
CO5	M	S	S									
CO6	M	S	S									

SITE INVESTIGATION AND SELECTION OF FOUNDATION 8Hours

Scope and Objectives – Methods of exploration – auguring and boring – wash boring and rotary drilling – Depth of boring- spacing of bore hole – sampling techniques – representative and undisturbed sampling- methods- split spoon sampler, Thin wall sampler, Stationery piston sampler-– Bore log report –data interpretation- strength parameters and liquefaction potential – Selection of foundation based on soil condition.

BEARING CAPACITY AND SETTLEMENT 9Hours

Introduction- Location and depth of foundation – Codal provisions – bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – factors affecting bearing capacity – problems – Bearing capacity from in-situ tests (plate load and SCPT) Allowable bearing pressure – Seismic considerations in bearing capacity evaluation. Determination of Settlement of foundations on granular and clay deposits – Total and differential settlement

SHALLOW FOUNDATION 7Hours

Types of footings – Contact pressure distribution: isolated footing – combined footings – proportioning – Mat foundation – Types and applications- Floating foundation – foundation subjected to Tensile force- Seismic force consideration – Codal provision (No structural design).

PILE FOUNDATION 9Hours

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – static formula - dynamic formula – Capacity from insitu tests – negative skin friction – uplift capacity – Group capacity by different methods (Feld's rule, Converse – labara formula and block failure criterion) – Settlement of pile groups – interpretation of pile load test – Under reamed piles

RETAINING WALLS 8Hours

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

GROUND IMPROVEMENT TECHNIQUES 4Hours

Stabilization of soil using various methods –Geo-textiles, underpinning, stone column, vibroflotation, sand drains, Soil Nailing- Case study.

Theory:45Hrs **Total: 45Hrs**

REFERENCES

U15CET604 DESIGN OF STEEL STRUCTURES

L	T	P	C
2	2	0	3

Course Outcomes

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

CO1: design bolt and welded connections for steel structures.
CO2: design compression and tension members using rolled steel sections.
CO3: design steel beams and plate girders.
CO4: design gantry girders.
CO5: design steel roof truss components.
CO6: design light gauge steel elements.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S			S						
CO2	M	M	S			S						
CO3	M	M	S			S						
CO4	M	M	S			S						
CO5	M	M	S			S						
CO6	M	M	S			S						

INTRODUCTION **4+4Hours**

Properties of steel – structural steel sections – Limit State Design Concepts- Loads on Structures -Connections using bolts and welding – Design of bolted and welded joints- Eccentric connections – Efficiency of joints.

TENSION MEMBERS **4+4Hours**

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of

connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag.

COMPRESSION MEMBERS **6+6Hours**

Types of compression members – Theory columns – Basis of current codal provision for compression member design- slenderness ratio - Design of single section and compound section compression members – design of laced and battened type columns – design of column bases- Gusseted base

BEAMS **6+6Hours**

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to uniaxial and biaxial bending – design of plate girders- Intermediate and bearing stiffeners – Flange and web splices.

ROOF TRUSSES AND INDUSTRIAL STRUCTURES **6+6Hours**

Roof trusses – Roof and side coverings – Design of purlin and elements of truss; end bearing- Design of gantry girder.

LIGHT GAUGE SECTIONS **4+4Hours**

Design of light gauge steel members- local and post buckling of thin element – light gauge steel compression members – tension members- beams and connections

Theory:30Hrs **Tutorial: 30Hrs** **Total :60Hrs**

REFERENCES

1. Gambhir.M.L. “Fundamentals of Structural Steel design”, McGraw Hill Education India Pvt.Ltd., 2013.
2. Shiyekar. M.R., “Limit State Design in Structural Steel”, Prentice Hall of India Pvt. Ltd, 2nd Edition 2013.
3. Subramanian.N, “Design of Steel Structures”, Oxford University Press, New Delhi,2013.
4. Duggal. S.K, “Limit State Design of Steel Structures”, Tata McGraw Hill Publishing Company, 2005.

OTHER REFERENCES

1. IS 800:2007, General Construction in Steel-Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007.
2. IS IS 801. 1975. Indian Standard. Code of Practice For Use Of. Cold-Formed Light Gauge Steel. Structural Members
3. Is 811: 1987 Specification For Cold Formed Light Gauge? Structural Steel Sections. (Second Revision)
4. Narayanan.R.et.al. “Teaching Resource on structural Steel design”, INSDAG, Ministry of Steel Publications, 2002.

U15CET605 WATER SUPPLY AND WASTE WATER ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: plan water supply system for developing area.
CO2: design the various treatment units in water supply system.
CO3: apply advanced techniques for the water and wastewater treatments.
CO4: design the septic tank and wastewater treatment units.
CO5: prepare plumbing layout for apartment buildings.
CO6: implement advanced techniques for sewage and sludge treatments.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S				S					
CO2	M	M	S				S					
CO3	M	M	S				S					
CO4	M	M	S				S					
CO5	M	M	S				S					
CO6	M	M	S				S					

PLANNING FOR WATER SUPPLY SYSTEM 9Hours

Public water supply system – Planning - Objectives – Population forecasting– Water demand – Sources of water and their characteristics – Surface and ground water- Water supply intake structures– selection of source – water quality and standards – pipes and conduits for water- Pipe materials– transmission main design – laying, jointing and testing of pipes– Pumps – selection of pumps.

WATER TREATMENT 9Hours

Objectives – Unit operations and processes- principles, functions design of sedimentation tanks and sand filters – disinfection –Operation and maintenance of water treatment plants.
Principles and functions of aeration – Iron and manganese removal, Defluoridation and demineralization -Water softening – Desalination - Reverse osmosis.

WATER DISTRIBUTION AND SUPPLY TO BUILDINGS 6Hours

Service reservoirs –Network design – Analysis of distribution networks- Operation and maintenance – leak detection, methods. Principles of water supply in buildings – House service connection– Systems of plumbing and types of plumbing.

SEWER DESIGN 9Hours

Sources of waste water generation –Estimation of DWF & WWF –Hydraulics of flow in sewers – Design of sanitary and storm sewers –sewers appurtenances – Sewage plumbing system for buildings - Effluent standards - Reclamation and Reuse of sewage

TREATMENT OF SEWAGE 12Hours

Objective –Unit operations – physico chemical treatments – Design of Screen, grit chambers and primary sedimentation tanks. Secondary Treatment - Design of Activated sludge process and Trickling filter - Septic tank with effluent disposal arrangements – Advanced sewage treatment methods – SBR, UASBR and Hybrid Reactors – Sludge Management (Theory).

Theory:45Hrs **Total :45Hrs**

REFERENCES

1. Mike Garg, S.K., “Environmental Engineering”, Vol.1 Khanna Publishers, New Delhi, 2010.
2. Modi, P.N. “Water Supply Engineering”, Vol.I Standard Book House, New Delhi, 2012.
3. Punmia B.C., Ashok K Jain and Arun K Jain, “ Water Supply Engineering”, Laxmi Publications Pvt. Ltd., New Delhi, 2016.
4. Government of India, “Manual on water Supply and Treatment”, CPHEEO, Ministry of Urban Development, New Delhi, 2003.
5. Syed R. Qasim and Edward M. Motley Guang Zhu, “Water Works Engineering Planning”, Design and Operation, Prentice Hall of India Private Limited, New Delhi, 2006.
6. Birdie.J.S, “ Water Supply and Sanitatio Engineering”, S.Chand Publications Pvt. Ltd., New Delhi, 2011.
7. Metcalf Eddy,Franklin.L,H David stensel”Waste Water Engineering Treatment and Reuse” McGrawhill, New York 2015.

U15CEP601 **DESIGN AND DRAWING (RCC & STEEL)**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: analyze and design R.C framed structure using software.
CO2: design R.C retaining walls using software.
CO3:design RCC Tee beam bridges and water tanks using computer software
CO4: prepare structural drawings for various concrete structures using software.
CO5: design steel structures like foot bridge, plate girder and gantry girder using software.
CO6: design framed connections for steel structures using software

Pre-requisite : Design of Masonry and Reinforced Concrete Elements

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M		S					M		M
CO2		M	M		S					M		M
CO3		M	M		S					M		M
CO4		M	M		S					M		M
CO5		M	M		S					M		M
CO6		M	M		S					M		M

1. Analysis and design of RC Framed structure using software
2. Design and drawing of RCC cantilever and counter fort type retaining walls with reinforcement details
3. Design of solid slab and RCC Tee beam bridges for IRC loading and reinforcement details
4. Detailing of circular and rectangular water tanks
5. Design of Simple Industrial shed-gantry girder-
6. Design of steel foot bridge-
7. Design of steel framed structures-connections

Practicals: 45Hrs **Total : 45Hrs**

References:

1. Krishnamurthy, D., “Structural Design & Drawing – Vol. 1”, CBS Publishers &Distributors, Delhi 2006.
2. Krishnamurthy, D., “Structural Design & Drawing – Vol. 3 Steel Structures”, CBS Publishers & Distributors, New Delhi 2008.
3. Dayaratnam, Limit state design of R.C structures, India Book House Ltd, 2004
4. Krishna Raju, “Structural Design & Drawing (Concrete & Steel)”, University Press 2004

U15CEP602 **ENVIRONMENTAL ENGINEERING LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: conduct various quality tests on water and waste water.
CO2: assess the suitability of water for drinking and irrigation purpose.
CO3: assess the suitability of water for concreting works.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M	S			M					
CO2			M	S			M					
CO3			M	S			M					

LIST OF EXPERIMENTS

1. Determination of pH & Turbidity
2. Determination of Hardness
3. Determination of Dissolved Oxygen & BOD
4. Determination of Optimum Coagulant Dosage
5. Determination of Suspended, Volatile and fixed solids
6. Determination of Iron & Ammonical Nitrogen
7. Determination of Residual Chlorine& Fluoride
8. Determination of Sulphate & Chlorides
9. Determination of COD
10. Estimation of Acidity & Alkalinity
11. Determination of available Chlorine.

STUDY EXPERIMENTS

1. Sampling and preservation methods and signification of characterization of water

and Wastewater.

2. Use Of Gas Chromatograph for the Air and Gas Composition analysis
3. Introduction to Bacteriological Analysis (Demonstration only)
4. Heavy metal analysis using AAS (Demonstration only)

Experiments beyond the syllabus will be conducted.

Practical:45Hrs **Total : 45Hrs**

U15CEP603 **INDUSTRIAL TRAINING**

L	T	P	C
0	0	0	1

Course Outcomes

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

CO1: handle and execute the civil engineering projects in the field.
CO2: inculcate the spirit of team work.
CO3: plan for material and manpower resources management.
CO4: prepare project report.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
Report presentation	Course end survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										S		M
CO2									S		S	M
CO3											S	M
CO4										S		M

Course objectives:
Students have to undergo two-week practical training in Civil Engineering related organizations so that they become aware of the practical applications of theoretical concepts studied in the class rooms.

Students have to undergo two-week practical training in Civil Engineering related organizations of their choice but with the approval of the department. At the end of the training student will submit a report as per the prescribed format to the department.

Assessment Process:
This course is mandatory and a student has to pass the course to become eligible for the award of degree. The student shall make a presentation before a committee constituted by the department which will assess the student based on the report submitted and the presentation made. Marks will be awarded out of 100 and appropriate grades assigned as per the regulations.

U15GHP601 **NATIONAL VALUES**

(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	0	1

Course outcomes:

After successful completion of the course, the student will be able to:

CO1: acquire knowledge on the Enlightened Citizenship.
CO2: know skills the greatness of India and Indian Culture.
CO3: aware of the messages of India to the world
CO4: aware of the uniqueness of India
CO5: know about the inspiring Indian personalities and emulate them

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W				M		M				M
CO2		W				S	W	S	M	M		M
CO3		W	W		W	M	W	M	M	M		M
CO4		W				M	W	M	W	W		M
CO5						W	M	W	W	W		S

Course Assessment methods:

Direct	Indirect
1. Individual Assignment 2. Group Assignment 3. Presentation 4. Surprise Test 5. Practical Assessment 6. End Semester Assessment	Attendance and Behavioural Assessment

Enlightened Citizenship	2 Periods
Greatness of India & Indian Culture	2 Periods
Uniqueness of India	2 Periods
Famous Indian Personalities	2 Periods
India's messages to the world	3 Periods
Meditation & Yogasanas	4 Periods

Total Periods: 15

References Books:

1. Gurcharan Das, "***India Grows at Night***", Penguin **Books** India, Published September 2012.
2. Swami Vivekananda, "***Prosperous India"*** 1st edition, The Ramakirshna Mission Institute of Culture, 1937.
3. Sarvepalli Radhakrishnan, ***"The Source Book on Indian Philosophy"***, Princeton, N.J. : Princeton University Press, 1957.
4. Amartya Sen, ***"The Argumentative Indian",*** Allen Lane, Published 2005.

SEMESTER VII

U15CET701 **ESTMATION, COSTING AND VALUATION**

L	T	P	C
2	0	2	3

Course Outcomes

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

CO1: prepare various types of estimation and find out the quantity of works involved.
CO2: carry out analysis of rates and bill preparation using spreadsheets.
CO3: prepare specifications for various items of construction works
CO4: estimate the quantity of works involved in road works, water supply and sanitary works.
CO5: estimate the value of buildings.
CO6: implement cost control systems for projects.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M								S	M	
CO2	M				S	S				S	M	
CO3	M									S	M	
CO4	M									S	M	
CO5	M									S	M	
CO6	M									S	S	

ESTIMATE OF BUILDINGS **6+6Hours**

Types of estimates – Units of measurements – Methods of estimates – Advantages. Quantity estimate for load bearing and framed structures - brick work and RCC works only, Steel requirement and Bar bending schedule - Calculation of quantities of earth work excavation, brickwork, PCC, RCC, Plastering, white washing, colour washing and painting/varnishing for shops and residential building with flat roof.

ESTIMATE OF OTHER STRUCTURES **6+6Hours**

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe

line – sewer line– estimate of bituminous and cement concrete roads

ANALYSIS OF RATES AND SPECIFICATIONS 6+6Hours

Data – Schedule of rates – Analysis of rates – Specifications – sources – General and Detailed specifications-Material Calculations for each work.- Material cost.

VALUATION 6+6Hours

Necessity – Different methods of valuation of a building – capitalized value – Depreciation – Escalation – Value of building – Calculation of Standard rent - Mortgage - lease.

REPORT PREPARATION 6+6Hours

Principles for report preparation – report on estimate of residential and industrial building – Roads – Water supply and sanitary installations.

Introduction to Value Engineering: Cash flow and cost control. Systems of cost control based on accounting details of spends and periodicity of cost comparison

Theory:30Hrs Practical: 30Hrs Total :60Hrs

REFERENCES

1. Dutta, B,N, "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003.
2. Chakraborti M, "Estimation, Costing, Specification and Valuation in Civil Engineering (including Computer estimation)", 2001.
3. Kohli, D.D and Kohli,R.C, "A text book of Estimating and Costing (Civil)", S.Chand& Company Ltd., 2004.
4. Rangwala S C, "Estimating, Costing and Valuation", Charotar Publishing House", 2001.
5. Estimating and Costing: Including Quantity Surveying, Tendering and Evaluation Kataria& Sons, 2010

U15CET702 **CONSTRUCTION PROJECT MANAGEMENT**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: carry out resource planning, pre-contract planning.
CO2: prepare cost estimates and budget for projects.
CO3: prepare the time scheduling using Gantt chart and software.
CO4: handle resource management and perform time cost optimization.
CO5: manage equipment and machinery requirements.
CO6: prepare tender and contract documents.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal Tests 2. Assignment / Seminar	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										S	S	
CO2										S	S	
CO3					S					S	S	
CO4										S	S	
CO5										S	S	
CO6										S	S	

PRETENDER AND PRECONTRACT PLANNING **9Hours**

Concept and functions of management – need for management in construction projects. Pretender data collection and report – Methods and resource planning – characteristic of labour and staff requirements, material and plant requirements – precontract planning: updating pretender report and charts, establishing communication networks, Master Programme, Cost estimates and budget.

Project Planning And Scheduling

Bar chart planning – CPM Network construction : Activities and events, logic and interdependence in network, time computations, critical period and path, floats – PERT Network : time estimates, Beta distribution, expected time, standard deviation, probability of achieving desired time targets for projects.

RESOURCE AGGREGATION, SMOOTHING AND LEVELLING 9Hours

Resource aggregation diagrams as per early start and late start - smoothing by activity start time manipulation - Levelling of resources according to constraints - priorities of activities - sort rules - Minimum project duration subject to resource constraints.

TIME COST OPTIMISATION 9Hours

Direct and Indirect costs and their relation to time – Activity crashing – Normal and Crash duration and corresponding cost of activities – Cost slope – Crashing of network to optimize cost and duration of a project – Operations Research Technique to optimize assignment of tasks to groups of workmen, transport of materials quarries to sites.

MACHINERY AND EQUIPMENT MANAGEMENT 9Hours

Classes of construction equipment according to functions and work cycle – Plant organization: ownership, leasing and hiring of equipment, their rationale and relative merits – performance factors of earth moving equipment: machine related, environmental related and material related– work cycle and time cycle – Earth work calculation by mass hand diagram.

TENDER AND CONTRACT 9Hours

Tenders: Types, tender notice, tender documents, submission, opening, scrutiny and award – Contract agreement : types of contracts, their relative merits and suitability – Principal clauses and conditions in contract agreement – Payment for works : measurements, bills, deductions. Introduction to construction management software packages – principles of dispute resolution.

Theory: 45Hrs Total:45Hrs

REFERENCES

1. Srinath L S, “PERT/CPM Principles and Applications”, Affiliated East West Press (P) ltd, 2002.
2. Chitkara, K.K. “Construction Project Management Planning, Scheduling and Control”, Tata McGraw-Hill Publishing Co., New Delhi, 2010.
3. Punmia B C and Khandelwal K K, “Project Planning and Control with PERT and CPM”, Laxmi Publications, 1993.
4. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pitsburgh, 2000.

U15CEP701 **DESIGN PROJECT**

L	T	P	C
0	0	4	2

Course Outcomes

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

CO1: prepare plan for various types of structures.
CO2: analyze and design various components of structures using software.
CO3: prepare the working and approval drawings for Civil engineering structures.
CO4: apply suitable software for the projects.
CO5: prepare the project reports in the prescribed formats.
CO6: present project proposals efficiently.

Pre-requisites:

1.U15CET502 Design of Reinforced Concrete Elements,
2. U15CET604 Design of Steel Structures
3. U15CET501 Structural Analysis I
4. U15CET601 Structural Analysis II

Course Assessment methods:

Direct	Indirect
1. Project report 2. Oral presentation	Course end survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S			S		M	
CO2		S	S		S	M			S		M	M
CO3						S			S		M	M
CO4					S	M			S		M	M
CO5						M			S	S	M	M
CO6						M			S	S	M	M

The design project involves the following:

1. Preparation of plan of a Civil engineering structure.
2. Analysis and design of the structure

3. Preparation of detailed drawings
4. Consolidated report preparation

Every Project Work shall have a Guide who is a member of the faculty of Civil Engineering of the college where the student is registered. The hours allotted for this course shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work and also to present in periodical seminars the progress made in the project.

Total : 60Hrs

U15CEP702 **COMPUTER APPLICATIONS LABORATORY**

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: develop design procedures for R.C and steel elements using spread sheet.
CO2: develop spread sheet for design of Pile cap.
CO3: perform estimation and rate analysis for residential buildings using spreadsheet.
CO4: prepare work schedule of a project using software.
CO5: estimate the quantity of civil engineering works using software.
CO6: analyze water distribution pipe network using software.

Pre-requisite : U15CET502 Design of Reinforced Concrete Elements

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			M		S					M	S	M
CO2			M		S					M	S	M
CO3					S					M	S	M
CO4					S					S	S	M
CO5					S					S	S	M
CO6		M			S					M	S	M

1. Spread sheet development for design of RCC and Steel Structural elements.
2. Spread sheet development for design of Pile cap.
3. Spread sheet development for Estimation and Rate analysis of residential building.
4. Scheduling and tracking of a project.
5. Computer aided estimation of buildings.
6. Analysis of pipe network for water distribution.

Practicals: 45Hrs **Total : 45Hrs**

References:

1. Krishnamurthy, D., “Structural Design & Drawing – Vol. 1”, CBS Publishers & Distributors, Delhi 2006.
2. Krishnamurthy, D., “Structural Design & Drawing – Vol. 3 Steel Structures”, CBS Publishers & Distributors, New Delhi 2008.
3. Dayaratnam, Limit state design of R.C structures, India Book House Ltd, 2004
4. Krishna Raju, “Structural Design & Drawing (Concrete & Steel)”, University Press 2004

U15CEP703 DESIGN AND DRAWING (IRRIGATION AND ENVIRONMENTAL ENGINEERING)

L	T	P	C
0	0	3	1

Course Outcomes

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

CO1: design the various irrigation structures.
CO2: draw various irrigation structures using software.
CO3: prepare the general layout for water supply scheme.
CO4: prepare flow diagram for waste water treatment process.
CO5: design and draw various components of water treatment plants.
CO6: design and draw various components of wastewater treatment plants.

Pre-requisite : Water Supply and Waste Water Engineering

Course Assessment methods:

Direct	Indirect
1. Lab exercise 2. Model exam 3. Observation	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		S									
CO2			S									
CO3			S									
CO4			S									
CO5	S		S									
CO6	S		S									

PART- A **25Hours**

- Tank Surplus Weir
- Tank Sluice (Tower Head)
- Canal Regulator
- Canal drop
- Canal Drainage Works (Aqueduct)

PART – B **20Hours**

- General layout of a water supply scheme – wastewater treatment process flow diagram
- Sedimentation tanks

- Rapid sand filters
- Septic Tank
- Activated sludge process
- Trickling filter

QUESTION PAPER PATTERN

Two questions will be set in each part and the students will be asked to write any one in each part. Each question in part – A carries 60 marks and each question in part – B carries 40 marks.

Practical : 45Hrs **Total : 45Hrs**

REFERENCES

1. Satya Narayan Murty Challa, "Water Resources Engineering (principles and practice)" New Age International Publishers, 2002, 2nd Reprint : 2015.
2. Manual on Water Supply and Treatment, CPHEEO, Ministry of Urban Development, New Delhi, 2003.
3. Metcalf Eddy,Franklin.L,H David stensel "Waste Water Engineering Treatment and Reuse" McGrawhill, New York 2015.

U15GHP701 **GLOBAL VALUES**

(Common to all branches of Engineering and Technology)

L	T	P	C
1	0	1	1

Course outcomes:

After successful completion of the course, the student will be able to:

CO1: understand importance of ecology and its preservations
CO2: understand the various global issues and their causes and solutions
CO3: approach any problem holistically as against giving a reductionist solution
CO4: learn impact of globalization on various factors such as environment, local population etc.
CO5: learn to integrate and understand how an Individual peace impacts world peace

Pre-requisite: NIL

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		W					M	M	M	M		M
CO2		W				M	S	S	M	M		M
CO3		W	W		W	M	M	M	W	W		M
CO4		W				S	M	M	W	W		M
CO5						W	W	W				S

Course Assessment methods:

Direct	Indirect
1. Individual Assignment 2. Group Assignment 3. Presentation 4. Surprise Test 5. Practical Assessment 6. End Semester Assessment	Attendance and Behavioural Assessment

Introduction to Global Values	1 Period
Introduction to Systems Thinking	1 Period
Ecology, ecological imbalances and its solution	3 Periods
Globalisation Vs Localisation – an economic and Spiritual Perspective	3 Periods
Global Issues & Solutions	3 Periods
Advanced Contemplative Practices	4 Periods

Theory: 11 Periods **Practical: 4 Periods** **Total Periods: 15**

References Books:

1. Vethathiri's Maharishi's, ***"World peace"*** The World Community Service Centre, Vethathiri Publications,1957.
2. Fritz Schumacher, ***"Small is Beautiful",*** The Blond & Briggs, Published 1973.
3. Noam Chomsky, ***"Profit over People",*** Seven Stories Press, Published 1999.
4. Vethathiri's Maharishi's, ***"Atomic Poison"*** The World Community Service Centre, Vethathiri Publications, 1983.

SEMESTER VIII

U15CEP801 **PROJECT WORK**

L	T	P	C
0	0	20	10

Course Outcomes

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

CO1: carryout literature review of state of the art works in civil engineering field.
CO2: identify the real world problems
CO3: perform mix-design and conduct tests for the given grade of concrete.
CO4: utilize advanced software techniques / skills.
CO5: prepare the project reports in the prescribed formats.
CO6: present project proposals efficiently.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Project report 2. Oral presentation	Course end survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							M					S
CO2							S					
CO3	M	M		S								
CO4	M	M			S							M
CO5	M	M							M	S		
CO6	M	M							S	S	M	

The students in a group of 3 to 4 works on a topic approved by the Project Review committee of the department and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluatedbased on a minimum of three reviews. The Project Review committe may beconstituted by the Head of the Department. A project report is required at the end of the semester. The projectwork is evaluated based on oral presentation and the project report jointly by external and internal examiners appointed by the Controller of Exams.

Total :300Hrs

PROFESSIONAL ELECTIVE

U15CEPE01 **CONCRETE TECHNOLOGY**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: test the properties of various Ingredients of concrete.
CO2: conduct tests for fresh and hardened properties of concrete
CO3: design the concrete mix for the required strength.
CO4: assess the durability properties of concrete.
CO5: suggest suitable admixture for concrete with special properties.
CO6: suggest special type of concrete for the given requirement.

Pre-requisites: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M		M								
CO2	S	M		M								
CO3	S	M		S								
CO4	S	M		M	M							
CO5	S	M		M								
CO6	S	M										

INGREDIENTS OF CONCRETE **9 Hours**

Cement :
Hydration process - Bougue's compounds – Effects – Types of cements - Tests

Aggregates:
General classification of aggregates, particle shape and texture - Alkali-aggregate reaction, thermal properties of aggregates - Grading of fine and coarse aggregates - Tests on aggregates- specific gravity, moisture content, bulk density- Selection of aggregates.

Water
Quality of water – Permissible limits- Suitability of sea water for concreting.

CONCRETE MIX DESIGN **6Hours**

IS Method of Design -ACI method- Mix design for high strength concrete.

PROPERTIES OF CONCRETE **9Hours**

Workability tests - Segregation and bleeding - Curing of concrete - Shrinkage of concrete - creep - thermal expansion - permeability - water tightness and crack control - thermal conductivity- Rebound Hammer test - Test cores Electro dynamic method –pulse velocity method

Quality control:

General - Frequency of sampling - Test specimen - statistical analysis of test results - standard deviation - coefficient of variation - characteristic strength - acceptance and rejection criteria.

DURABILITY AND RESISTANCE OF CONCRETE TO DETERIORATION **6Hours**

Corrosion of reinforcement – reaction between aggregate and cement – reaction of chemicals in aggregate – resistance to various chemicals- concrete in sea water- resistance to sewage – mechanism of disintegration – resistance to erosion and abrasion- resistance to fire- heat resistant concrete

CONCRETE ADMIXTURES **6Hours**

Chemical admixtures: Accelerators - catalysts - retarders - corrosion inhibitors - air entraining agent - workability agent – viscosity modifying agent - Information regarding commercially available admixtures (Plasticizers) - water repelling materials

Mineral admixtures: fly ash, GGBS, Copper Slag, Silica fume.

SPECIAL CONCRETES AND CONCRETING TECHNIQUES **9Hours**

Self-Compacting Concrete- Bacterial Concrete, Geopolymer Concrete, High Strength Concrete, High Performance Concrete, Fibre Reinforced Concrete, Polymer Concrete, Ferrocement and Light Weight Concrete.

Theory:45Hrs **Total: 45Hrs**

REFERENCES

1. Shetty M.S., “Concrete Technology”, S.Chandand Company, 2009.
2. Gambhir,M.L., “Concrete Technology”, Tata McGraw Hill, Publishing CompanyLimited, New Delhi 2004.
3. A.M.Neville,” Properties of Concrete”, J.J.Brooks Pearson Education India Ltd, .2008.
4. A.R. Santhakumar, “Concrete Technology”, Oxford University Press, 2004.
5. Kulkarni, “Text book of Concrete Technology”, Tata McGraw Hill 2000.

U15CEPE02 **BASICS OF DYNAMICS AND ASEISMIC DESIGN**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concept of inertia and damping, equation of motion for SDOF system.
CO2: solve problems in the dynamic response of two degree of freedom systems.
CO3: summarize the phenomenon, causes and measurement of earthquakes.
CO4: explain the concept of response spectrum.
CO5: apply codal provisions on design problems.
CO6: apply codal provisions for ductile detailing.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M										
CO2	S	M										
CO3	M			M								
CO4	M		S									
CO5		S	S	S								
CO6		S		S								

THEORY OF VIBRATIONS **9Hours**

Concept of inertia and damping – Types of Damping – Difference between static forces and dynamic excitation – Degrees of freedom – SDOF idealization – Equations of motion of SDOF system for mass as well as base excitation – Free vibration of SDOF system – Response to harmonic excitation – Duhamel integral

MULTIPLE DEGREE OF FREEDOM SYSTEM **9Hours**

Two degree of freedom system – Normal modes of vibration – Natural frequencies -Mode shapes - Introduction to MDOF systems – Decoupling of equations of motion –Concept of mode superposition.

ELEMENTS OF SEISMOLOGY **9Hours**

Causes of Earthquake – Geological faults – Tectonic plate theory – Elastic rebound theory – Earthquake Terminologies – Seismic waves – Seismograph – Magnitude and intensity of earthquakes – Spectral Acceleration - Case studies on some disastrous earthquakes.

RESPONSE OF STRUCTURES TO EARTHQUAKE **9Hours**

Cyclic behavior of Plain concrete, steel and RCC - Response and design spectra – Design earthquake – concept of peak acceleration – Site specific response spectrum – Effect of soil properties and damping – Liquefaction of soils – Importance of ductility.

DESIGN METHODOLOGY **9Hours**

IS 1893, IS 13920 and IS 4326 – Codal provisions – Methods of introducing ductility into RC structures – Design base shear - Base isolation techniques – Vibration control measures – Capacity building – Important points in mitigating effects of earthquake on structures.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. PankajAgarwal,manishShrikande“EarthquakeResistantDesignofStructures”,Prentice HallofIndiaPvt.Ltd,New Delhi2006
2. S.R.Damodarasamy,S.Kavitha“BasicsofStructuralDynamicsandAseismicDesign”,PH IlearningPvt.Ltd,2009.
3. S.KDuggal“EarthquakeResistantDesignofStructures”,OxfordUniversityPress,NewDe lhi2009
4. Dowrick,D.J, “Earthquake Resistant Design”,JohnWiley & Sons, London,2009

U15CEPE03 **TOWN PLANNING AND ARCHITECTURE**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: perform architectural design of structures.
CO2: suggest the land requirement as per the zoning regulations.
CO3: apply anthropometry and space standards.
CO4: apply green building concepts.
CO5: design for various climate types.
CO6: perform Landscape design.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M								
CO2		M				S						
CO3	M					S						
CO4							S					
CO5		M	S	M								
CO6	M		S	M								

ARCHITECTURAL DESIGN **9Hours**

Architectural design – an analysis – Integration of function and aesthetics – Introduction to basic elements and principles of design.

SITE PLANNING **9Hours**

Surveys – Site analysis – Development control – Zoning regulations - Layout Regulations – Urban Planning standards – Layout design concepts.

BUILDING TYPES **9Hours**

Residential, institutional, commercial and Industrial – Planning concepts – Application of anthropometry and space standards – Inter relationships of functions – Safety standards – Building rules and regulations – Integration of building services – Interior planning

CLIMATE RESPONSIVE DESIGN **9Hours**

Factors that determine climate – Characteristics of climate types – Design for various climate types – Passive and active energy controls – Green building concept

ENVIRONMENTAL DESIGN **9Hours**

Urban renewal – Conservation – Principles of Landscape design – Case studies.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Rangwala," Town Planning " Charotar Publishing House Pvt. Ltd.; 26th Edition edition (2013)
2. G.K. Hiraskar "Fundamentals of Town Planning" Dhanpat Rai Publications, 2012
3. Gallian B. Arthur and Simon Eisner, "The Urban Pattern – City Planning and Design",Affiliated Press Pvt.Ltd, New Delhi, 1995.
4. Givoni B., "Man Climate and architecture", Applied Science, Barking ESSEX, 1982
5. Margaret Roberts, "An Introduction to Town Planning Techniques", Hutchinson,London, 1990.
6. Edward D. Mills, "Planning the Architects Handbook", Butterworth London, 1995
7. Dash Sushil Kumar, "Climate Change An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

U15CEPE04 PAVEMENT ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: find the stress and deflections in pavements under repeated loading.
CO2: design flexible pavement based on IRC guidelines.
CO3: design rigid pavement based on IRC guidelines.
CO4: implement various techniques to evaluate performance of pavements.
CO5: utilize geo synthetics for pavements
CO6: adopt suitable soil stabilization techniques for pavements

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	M		S	S								
CO3	M		S	S								
CO4	M	S										
CO5	M		S									
CO6	M		S									

TYPES OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM **9Hours**

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

DESIGN OF FLEXIBLE PAVEMENTS **9Hours**

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

specification of rural roads.

DESIGN OF RIGID PAVEMENTS **9 Hours**

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

PERFORMANCE EVALUATION AND MAINTENANCE **9Hours**

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

STABILIZATION OF PAVEMENTS **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Wright P.H. " Highway Engineers", John Wiley and Sons, Inc., New York, 1996.
2. Khanna , S.K., Justo C.E.G and veeraragavan . A., " Highway Engineering", Nem Chand and Brothers, 10th edition, Roorkee, 2014.
3. Kadiyali, L.R. " Principles and Practice of Highway Engineering", Khanna tech. Publications, New Delhi, 2000.
4. Yoder R.J. and Witchak M.W. " Principles of Pavement Design", John Wiley 2000.
5. Rajib B. Mallick, Tahar El-Korchi, " Pavement Engineering" Principles and Practice 2nd edition, CRC Press, 2013.

U15CEPE05 **HYDROLOGY**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: measure the rainfall intensity, duration and frequency.
CO2: measure probable maximum precipitation.
CO3: assess the losses of precipitation due to evaporation.
CO4: prepare the unit hydrograph for surface runoff.
CO5: solve the flood routine and channel routine problems.
CO6: conduct yield test on aquifers.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		M								
CO2	M	S		M								
CO3	M	S		M								
CO4	M	S	S	M								
CO5	M	S		M								
CO6	M	S		M								

PRECIPITATION **9Hours**

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

ABSTRACTION FROM PRECIPITATION **9Hours**

Losses from precipitation – Evaporation process- reservoir evaporation- Infiltration process- Infiltration capacity – Measurement of infiltration- Infiltration indices- Effective rainfall

HYDROGRAPHS **9Hours**

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

FLOODS AND FLOOD ROUTING **9Hours**

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

GROUND WATER HYDROLOGY **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Subramanya, K., " Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000.
2. Raghunath, H.M., " Hydrology", Wiley Eastern Ltd., 2000.
3. Jayarami Reddy. P. Hydrology, tat McGraw Hill, 2008.
4. Madan Mohan das and Mimi Das Saikia, Hydrology, Prentice Hall of India, 2013.
5. Chow, V.T. and Maidment D.R., " Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000.
6. Singh, V.P., "Hydrology", McGraw Hill Inc., Ltd., 2000.

U15CEPE06 REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: suggest maintenance and repair strategies.
CO2: assess the durability of concrete under various climatic conditions.
CO3: suggest the suitable materials and techniques for repair.
CO4: suggest suitable special concretes for repair works.
CO5: implement various rehabilitation and retrofitting techniques.
CO6: select suitable demolition techniques for structures.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M									
CO2	M	S	M									
CO3	M	S	M									
CO4	M	S	M									
CO5	M	S	M									
CO6	M	S	S									

MAINTENANCE AND REPAIR STRATEGIES **8Hours**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration.

SERVICEABILITY AND DURABILITY OF CONCRETE **12Hour**

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking. – Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking

MATERIALS AND TECHNIQUES FOR REPAIR **15Hour**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coating and cathodic protection**.**

REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES **6Hours**

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure

DEMOLITION TECHNIQUES **4Hours**

Engineered demolition techniques for Dilapildated structures – case studies

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 2008.
2. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1992.
3. R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1993Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, “RHDC – NBO” Anna University, July 1992..

U15CEPE07 PREFABRICATED STRUCTURES

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the principles and systems of prefabrication in the field.

CO2: safely transport and erect prefabricated elements.

CO3: identify suitable prefabricated components for specific use.

CO4: adopt the design principles for prefabricated structures.

CO5: classify the structural connections.

CO6: utilize the various code provisions regarding progressive collapse.

Pre-requisite: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S									
CO2		S	S			S						
CO3		S	S									
CO4		S	S									
CO5		S	S									
CO6		S	S	S		S						

INTRODUCTION **9Hours**

Need for prefabrication – Principles – Types of prefabrication - Disuniting of structures - Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection – Elimination of erection stresses

PREFABRICATED COMPONENTS **9Hours**

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

DESIGN PRINCIPLES 9Hours

Form factor - Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation – Precision and dimensional Tolerance.

JOINTS IN STRUCTURAL MEMBERS 9Hours

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

PROGRESSIVE COLLAPSE & CODE PROVISIONS 9Hours

Progressive collapse – Code provisions – IS 15916:2010 – ASCE 7-02, ACI 318-02, GSA PBS Facilities Standards 2000, GSA PBS Facilities Standards 2003, GSA PBS Progressive collapse Guidelines 2003 - Importance of avoidance of progressive collapse.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. L. Mokk, Prefabricated Concrete for Industrial and Public Structures, Publishing House of the Hungarian, Academy of Sciences, Budapest, 2007.
2. CBRI, Building materials and components, India, 1996
3. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
4. Koncz T., Manual of precast concrete construction, Vols.I,II and III,Bauverlag, GMBH, 1971.
5. B.Lewicki, Building wih large prefabricates, Elsevier Publishing CompanyAmserdam/London/Newyork.1966.
6. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland BetorVerlag, 1978.
7. IS 15916:2010 – Building design and erection using prefabricated concrete – Code of practice.

U15CEPE08 **PRESTRESSED CONCRETE STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: suggest suitable method of prestressing for the given condition.

CO2:design pre-stressed concrete beam

CO3: design pre-stressed composite beams

CO4: design flexural members with partial pre-stressing

CO5: design pre-stressed concrete tanks, poles and sleepers

CO6: design pre-stressed concrete bridges

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	M	M	S									
CO3	M	M	S									
CO4	M	M	S									
CO5	M	M	S									
CO6	M	M	S									

INTRODUCTION – THEORY AND BEHAVIOUR **9Hours**

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

DESIGN **9Hours**

Flexural strength – Simplified procedures as per codes – strain compatibility method – Basic

concepts in selection of cross section for bending – stress distribution in end block, Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications

CIRCULAR PRESTRESSING **9Hours**

Design of prestressed concrete tanks – Poles and sleepers

COMPOSITE CONSTRUCTION **9Hours**

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members

PRE-STRESSED CONCRETE BRIDGES **9Hours**

General aspects – pre-tensioned pre-stressed bridge decks – Post tensioned pre-stressed bridge decks – Principles of design only.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Krishna Raju N., Pre-stressed concrete, Tata McGraw Hill Company, New Delhi, 2012
2. Mallic S.K. and Gupta A.P., Pre-stressed concrete, Oxford and IBH publishing Co. Pvt Ltd. 2007.
3. Ramaswamy G.S., Modern pre-stressed concrete design, Arnold Heinimen, New Delhi, 2005.
4. Lin T.Y. Design of pre-stressed concrete structures, Asia Publishing House, Bombay 1995.
5. David A.Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete – A design guide, McGraw Hill, New Delhi 1992.

U15CEPE09 **FINITE ELEMENT ANALYSIS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concept of the differential equilibrium equations and their relationship in the analysis of structures.
CO2: formulate shape functions for various elements.
CO3: analyze one and two dimensional problems using finite element approach.
CO4: use displacement models and load vectors to find the member forces.
CO5: apply iso-parametric concept in finite element analysis.
CO6: develop computer programs for an axial and beam bending elements.

Pre-requisite courses: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S									
CO2		S	S									
CO3		S	S									
CO4		S	S									
CO5		S	S									
CO6		S	S		S							

INTRODUCTION **9Hours**

Background - General description of the method - Analysis Procedure. Node numbering – Mesh generation - Linear constitutive equations - Plane stress, Plane strain and axisymmetric cases of elasticity - Energy principles - Variational methods – Raleigh Ritz method – Galerkin Method.

ONE DIMENSIONAL PROBLEMS **9Hours**

Finite element modeling – Coordinates and shape functions – Linear and quadratic elements - Applications to axial loadings of rods – Extension to plane trusses – Bending of beams Element

Finite element formulation of stiffness matrix and load vectors – Assembly for global equations – Boundary conditions.

TWO DIMENSIONAL PROBLEMS **9Hours**

Convergence requirements - Constant Strain Triangular (CST) Element – Rectangular Element -Finite element modeling - Element equations, Load vectors and boundary conditions – Assembly - shape functions from Lagrange and serendipity family— Application to heat transfer.

ISOPARAMETRIC FORMULATION **9Hours**

Introduction – Coordinate Transformation –Basic theorem of Isoparametric concept – Uniqueness of mapping – Isoparametric, Subparametric and Superparametric elements – Assembling Stiffness matrix – Numerical Examples.

APPLICATIONS **9Hours**

Application of displacement finite elements to the analysis of simple problems (one and two dimensional cases) in the area of structural mechanics. Computer Programs: Development of computer programs for an axial and beam bending elements – Use of computer packages – programming techniques.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Krishnamoorthy, C.S, Finite Element Analysis Theory & Programming, McGraw-Hill, 1995.
2. Desai C.S and Abel,, J.F., Introduction to Finite Element Method, affiliated East West Press Pvt Ltd, New Delhi, 2000
3. Chandrupatla T.R., and Belegundu A.D., “Introduction to Finite Elements in Engineering”, Pearson Education 2011, 4th Edition.
4. SS. Bhavikkatti, Introduction to Finite Element Analysis –Newage International (P) Limited Publishers, New Delhi, 2011.
5. Seshu, P., Textbook of finite element analysis. New Delhi: Prentice-Hall of India, 2006.
6. Bathe. K.J., "Finite Element Procedure", Prentice Hall of India, New Delhi, 2006.

U15CEPE10 ADVANCED RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: implement modern trends and developments in railways.
CO2: develop high speed railway tracks.
CO3: prepare layout for airport and classify the airport
CO4: perform the geometric design of airport components
CO5: prepare the plan for various harbor structures
CO6: design coastal structures

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S										
CO2	M	S										
CO3	M	S										
CO4	M	S	S									
CO5	M	S										
CO6	M	S	S									

RAILWAY TRANSPORTATION AND MODERNIZATION 9Hours

Role of Railways in Transportation; Organization of Indian Railways; Classification of Indian railways-Modern trends and developments on World and Indian railways- Metro, mono, underground and tube rails-Tunneling methods-Drainage and Ventilation– Development of High speed tracks – Modernization of track for high speeds- Modern methods of track maintenance

AIRPORT PLANNING 9Hours

Air transport characteristics – airport classification – aircraft characteristics-airport planning; objectives, components, layout characteristics, socio-economic characteristics of the Catchment area, criteria for airport site selection and ICAO stipulations, Typical airport layouts, case

studies, Parking and circulation area.

AIRPORT DESIGN **9Hours**

Runway Design: Orientation, Wind Rose Diagram – Runway length – Problems on basic and Actual length, Geometric design of runways, Configuration and Pavement Design Principles – Elements of taxiway Design – Airport obstruction and zones – Passenger Facilities and Services – airport Markings and lighting- Air traffic control aids-heliports

HARBOUR AND PORTS **9Hours**

Elements of Harbour: Water transportation, harbours, artificial, natural and semi-natural, natural and artificial road steads, accessibility, size and shape of harbours, harbour depth, Features of a harbour, Design of Harbours : Requirements, Classification, Location and design principles – harbor layout and terminal facilities defects in harbour, Ports: classification, design and requirements of a good port, satellite port

COASTAL STRUCTURES **9 Hours**

Break Waters: Breakwaters, alignment, forces acting, classification of breakwaters, breakwater height and failures, comparison of mound type and wall type breakwaters. Docks: General, Open berths, approaches to basins and docks, depth of docks and basins, location and internal arrangement, design and construction of basin or dock walls, dock entrances, sizes of dock entrances, wet docks, dry docks. Berthing Structures: Jetties, Piers, Wharves, Quays, spring fenders, dolphins and its construction. Navigational Aids: Lighthouse, buoys, anchors, moorings. Transit Sheds & Warehouses: planning, design and specific requirements. Environmental concern of Port operations – Coastal Regulation Zone, 2011

Theory:45Hrs **Total : 45Hrs**

REFERENCES

1. SaxenaSubhash C and Satyapalarora, “A course in Railway Engineering”, Dhanpatrai and Sons, Delhi, 2003.
2. Satish Chandra and Agarwal M.M. “Railway Engineering”, 2nd Edition, Oxford University Press, New Delhi, 2013.
3. Khanna S.K., Arora M.G and Jain S.S “Airport Planning and Design” Nemchand & Brothers, Roorkee, 2012.
4. Norman J. Ashford, Saleh Mumayiz, Paul H. Wright “Airport Engineering: Planning, Design and Development of 21st Century Airports” John Wiley & Sons, 2011
5. Bindra S.P, “A Course in Docks and Harbour Engineering” Dhanpatrai and Sons, New Delhi, 2013.
6. Hasmukh Pranshanker Oza, Gautam H. Oza, “Dock and Harbour Engineering”, Charotar Publishing House, 1999.

U15CEPE11 **GEOGRAPHICAL INFORMATION SYSTEM (GIS) AND REMOTE SENSING**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concepts of Electro Magnetic energy, spectrum and spectral signature curves in the practical problems
CO2: apply the concepts of satellite and sensor parameters and characteristics of different platforms
CO3: apply the concepts of DBMS in GIS
CO4: apply digital image processing techniques.
CO5: analyze raster and vector data and modeling in GIS
CO6: apply GIS in land use, disaster management, ITS and resource information system

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S		M									
CO2	S		M									
CO3	S		M									
CO4	S		M		M							
CO5	S		M		M							
CO6	S		S									

EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL **9Hours**

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

PLATFORMS AND SENSORS **9Hours**

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

IMAGE INTERPRETATION AND ANALYSIS **9Hours**

Types of Data Products – types of image interpretation- basic elements of image interpretation- visual interpretation keys – Digital image processing – Pre-processing – image enhancement techniques – multispectral image classification – supervised and unsupervised.

GEOGRAPHIC INFORMATION SYSTEM **9Hours**

Introduction – Maps- Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS software – data type – Spatial and non spatial (attribute) data – measurement scales- Data base Management Systems (DBMS).

DATA ENTRY, STORAGE AND ANALYSIS **9Hours**

Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS highway-alignment studies – land Information system.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Ian Heywood "An Introduction to GIS", Pearson Education, Asia, 2000.
2. Lo.C.P and A.K.W.Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 2002.
3. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.
4. C.P.Lo and Albert K.W.Yeung, Concepts and Techniques of Geographical Information Systems, Prentice Hall India, 2006.
5. Thomas. M.Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003.

U15CEPE12 INDUSTRIAL WASTE MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: suggest the industrial waste disposal methods on land and water environment.
CO2: prevent and control industrial effluents and hazardous wastes implementing environmental legislations.
CO3: conduct waste audit in an industry and implement waste minimization techniques.
CO4: identify the impacts on environment due to various industrial effluents.
CO5: select suitable treatment methods for low, medium and high polluting industries.
CO6: suggest methods for safe disposal of hazardous waste.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	M				S					
CO2		M	M				S					
CO3		M	M			M	S					
CO4		M	M			M	S					
CO5		M	M			M	S					
CO6		M	M				S					

INTRODUCTION **7Hours**

Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

CLEANER PRODUCTION **8Hours**

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

POLLUTION FROM MAJOR INDUSTRIES **10Hours**

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

TREATMENT TECHNOLOGIES **12Hours**

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

HAZARDOUS WASTE MANAGEMENT **8Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES:

1. Nemerow, Nelson Leonard., Industrial waste Treatment", Elsevier Science & Technology, 2007
2. Ahmad Ashfaq., Industrial waste treatment technology", S.K. Kataria & Sons (2014)
3. M.N.Rao&A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication, 1995.
4. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.
5. T.T.Shen, "Industrial Pollution Prevention", Springer, 1999.
6. R.L.Stephenson and J.B.Blackburn, Jr., "Industrial Wastewater Systems Hand book", Lewis Publisher, New Yark, 1998
7. H.M.Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995.
8. Bishop, P.L., "Pollution Prevention: Fundamental & Practice", McGraw-Hill, 2000.

U15CEPE13 **CONSTRUCTION PLANNING & SCHEDULING**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: develop construction plans
CO2: estimate the resource requirements for the project.
CO3: prepare bar chart for work schedule.
CO4: execute quality control and safety during execution.
CO5: judge the quality control through statistical modeling.
CO6: perform cost control monitoring.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S									
CO2		S	S									
CO3		S	S									
CO4		S	S									
CO5		S	S									
CO6		S	S									

CONSTRUCTION PLANNING **9Hours**

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

SCHEDULING PROCEDURES AND TECHNIQUES **9Hours**

Relevance of construction schedules-Bar charts - The critical path method-Calculations for

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

COST CONTROL MONITORING AND ACCOUNTING 9Hours

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

QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9Hours

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods - Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety Management - Person Protection Equipment(PPE)

ORGANIZATION AND USE OF PROJECT INFORMATION 9Hours

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

Theory: 45Hrs Total:45Hrs

REFERENCES

1. Chitkara, K.K. “Construction Project Management Planning,Scheduling and Control”,Tata McGraw-Hill Publishing Co., New Delhi, 2010
2. Chris Hendrickson and Tung Au, “Project Management for Construction Fundamentals Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall,Pitsburgh, 2000.
3. Moder.J., C.Phillips and Davis, “Project Management with CPM, PERT andPrecedence Diagramming”,Van Nostrand Reinhold Co., Third Edition, 1983.
4. Willis., E.M., “Scheduling Construction projects”, John Wiley and Sons 1986.
5. Halpin,D.W., “Financial and cost concepts for construction Management”, John Wiley and Sons, New York, 1985.

U15CEPE14 **WATER RESOURCES SYSTEMS ANALYSIS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: develop simple modeling with respect to water resources.
CO2: identify the sources for the collection of data for developing water resource model.
CO3: plan for water resource projects.
CO4: optimize the water resource models.
CO5: apply bellman's optimality criteria Problem solution.
CO6: develop deterministic simulation model for water resources application.

Pre-requisite: Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S		M							
CO2		M	S		M							
CO3		M	S		M							
CO4		M	S		M							
CO5		M	S		M							
CO6		M	S		M							

SYSTEM APPROACH **9Hours**

Philosophy of modeling – Goals and objectives – Basics of system analysis concept- scopes and steps in systems engineering.

PHYSICAL AND SOCIO ECONOMIC DATA **9Hours**

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

LINEAR PROGRAMMING **9Hours**

Operation research – introduction – problem formulation – graphical solution – Simplex method

– Sensitivity analysis – simple applications.

DYNAMIC PROGRAMMING **9Hours**

Optimality criteria Stage coach problem- bellman's optimality criteria Problem formulation and solution – simple applications

SIMULATION **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Vedula S., and Majumdar, P.P. " Water Resources Systems" – Modelling Techniques and Analysis, tata McGraw Hill, 5th reprint, New Delhi, 2010.
2. Hall Warren, A. and John A. Dracup., " Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
3. Chadurvedi M.C., "Water resource Systems Planning and Management", tata McGraw Hill inc., New Delhi, 1997.

U15CEPE15 **GROUND IMPROVEMENT TECHNIQUES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: assess geotechnical problems at the site.
CO2: suggest suitable ground improvement techniques for different types of soil.
CO3: suggest dewatering and drainage techniques for different types of soil.
CO4: perform in-situ treatment of cohesionless and cohesivesoils.
CO5: utilize geo-textiles for soil stabilization.
CO6: implement grouting techniques for stabilization of expansive soil.

Pre-requisite : Nil

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M									
CO3		S	M									
CO4		S	M		M							
CO5		S	M		M							
CO6		S	M		M							

INTRODUCTION **9Hours**

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

DRAINAGE AND DEWATERING **9Hours**

Drainage techniques - Well points - Vaccum and electro-osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple

cases only).

INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOIL **9Hours**

Insitu densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloation - Sand pile compaction - Preloading with sand drains and fabric drains – Stone columns – Lime piles - Installation techniques only - relative merits of various methods and their limitations.

EARTH REINFORCEMENT **9Hours**

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth – use of Geotextiles for filtration, drainage and separation in road and other works.

GROUT TECHNIQUES **9Hours**

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring – Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Koerner R.M., "Construction and Geotechnical Methods in Foundation Engineering", McGraw-Hill, 1994.
2. Purushothama Raj, P. "Ground Improvement Techniques", Tata McGraw-Hill Publishing Company, New Delhi, 1995
3. Moseley M.P., Ground Improvement Blockie Academic and Professional, Chapman and Hall, Glassgow, 1993.
4. Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1995.
5. Koerner, R.M., "Design with Geosynthetics", (3rd Edition) Prentice Hall, New Jersey, 2002
6. Jewell, R.A., "Soil Reinforcement with Geotextiles", CIRIA special publication, London, 1996
7. Das, B.M., "Principles of Foundation Engineering", Thomson Books / Cole, 2003.

U15CEPE16 **EARTHQUAKE RESISTANT STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: analyze the safety of existing structure using the past earthquake history.
CO2: interpret the cyclic loading behavior of various elements.
CO3: design capacity based structures.
CO4: make use of IS code provisions for shear walls and braced frames.
CO5: analyze a structure by equivalent static procedure and determine base shear.
CO6: apply base isolation systems in buildings

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		M	S									
CO3		M	S									
CO4		M	S									
CO5		M	S									
CO6		M	S									

ELEMENTS OF ENGINEERING SEISMOLOGY **9Hours**

Elements of Engineering Seismology- Theory of Vibrations- Indian Seismicity – earthquake history – behavior of structures in the past earthquakes.

SEISMIC DESIGN CONCEPTS **9Hours**

Seismic Design Concepts – Cyclic loading behavior of RC, Steel and Prestressed Concrete elements- Response Spectrum – Design spectrum – capacity based design.

SHEAR WALLS AND BRACED FRAMES **9Hours**

Provision of Seismic code for frames, shear walls, Braced frames, Combinations- Torsion.

DESIGN METHODOLOGY **9Hours**

IS 1893, IS 13920 and IS 4326 – Codal provisions, Determination of design base shear as per code books – problems.

BASE ISOLATION **9Hours**

Seismic performance – irregular Buildings – Soil performance, modern concepts – Base Isolation – Adoptive systems – case studies.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. S.K.Duggal, Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, 2013.
2. PankajAgarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India, New Delhi, 2015.
3. Bullen K.E., Introduction to the Theory of Seismology, Great Britain at the University Printing houses, Cambridge University press 1996.
4. IS 1893-Part I (2002), "Indian Standard Criteria for Earthquake Resistant Design of Structures".
5. IS 4326 (1993), "Indian Standard Earthquake Resistant Design and construction of buildings - Code of practice PART 1 General provisions and Buildings".
6. IS 13920 (1993), "Indian Standard Ductile detailing of reinforced Concrete Structures subjected to Seismic forces – Code of practice".

U15CEPE17 **STRUCTURAL DYNAMICS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concepts of dynamic systems

CO2: identify, formulate and solve dynamic response of SDOF systems

CO3: identify, formulate and solve dynamic response of MDOF systems

CO4: analyze continuous systems subjected to different types of dynamic loads

CO5: identify, formulate and solve free and forced vibrations response of structural systems.

CO6: analyze and design earthquake resistant structures.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S									
CO2		S	S									
CO3		S	S									
CO4		S	S									
CO5		S	S									
CO6		S	S									

DYNAMIC ANALYSIS **9Hours**

Dynamic analysis – Elements of vibratory systems and simple Harmonic Motion – Mathematical models of SDOF systems- Principle of Virtual displacements – Evaluation of damping resonance.

VIBRATION ANALYSIS **9Hours**

Fourier series expression for loading – (blast or earthquake) – Duhamel's Integral- Numerical evaluation – Expression for generalized system properties – vibration analysis Rayleigh's method – Rayleigh – Ritz method.

FINITE ELEMENT METHOD **9Hours**

Differential equation of motion – Beam flexure including shear deformation and rotary inertia- Vibration analysis using finite element method for beams and frames.

EIGEN VALUE PROBLEM **9Hours**

Evaluation of structural property matrices – Natural vibration – Solution of the eigen value problem – Iteration due to Holzer and Stodola

DESIGN OF EARTHQUAKE RESISTANT STRUCTURES **9Hours**

Idealization of multi-storeyed frames- analysis to blast loading – Deterministic analysis of earthquake response – lumped SDOF system – Design of earthquake resistant structures.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Mario Paz, Structural Dynamics, CBS, Publishers, 2004.
2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 2011.
3. A.K. Chopra, "Dynamics of Structures- Theory and Applications of Earthquake Engineering", Pearson Education 2011.

U15CEPE18 GROUND WATER ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: assess the aquifer properties and its dynamics.
CO2: estimate the ground water yield from an open well/ bore well
CO3: assess the water bearing properties of the rocks at the given site.
CO4: plan the ground water management schemes
CO5: assess the impact of saline water intrusion in ground water
CO6: suggest artificial recharge techniques

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	S									
CO2		S	S									
CO3		S	S									
CO4		S	S									
CO5		S	S									
CO6		S	S									

HYDROGEOLOGICAL PARAMETERS **9Hours**

Introduction – water bearing Properties of Rock – Type of aquifers – Aquifer properties – Permeability, specific yield, transmissivity and storage coefficient – methods of Estimation – Ground water table fluctuation and its interpretations – ground water development and Potential in India – GEC norms

WELL HYDRAULICS **9Hours**

Objectives of Ground water hydraulics – Darcy's Law – Ground water equation – steady state flow – DupuitForchheimer assumption – unsteady state flow – thesis method – Jacob method –

Slug tests – Image well theory – Partial penetrations of wells.

GROUND WATER MANAGEMENT **9Hours**

Need for management model- Database for groundwater management – ground water balance study – Introduction to mathematical model – Conjuctive use – Collector well and infiltration gallery.

GROUNDWATER QUALITY **9Hours**

Groundwater chemistry – origin, movement and quality – water quality standards – health and aesthetic aspects of water quality – Saline intrusion – Environmental concern and regulatory requirements

GROUNDWATER CONSERVATION **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Raghunath H.M., "Ground water Hydrology", New Age International (P) Ltd. New Delhi 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.
3. Fitts R Charles, "Groundwater Science", Elsevier, Academic Press, 2002.
4. Ramakrishnan, S, Ground water, K.J. Graph arts, Chennai 1998.

U15CEPE19 GEOTECHNICAL EARTHQUAKE ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: identify earthquake fault sources.
CO2: apply the principles of earthquake loading.
CO3: quantify earthquake intensity and ground motion.
CO4: estimate seismic soil design parameters.
CO5: analyze and design seismic resistant foundation for buildings.
CO6: prepare soil risk and microzonation maps.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	M									
CO2	M	M	S									
CO3	M	M	S									
CO4	M	M	S									
CO5	M	S	S									
CO6	M	M	S									

MECHANISM OF EARTHQUAKE **9Hours**

Mechanism of Earthquakes- Causes of earthquake- earthquake Fault sources- Elastic Rebound theory – Seismic wave in Earthquake shaking – terminology- Locating an earthquake- Quantification of earthquakes. Strong Motion Records – Characteristics of ground motion- factors influencing Ground motion- Estimation of frequency content parameters.

SEISMIC SITE INVESTIGATIONS **9Hours**

Seismic site investigations- Selected case studies- Evaluation of Dynamic soil properties- Codal provisions

GROUND MOTION **9Hours**

Design Ground Motion – Developing Design Ground Motion- codal recommendations. Earthquake Resistant Design of foundation of Buildings- Design considerations

EARTHQUAKE RESPONSE OF SLOPES **9Hours**

Earthquake Response of slopes- Evaluation of slope stability- Liquefaction- Susceptibility- Liquefaction Resistance- Codal recommendations.

HAZARD ASSESSMENT **9Hours**

Risk mapping- Hazard assessment- Mitigation measures- Seismic microzonation and its importance.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing- New Delhi, 2000.
2. Krammer S.L., Geotechnical Earthquake Engineering, Prentice Hall, International Series, Pearson Education (Singapore) Pvt.Ltd. 2004.
3. KameswaraRao, Vibration Analysis and Foundation Dynamics, Wheeler
4. Robert W.day, geotechnical Earthquake Engineering Hand book, McGraw Hill, 2002.

U15CEPE20 **SHORING, SCAFFOLDING AND FORMWORK**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: plan for the formworks for beams, columns, walls, etc.
CO2: Suggest the requirement of material accessories at the site.
CO3: Analyze the stresses in the formwork.
CO4: Plan for various types of shoring for the construction.
CO5: Suggest suitable type of formwork for the foundations.
CO6: Suggest suitable types of formworks for special structures.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S									
CO2	M	M	S									
CO3	M	M	S									
CO4	M	M	S									
CO5	M	M	S									
CO6	M	M	S									

PLANNING, SITE EQUIPMENT & PLANT FOR FORM WORK **9Hours**

Introduction -Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety -Development of a Basic System -Key Areas of cost reduction -Planning examples. Overall Planning -Detailed planning -Standard units -Corner units -Pass units -Calculation of labour constants -Formwork hours -Labour Requirement - Overall programme Detailed programme -Costing -Planning crane arrangements -Site layout plan -Transporting plant -Formwork beams -Scaffold frames -Framed panel formwork - Formwork accessories.

MATERIALS ACCESSORIES PROPRIETARY PRODUCTS &PRESSURES **9Hours**

Lumber -Types -Finish -Sheathing boards working stresses -Repetitive member stress -Plywood -Types and grades -Jointing Boarding -Textured surfaces and strength -Reconstituted wood -Steel -Aluminum -Hardware and fasteners -Nails in Plywood -Allowable withdrawal load and lateral load. Pressures on formwork -Examples -Vertical loads for design of slab forms -Uplift on shores - Laterals loads on slabs and walls.

DESIGN OF FORMS AND SHORES **9Hours**

Basic simplification -Beam formulae -Allowable stresses -Deflection, Bending -Lateral stability -Shear, Bearing -Design of Wall forms -Slab forms -Beam forms - Column forms -Examples in each. Simple wood stresses - Slenderness ratio -Allowable load vs. length behavior of wood shores -Form lining Design Tables for Wall formwork -Slab Formwork -Column Formwork -Slab props -Stacking Towers -Free standing and restrained -Rosett Shoring -Shoring Tower -Heavy Duty props.

BUILDING AND ERECTING THE FORM WORK **9Hours**

Carpentry Shop and job mill -Forms for Footings -Wall footings -Column footings -Sloped footing forms -Strap footing -Stepped footing -Slab form systems -Sky deck and Multiflex -Customized slab table -Standard Table module forms -Swivel head and uniportal head -Assembly sequence -Cycling with lifting fork -Moving with table trolley and table prop. Various causes of failures - Design deficiencies -Permitted and gradual irregularities.

FORMS FOR DOMES AND TUNNELS, SLIP FORMS AND SCAFFOLDS **9Hours**

Hemispherical, Parabolic, Translational shells -Typical barrel vaults Folded plate roof details -Forms for Thin Shell roof slabs design considerations -Building the forms -Placing concrete -Form removed -Strength requirements -Tunnel forming components -Curb forms invert forms -Arch forms -Concrete placement methods -Cut and cover construction -Bulk head method -Pressures on tunnels -Continuous Advancing Slope method -Form construction -Shafts. Slip Forms -Principles -Types -advantages -Functions of various components -Planning -Desirable characteristics of concrete -Common problems faced -Safety in slip forms special structures built with slip form Technique -Types of scaffolds -Putlog and independent scaffold -Single pole scaffolds -Truss suspended -Gantry and system scaffolds.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Austin, C.K., “Formwork for Concrete”, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., “Formwork for Concrete”, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Robert L. Peurifoy and Garold D. Oberlender, “Formwork For Concrete Structures”, McGraw, 2010
5. Tudor Dinescu and Constantin Radulescu, “Slip Form Techniques”, Abacus Press, Turn Bridge Wells, Kent, 2004

U15CEPE21 **STEEL-CONCRETE COMPOSITE STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concepts of composite construction in engineering.
CO2: analyze the behavior of shear connectors, degree of shear connection and their interaction.
CO3: design composite beams under propped and un-propped condition.
CO4: design different types of composite deck slabs.
CO5: analyze the effects of temperature, shrinkage and creep.
CO6: analyze the effects of cyclic loading on composite sections.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M									
CO3		M	S									
CO4		M	S									
CO5		S	M									
CO6		S	M									

INTRODUCTION **9Hours**

Introduction –types-advantages-comparison-limit states of composite sections- introduction to plastic analysis – mechanism of composite members

SHEAR CONNECTORS **9Hours**

Shear connectors- types of shear connectors - degree of shear connection –partial and complete shear connections- strength of shear connectors- experimental evaluation of shear connectors.

DESIGN OF COMPOSITE BEAMS **9Hours**

Analysis and design of composite beams without profile sheet-propped condition- un-propped condition- deflection – design of partial shear connection

COMPOSITE BEAM WITH PROFILE SHEET **9Hours**

Design of composite beam with profile sheet- propped and un-propped condition – deflection of composite beams – design of partial shear connection

COMPOSITE SLABS **9Hours**

Introduction- Composite slabs- profiled sheeting-sheeting parallel to span-sheeting perpendicular to span- analysis and design of composite floor system..

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Johnson R.P., "Composite Structures of Steel and Concrete" Volume-I, Black Well Scientific Publication, U.K., 1994.
2. Teaching Resources for "Structural Steel Design", Vol.2 of 3, Institute of Steel Development and Growth (INSDAG),2000.
3. Narayanan R., "Composite Steel Structures- Advances, design and construction, Elsvier, Applied Science, U.K., 1987.
4. Owens,G.W&Knowels,P., Steel Designers Manual", (fifth edition), Steel Concrete Institute (U.K), Oxford Blackwell Scientific Publication,1992.
5. IS 11384-1985 Indian Standard Code of Practice for Composite Construction in Structural Steel and Concrete, Bureau of Indian Standards, New Delhi.

U15CEPE22 **TALL BUILDINGS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: implement design philosophies for the development of high rise structures

CO2: find out the design loads for high rise buildings

CO3: analyze the behavior of tall buildings subjected to lateral loading.

CO4: perform computerized general three dimensional analysis for high rise building

CO5: perform stability analysis using various methods for tall buildings

CO6: analyze effect of foundation rotation in tall buildings.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		M	S									
CO3		S	M									
CO4		M	S		M							
CO5		M	S									
CO6		S	M									

DESIGN CRITERIA AND MATERIALS **9Hours**

Development of High Rise Structures – general Planning Considerations- Design Philosophies- Materials used for construction – High Strength Concrete – High Performance Concrete- Self Compacting Concrete – Glass-High strength steel.

LOADING **9Hours**

Gravity Loading-dead load- Live load- Live load reduction technique- Impact load- Construction load- Sequential Loading - Lateral Loading – Wind Load – earthquake Load.

BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS **9Hours**

Factors affecting growth, height and Structural form. High rise behavior of various Structural systems – Rigid frames, braced frames, infilled frames, shear walls, coupled shear walls, wall-frames, tubular structures, cores, outrigger- braced and hybrid mega systems

ANALYSIS AND DESIGN **9Hours**

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

STABILITY OF TALL BUILDINGS **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Bryan Stafford Smith, Alex coull, “Tall Building Structures, Analysis and Design”, John Wiley and Sons, Inc, 1991.
2. Taranath B.S., “Structural Analysis and Design of Tall Buildings”, McGraw-Hill, 2011.
3. Lin. T.Y, Stotes Burry. D, “Structural Concepts and Systems for Architects and Engineers”, John Wiley, 1988.

U15CEPE23 **STORAGE STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1:design steel water tank
CO2: design staging and foundation for water tank
CO3: design concrete , overhead and underground water tanks
CO4: design steel bunkers and silos as per IS codal provisions
CO5: design concrete bunkers and silos as per IS codal provisions
CO6: design prestressed concrete circular water tank

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S									
CO2		M	S									
CO3		M	S									
CO4		M	S									
CO5		M	S									
CO6		M	S									

STEEL WATER TANKS **15Hours**

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

CONCRETE WATER TANKS **15Hours**

Design of Circular tanks – Hinged and fixed at the base – IS method of calculating shear forces and moments – Hoop tension – Design of intze tank – Dome – Ring girders – Conical dome –

Staging – Bracings – Raft foundation – Design of rectangular tanks – Approximate methods and IS methods – Design of underground tanks – Design of base slab and side wall – Check for uplift.

STEEL BUNKERS AND SILOS **5Hours**

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

CONCRETE BUNKERS AND SILOS **5Hours**

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

PRESTRESSED CONCRETE WATER TANKS **5Hours**

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

Theory: 45Hrs **Total:45 Hrs**

REFERENCES

1. Punmia B.C., Ashok Kumar Jain, ArunK.Jain, R.C.C Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd, New Delhi, 2006.
2. Gambhir M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
3. Rajagopalan K., Storage Structures, Tata McGraw-Hill, New Delhi, 1998.
4. Krishna Raju N., Advanced Reinforced Concrete Design, CBS Publishers and Distributors, New Delhi, 1998.

U15CEPE24 **BRIDGE STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: design of through type and deck type steel highway bridges.

CO2: design various types of plate girder bridges.

CO3: design various types of truss girder railway bridges.

CO4: design various types of RC slab bridges for IRC loading.

CO5: design various types of RC girder bridges for IRC loading.

CO6: design prestressed concrete bridges.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S									
CO2		M	S									
CO3		M	S									
CO4		M	S									
CO5		M	S									
CO6		M	S									

INTRODUCTION

9Hours

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

STEEL BRIDGES

9Hours

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.

REINFORCED CONCRETE SLAB BRIDGES **9Hours**

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading

REINFORCED CONCRETE GIRDER BRIDGES **9Hours**

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.

PRESTRESSED CONCRETE BRIDGES **9Hours**

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.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

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.
3. Phatak D.R., “Bridge Engineering”, SatyaPrakashan, New Delhi, 1990.

U15CEPE25 **INDUSTRIAL STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: Prepare the layout for industrial buildings.
CO2: design for functional requirements.
CO3: design steel girder, bunker and silos.
CO4: design RC structures like chimneys and silos.
CO5: design RC folded plates.
CO6: design prestressed precast concrete units.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S									
CO2		M	S									
CO3		M	S									
CO4		M	S									
CO5		M	S									
CO6		M	S									

PLANNING **9Hours**

Classification of Industries and Industrial structures – General requirements for industries like cement, chemical and steel plants – Planning and layout of buildings and components.

FUNCTIONAL REQUIREMENTS **9Hours**

Lighting – Ventilation – Accounts – Fire safety – Guidelines from factories act.

DESIGN OF STEEL STRUCTURES **9Hours**

Industrial roofs – Crane girders – Mill buildings – Design of Bunkers and Silos

DESIGN OF R.C. STRUCTURES **9Hours**

.Silos and bunkers – Chimneys – Principles of folded plates and shell roofs

PREFABRICATION **9Hours**

Principles of prefabrication – Prestressed precast roof trusses- Functional requirements for Precast concrete units

Theory: 45Hrs **Total:45Hrs**

REFERENCES

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

U15CEPE26 **COMPUTER AIDED DESIGN OF STRUCTURES**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: prepare wire frame modeling and solid modeling using drafting packages.
CO2: perform structural analysis using computer packages.
CO3: prepare algorithms for the analysis and design of steel structures.
CO4: prepare algorithms for the analysis and design of RC structures.
CO5: apply optimization techniques in the structural design.
CO6: analysis simple structures using expert systems.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M		S							
CO2		S	M		S							
CO3		S	M		S							
CO4		S	M		S							
CO5		S	M		S							
CO6		S	M		S							

INTRODUCTION **9Hours**

Fundamentals of CAD - Hardware and software requirements -Design process - Applications and benefits.

COMPUTER GRAPHICS **9Hours**

Graphic primitives - Transformations -Wire frame modeling and solid modeling -Graphic standards –Drafting packages

STRUCTURAL ANALYSIS **9Hours**

Fundamentals of finite element analysis - Principles of structural analysis -Analysis packages

and applications.

DESIGN AND OPTIMISATION **9Hours**

Principles of design of steel and RC Structures -Applications to simple design problems – Optimization techniques - Algorithms - Linear Programming – Simplex method

EXPERT SYSTEMS **9Hours**

Introduction to artificial intelligence - Knowledge based expert systems -Rules and decision tables –Inference mechanisms - Simple applications

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Groover M.P. and Zimmers E.W. Jr., "CAD/CAM, Computer Aided Design and Manufacturing", Prentice Hall of India Ltd, New Delhi, 1993.
2. KrishnamoorthyC.S.Rajeev S., "Computer Aided Design", Narosa Publishing House, New Delhi, 1993.
3. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, Oxford, 1990.
4. Rao S.S., "Optimisation Theory and Applications", Wiley Eastern Limited, New Delhi, 1977.
5. Richard Forsyth (Ed), "Expert System Principles and Case Studies", Chapman and Hall, London, 1989.

U15CEPE27 TRANSPORTATION PLANNING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the principles of the transportation planning process and demand estimation.
CO2: analyze the trip production and trip attraction models.
CO3: analyze the growth factor, gravity and opportunity models.
CO4: apply the mode choice behavior and mode split models.
CO5: apply the shortest path models for route assignment.
CO6: perform multiple path assignment.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M									
CO3		S	M									
CO4		S	M									
CO5		S	M									
CO6		S	M									

TRANSPORTATION PLANNING **9Hours**

Transportation planning Process and Concepts – Role of transportation – Transportation problems- Urban travel characteristics – Concept of travel demand – Demand function – demand estimation- sequential, recursive and simultaneous processes

TRIP GENERATION ANALYSIS **9Hours**

Trip Generation Analysis – Zoning- Types and sources of data- Expansive factors – Accuracy checks – Trip generation models- Zonal models – Household models – Category analysis – Trip attractions of work centres.

TRIP DISTRIBUTION ANALYSIS **9Hours**

Trip distribution analysis – Trip distribution models – Growth factor models- gravity models- Opportunity models.

MODE SPLIT ANALYSIS **9Hours**

Mode Split analysis – Mode split models – Mode choice behavior, Competing modes, Mode split curves, Probabilistic models

TRAFFIC ASSIGNMENT **9Hours**

Traffic Assignment- Route split analysis: Elements of transportation networks, Nodes and links- minimum path trees – all or nothing assignment – Multipath assignment – Capacity restraint.

Theory: 45Hr **Total : 45Hrs**

REFERENCES

1. Hutchinson B.G., Principles of Urban Transportation System Planning, McGraw-Hill, 2007.
2. Bruton M.J., Introduction to Transportation Planning, Hutchinson, London, 1992.
3. C.JotinKhisty, B. Kent lall, Transportation Engineering, Prentice Hall of India, 2003.

U15CEPE28 URBAN AND REGIONAL PLANNING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: identify the stages of planning process and surveys in planning
CO2: apply the principles of the regional, master, structural and detailed development plans
CO3: apply the concepts of the garden city movement, linear city and neighborhood.
CO4: identify the financing agencies and its functions.
CO5: involve public participation in planning of the projects.
CO6: apply the town and country plan act and building by-laws.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M									
CO2		S	M									
CO3		S	M									
CO4		S	M									
CO5		S	M									
CO6		S	M									

PLANNING **9Hours**

Definition and classification of urban areas – Trend of urbanization- Planning process – various stages of the planning process- Surveys in planning.

TYPES OF PLAN **9Hours**

Plans- Delineation of planning areas- Regional plan, master plan, Structure plan, detailed development plan and Transportation plan.

PLANNING PRINCIPLES **9Hours**

Planning principles of Ebenezer Howard (Garden City movement), Patrick Geddes, Dr.C.A.Doxiades, Soria Y Mata (Linear City) and Clarance, A Perry (heneighborhood concept).

PLAN IMPLEMENTATION **9Hours**

Plan implementation- Urban Planning agencies and their functions – Financing – Public, private, Non-governmental organizations – Public participation in planning.

REGULATIONS **9Hours**

Development control regulations- Town and country planning act- Building bye-laws.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Hutchinson, B.G., Principles of urban Transport Systems Planning, Scripta, McGraw-Hill, New York, 1974.
2. Clarie, Hand Book of Urban Planning, Van Nostrand Book Company 1974.
3. Gallian, B, Arthur and Simon Eisner, the Urban pattern- City Planning and Design, Affiliated Press Pvt.Ltd., New Delhi, 1995.
4. Margaret Roberts, An Introduction to Town Planning Techniques, Hutchinson, London, 1980.
5. Hiraskar, G.K., Fundamentals of Town Planning, DhanpatRai Publications, 2012.

U15CEPE29 **AIR POLLUTION MANAGEMENT**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: identify the impact on human being, flora and fauna due to air pollution.
CO2: perform quantitative measurements of the dispersion of pollutants in the atmosphere.
CO3: select suitable equipment for air pollution control.
CO4: implement town planning rules and regulation with respect to air pollution.
CO5: assess the ill effects of noise pollution.
CO6: implement necessary control methods for noise pollution.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M				S					
CO2		S	M				S					
CO3		S	M				S					
CO4		M	S				S					
CO5		S	M				S					
CO6		M	S				S					

SOURCES AND EFFECTS OF AIR POLLUTANTS **9Hours**

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

DISPERSION OF POLLUTANTS **9Hours**

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

AIR POLLUTION CONTROL **11Hours**

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

AIR QUALITY MANAGEMENT **7Hours**

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

NOISE POLLUTION **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. RaoM.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
4. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 1997.
5. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
6. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.

U15CEPE30 **DISASTER MANAGEMENT AND MITIGATION**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the remote sensing and GIS techniques for predicting the natural disasters.
CO2: apply various geospatial technology for disaster mapping.
CO3: prepare disaster mapping using GIS.
CO4: assess disaster vulnerability of a location.
CO5: work on recovery & rehabilitation due to disasters.
CO6: prepare disaster management plan.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S				M					
CO2		M	S				M					
CO3		M	S				M					
CO4		M	S				M					
CO5		M	S				M					
CO6		M	S				M					

NATURAL DISASTERS **9Hours**

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

MAN MADE DISASTERS **9Hours**

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

GEOSPATIAL TECHNOLOGY **9Hours**

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

RISK ASSESSMENT AND MITIGATION **9Hours**

Hazards, Risks and Vulnerabilities. -Disasters in 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.

DISASTER MANAGEMENT **9Hours**

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.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

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

U15CEPE31 **ENVIRONMENTAL IMPACT ASSESSMENT**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: carry out screening and scoping for developmental projects.
CO2: implement legal provisions of EIA.
CO3: implement different methodologies for environmental impact assessment.
CO4: measure quantitatively environmental impact on major environments.
CO5: implement ISO guidelines in industries.
CO6: prepare environmental impact assessment reports.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S				S					
CO2		M	S				S					
CO3		M	S				S					
CO4		M	S				S					
CO5		M	S				S					
CO6		M	S				S					

INTRODUCTION **5Hours**

Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) – EIA capability and limitations – Legal provisions on EIA.

METHODOLOGIES **5Hours**

Methods of EIA –Check lists – Matrices – Networks – Cost-benefit analysis – Analysis of alternatives – Case studies.

PREDICTION AND ASSESSMENT **10Hours**

Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation – Rapid EIA.

ENVIRONMENTAL MANAGEMENT PLAN **10Hours**

Plan for mitigation of adverse impact on environment – options for mitigation of impact on water, air and land, flora and fauna; Addressing the issues related to the Project Affected People – ISO 14000

CASE STUDIES **15Hours**

EIA for infrastructure projects – Bridges – Stadium – Highways – Dams – Multi-storey Buildings – Water Supply and Drainage Projects

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Canter, R.L., "Environmental Impact Assessment", McGraw-Hill Inc., New Delhi, 1997.
2. Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.
3. John G. Rau and David C Hooten (Ed)., "Environmental Impact Analysis Handbook", McGraw-Hill Book Company, 1990.
4. "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1999.
5. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I & II", Blackwell Science, 1999.

U15CEPE32 **SOLID WASTE MANAGEMENT**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply sampling techniques to collect municipal solid wastes from an area.
CO2: select shortest route for effective municipal solid waste collection.
CO3: conduct break even analysis and locate transfer station location.
CO4: suggest suitable offsite processing method for solid wastes.
CO5: select suitable equipment, process for handling and disposal of municipal solid waste.
CO6: construct an engineered landfill site for disposal of municipal solid waste.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		S	M				S					
CO2		S	M				S					
CO3		S	M				S					
CO4		S	M				S					
CO5		S	M				S					
CO6		S	M				S					

SOURCES AND TYPES OF MUNICIPAL SOLID WASTES

9Hours

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs; Legislation.

ON-SITE STORAGE & PROCESSING

9Hours

On-site storage methods – materials used for containers – on-site segregation of solid wastes –

public health & economic aspects of storage – options under Indian conditions – Critical Evaluation of Options.

COLLECTION AND TRANSFER **9Hours**

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

OFF-SITE PROCESSING **9Hours**

Processing techniques and Equipment; Resource recovery from solid wastes – composting, incineration, Pyrolysis - options under Indian conditions.

DISPOSAL **9Hours**

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – Leachate collection & treatment

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. George Tchobanoglous et.al. “Integrated Solid Waste Management”, McGraw-Hill Publishers, 1993.
2. B.Bilitewski, G.HardHe, K.Marek, A.Weissbach, and H.Boeddicker, “Waste Management”, Springer, 1997.
3. Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
4. R.E.Landreth and P.A.Rebers, “Municipal Solid Wastes – problems and Solutions”, Lewis Publishers, 1997.
5. Bhide A.D. and Sundaresan, B.B., “Solid Waste Management in Developing Countries”, INSDOC, 1997.

U15GST002 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: Apply & analyze quality concepts and philosophies of TQM.
CO2: Apply concepts of continuous improvement.
CO3: Apply TQM concepts to enhance customer satisfaction and deal with customer related aspects.
CO4: Apply and analyze the quality tools, management tools and statistical fundamentals to improve quality.
CO5: Apply and analyze the TQM tools as a means to improve quality.
CO6: Understand quality systems, procedures for its implementation, documentation and auditing.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M		M							M	
CO2		M		M							M	
CO3		M		M							M	
CO4					S						M	
CO5		M			S						M	
CO6					W						M	

INTRODUCTION **9Hours**

Definition of Quality, Dimensions of Quality, Quality costs, Top Management Commitment, Quality Council, Quality Statements, Barriers to TQM Implementation, Contributions of Deming, Juran and Crosby, Team Balancing

TQM PRINCIPLES **9Hours**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service

Quality, Customer Retention, Continuous Process Improvement,5S, Kaizen, Just-In-Time and TPS

STATISTICAL PROCESS CONTROL **9Hours**

Theseven tools of quality, New seven Management tools, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Concept of six sigma.

TQM TOOLS **9Hours**

Quality Policy Deployment (QPD), Quality Function Deployment (QFD), Benchmarking, Taguchi Quality Loss Function, Total Productive Maintenance (TPM), FMEA

QUALITY SYSTEMS **9Hours**

Need for ISO 9000 and Other Quality Systems, ISO 9001:2008 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, ISO 14001:2004

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Dale H.Besterfiled, "Total Quality Management", Pearson Education
2. James R.Evans& William M.Lidsay, "The Management and Control of Quality", South-Western (Thomson Learning), 2008.
3. Feigenbaum.A.V. "Total Quality Management", McGraw Hill
4. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford
5. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 2007.
6. Zeiri. "Total Quality Management for Engineers", Wood Head Publishers.
7. Bhaskar S. "Total Quality Management", (2007-revised edition) Anuradha Agencies, Chennai.

U15GST003 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply the concepts of management and administration and analyze the evolution of management thoughts.
CO2: apply the concepts of planning, forecasting and decision making
CO3: analyze organizational structures and apply staffing concepts
CO4: analyze the motivational and leadership theories
CO5: apply & analyze the communication and controlling processes.
CO6: analyze the various international approaches to management

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											M	
CO2											M	
CO3											M	
CO4									M		M	
CO5										M	M	
CO6											M	

MANAGEMENT CONTEXT **9Hours**

Management – Definition – Importance – Functions – Skills required for managers - Roles and functions of managers – Science and Art of Management –Management and Administration. Evolution of Classical, Behavioral and Contemporary management thoughts

PLANNING **9Hours**

Nature & Purpose – Steps involved in Planning – Forms of Planning – Types of plans – Plans at Individual, Department and Organization level - Managing by Objectives. Forecasting – Purpose – Steps and techniques. Decision-making – Steps in decision making.

ORGANISING **9Hours**

Nature and Purpose of Organizing - Types of Business Organization - Formal and informal organization – Organization Chart – Structure and Process – Strategies of Departmentation– Line and Staff authority – Benefits and Limitations. Centralization Vs De-Centralization and Delegation of Authority. Staffing – Manpower Planning – Recruitment – Selection – Placement – Induction.

DIRECTING & CONTROLLING **9Hours**

Nature & Purpose – Manager Vs. Leader - Motivation - Theories and Techniques of Motivation.
Leadership – Styles and theories of Leadership.
Communication – Process – Types – Barriers – Improving effectiveness in Communication.
Controlling – Nature – Significance – Tools and Techniques.

CONTEMPORARY ISSUES IN MANAGEMENT **9Hours**

Corporate Governance Social responsibilities – Ethics in business – Recent issues.
American approach to Management, Japanese approach to Management, Chinese approach to Management and Indian approach to Management.

Theory: 45Hrs **Total:45Hrs**

REFERENCES:

1. Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 4th Edition, 2008.
2. Dinkar Pagare, "Principles of Management", Sultan Chand & Sons, 2000.
3. Kanagasapapathi. P "Indian Models of Economy, Business and Management", Prentice Hall of India, New Delhi, ISBN: 978-81-203-3423-6, 2008.
4. Vijayaraghavan, G.K.and Sivakumar, M. "Principles of Management", Lakshmi Publications, 5th Edition, 2009.
5. Bhaskar S. "Principles Of Management", (2011) Anuradha Agencies, Chennai
6. Harold Koontz & Heinz Weihrich, "Essentials of Management – An International perspective", 8th edition. Tata McGraw-Hill, 2009.
7. Charles W.L. Hill and Steven L McShane – Principles of Management, Tata Mc Graw-Hill, 2009.

U15GST004 **OPERATIONS RESEARCH**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: apply linear programming model and assignment model to domain specific situations
CO2: analyze the various methods under transportation model and apply the model for testing the closeness of their results to optimal results
CO3: apply the concepts of PERT and CPM for decision making and optimally managing projects
CO4: analyze the various replacement and sequencing models and apply them for arriving at optimal decisions
CO5: analyze and apply appropriate inventory techniques in domain specific situations.
CO6: analyze and apply appropriate queuing theories in domain specific situations.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S		S								
CO2	S	S		S								
CO3	S	S		S							S	
CO4	S	S		S								
CO5	S	S		S								
CO6	S	S		S								

LINEAR MODEL **9Hours**

The phases of OR study – formation of an L.P model – graphical solution – simplex algorithm – artificial variables technique (Big M method, two phase method), duality in simplex.

TRANSPORTATION AND ASSIGNMENT MODELS **9Hours**

Transportation model – Initial solution by North West corner method – least cost method – VAM. Optimality test – MODI method and stepping stone method.

Assignment model – formulation – balanced and unbalanced assignment problems.

PROJECT MANAGEMENT BY PERT & CPM **9Hours**

Basic terminologies – Constructing a project network – Scheduling computations – PERT - CPM – Resource smoothening, Resource leveling, PERT cost.

REPLACEMENT AND SEQUENCING MODELS **9Hours**

.Replacement policies - Replacement of items that deteriorate with time (value of money not changing with time) – Replacement of items that deteriorate with time (Value of money changing with time) – Replacement of items that fail suddenly (individual and group replacement policies).

Sequencing models- n job on 2 machines – n jobs on 3 machines – n jobs on m machines, Traveling salesman problem.

INVENTORY AND QUEUING THEORY **9Hours**

Variables in inventory problems, EOQ, deterministic inventory models, order quantity with price break, techniques in inventory management.

Queuing system and its structure – Kendall's notation – Common queuing models - M/M/1: FCFS/∞/∞ - M/M/1: FCFS/n/∞ - M/M/C: FCFS/∞/∞ - M/M/1: FCFS/n/m

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Taha H.A., "Operation Research", Pearson Education
2. Hira and Gupta "Introduction to Operations Research", S.Chand and Co.2002
3. Hira and Gupta "Problems in Operations Research", S.Chand and Co.2008
4. Wagner, "Operations Research", Prentice Hall of India, 2000
5. S.Bhaskar, "Operations Research", Anuradha Agencies, Second Edition, 2004

U15GS*T*005

ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT

L	T	P	C
3	0	0	3

Course Outcomes

After successful completion of this course, the students should be able to:

CO1: evaluate the economic theories, Cost concepts and pricing policies

CO2: analyze the market structures and integration concepts

CO3: apply the concepts of national income and understand the functions of banks and concepts of globalization

CO4: apply the concepts of financial management for project appraisal and working capital management

CO5: understand accounting systems

CO6: analyze financial statements using ratio analysis

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation)S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		M				M					M			
CO2				M		M					M			
CO3						M					M			
CO4				M							S			
CO5											S			
CO6		M		M							S			

ECONOMICS, COST AND PRICING CONCEPTS **9 Hours**

Economic theories – Demand analysis – Determinants of demand – Demand forecasting – Supply – Actual Cost and opportunity Cost – Incremental Cost and sunk Cost – Fixed and variable Cost – Marginal Costing – Total Cost – Elements of Cost – Cost curves – Breakeven point and breakeven chart – Limitations of breakeven chart – Interpretation of breakeven chart

– Contribution – P/V-ratio, profit-volume ratio or relationship – Price fixation – Pricing policies – Pricing methods.

CONCEPTS ON FIRMS AND MANUFACTURING PRACTICES 9 Hours

Firm – Industry – Market – Market structure – Diversification – Vertical integration – Merger – Horizontal integration.

NATIONAL INCOME, MONEY AND BANKING, ECONOMIC ENVIRONMENT 9 Hours

National income concepts – GNP – NNP – Methods of measuring national income – Inflation – Deflation – Kinds of money – Value of money – Functions of bank – Types of bank – Economic liberalization – Privatization – Globalization

CONCEPTS OF FINANCIAL MANAGEMENT 9 Hours

Financial management – Scope – Objectives – Time value of money – Methods of appraising project profitability – Sources of finance – Working capital and management of working capital

ACCOUNTING SYSTEM, STATEMENT AND FINANCIAL ANALYSIS 9 Hours

Accounting system – Systems of book-keeping – Journal – Ledger – Trail balance – Financial statements – Ratio analysis – Types of ratios – Significance – Limitations

Theory :45 Hours **Total Hours: 45**

References:

1. Prasanna Chandra, " Financial Management (Theory & Practice) ,"TMH
2. Weston & Brigham, " Essentials of Managerial Finance"
3. Pandey, I. M., "Financial Management"
4. Fundamentals of Financial Management- James C. Van Horne.
5. Bhaskar S. "Engineering Economics and Financial Accounting", (2003) Anuradha Agencies, Chennai
6. Financial Management & Policy -James C. Van Horne
7. Management Accounting & Financial Management- M. Y. Khan & P. K. Jai
8. Management Accounting Principles & Practice -P. Saravanavel
9. Ramachandra Aryasri.A., and Ramana Murthy V.V.,"Engineering Economics & Financial Accounting"-Tata McGraw Hill, New Delhi, 2006.
10. Varshney R.L., and Maheswari K.L.,"Managerial Economics" – Sultan Chand & Sons, New Delhi, 2001
11. Samvelson and Nordhaus,"Economics"-Tata McGraw Hill, New Delhi, 2002

U15GST006	PRODUCT DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3

Objectives:

- Understand the basic concepts of product design and development.
- Know the implications in product architecture and the importance of industrial design.
- Understand prototyping basics and influence of diverse factors on project success.

Course Outcomes:

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

CO1: apply concepts of product development and outline product planning process**.**
CO2: apply relative importance of customer needs in establishing product specifications**.**
CO3: identify concept generation activities and summarize the methodology involved in concept selection and testing.
CO4: outline supply chain considerations in product architecture and understand the industrial design process.
CO5: apply design for manufacturing concepts in estimating manufacturing costs.
CO6: apply principles of prototyping in product development economics and highlight importance of managing projects

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		M		M					W		
CO2			M									
CO3	M		M									
CO4			S			W				M	M	
CO5			S		M	M						
CO6					M				M		S	

INTRODUCTION - DEVELOPMENT PROCESSES AND ORGANIZATIONS - 9Hours
PRODUCT PLANNING

Characteristics of successful product development to Design and develop products, duration and cost of product development, the challenges of product development.
A generic development process, concept development: the front-end process, adapting the generic product development process, the AMF development process, product development organizations, the AMF organization. The product planning process, identify opportunities. Evaluate and prioritize projects, allocate resources and plan timing, complete pre project planning, reflect all the results and the process.

IDENTIFYING CUSTOMER NEEDS - PRODUCT SPECIFICATIONS **9Hours**

Gathering raw data from customers, interpreting raw data in terms of customer needs, organizing the needs into a hierarchy, establishing the relative importance of the needs and reflecting on the results and the process. Specifications, establish specifications, establishing target specifications setting the final specifications.

CONCEPT GENERATION - CONCEPT SELECTION - CONCEPT TESTING **9Hours**

The activity of concept generation clarify the problem search externally, search internally, explore systematically, reflect on the results and the process.Overview of methodology, concept screening, concept scoring, caveats. Purpose of concept test, choosing a survey population and a survey format, communicate the concept, measuring customer response, interpreting the result, reflecting on the results and the process.

PRODUCT ARCHITECTURE - INDUSTRIAL DESIGN - DESIGN FOR MANUFACTURING **9Hours**

Meaning of product architecture, implications of the architecture, establishing the architecture, variety and supply chain considerations, platform planning, related system level design issues.
Assessing the need for industrial design, the impact of industrial design, industrial design process, managing the industrial design process, is assessing the quality of industrial design.Definition, estimation of manufacturing cost, reducing the cost of components, assembly, supporting production, impact of DFM on other factors.

PROTOTYPING - PRODUCT DEVELOPMENT ECONOMICS - MANAGING PROJECTS **9Hours**

Prototyping basics, principles of prototyping, technologies, planning for prototypes.
Elements of economic analysis, base case financial mode,. Sensitive analysis, project trade-offs, influence of qualitative factors on project success, qualitative analysis.
Understanding and representing task, baseline project planning, accelerating projects, project execution and postmortem project evaluation.

Theory: 45Hrs **Total:45Hrs**

REFERENCES:

1. Karl Ulrich,T, Steven Eppinger, D, “Product Design and Development”, McGrawHill, 2015.

2. Chitale, AK, Gupta, RC, "Product Design and Manufacturing" PHI, 2013.
3. Timjones, "New Product Development:An Introduction to a multifunctional process", Butterworth-Heinemann, 1997.
4. Geoffery Boothroyd, Peter Dewhurst and Winston Knight,A, "Product Design for Manufacture and Assembly", CRC Press, 2011.

U15GST007 **PROFESSIONAL ETHICS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: analyze the various concepts and theories of engineering ethics

CO2: apply concepts of ethics and analyze its impact on society

CO3: apply and analyze the concept of safety and risk in the light of engineering ethics

CO4: analyze and evaluate the rights & responsibilities of engineers

CO5: analyze the ethical issues engineers are to consider while operating globally

CO6: applying and analyzing the responsibilities of engineers in management and leadership roles

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						M		S				
CO2						M		S				M
CO3						M		S				
CO4						M		S				
CO5						M		S				
CO6						M		S				

ENGINEERING ETHICS AND THEORIES **9 Hours**

Definition, Moral issues, Types of inquiry, Morality and issues of morality, Kohlberg and Gilligan's theories, consensus and controversy, Professional and professionalism, moral reasoning and ethical theories, virtues, professional responsibility, integrity, self-respect, duty ethics, ethical rights, self-interest, egos, moral obligations.

SOCIAL ETHICS AND ENGINEERING AS SOCIAL EXPERIMENTATION 9 Hours

Engineering as social experimentation, codes of ethics, Legal aspects of social ethics, the challenger case study, Engineers duty to society and environment.

SAFETY **9 Hours**

Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the Three Mile Island and Chernobyl case studies. Bhopal gas tragedy.

RESPONSIBILITIES AND RIGHTS OF ENGINEERS **9 Hours**

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – Intellectual Property Rights (IPR) – discrimination.

GLOBAL ISSUES AND ENGINEERS AS MANAGERS, CONSULTANTS AND LEADERS **9 Hours**

Multinational Corporations – Environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – Engineers as trend setters for global values.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”. (2005) McGraw-Hill, New York.
2. John R. Boatright, “Ethics and the Conduct of Business”, (2003) Pearson Education, New Delhi.
3. Bhaskar S. “Professional Ethics and Human Values”, (2005) Anuradha Agencies, Chennai.
4. Charles D. Fleddermann, “Engineering Ethics”, 2004 (Indian Reprint) Pearson Education / Prentice Hall, New Jersey.
5. Charles E. Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and cases”, 2000 (Indian Reprint now available) Wadsworth Thompson Learning, United States.

U15GST008

FOUNDATIONS SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

L	T	P	C
3	0	0	3

Course Objectives:

To facilitate the acquisition of the foundation skills in the process- tools and techniques in the Integrated Product Development area of the Engineering Services industry.

To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects

Course Outcomes (CO):

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

CO1	Analyze various factors affecting the product development decision and their importance on new product development	K4
CO2	Comparison of various products and services, types and methods of product development, its planning and management.	K4
CO3	Analyze and apply the requirement based on critical parameters and develop system models.	K4
CO4	Apply and analyze the conceptualization, design prototyping ,testing certification and documentation processes related to product development	K3/K4
CO5	Apply and analyze concepts of product maintenance and strategies for obsolescence management, replacement and disposal.	K3/K4
CO6	Demonstrate understanding of product development in academic and real life situations, breakeven and trade off analysis in product development, IPR and security aspects related to product development.	K2

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping (S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak												
COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S		S		S		W	W	M	W	S
CO2	M		S			W			M	M	W	
CO3		M	S	W	M							
CO4			S						M	S		
CO5			M	S				M				
CO6							M					M

FUNDAMENTALS OF PRODUCT DEVELOPMENT **10Hours**

Global Trends Analysis and Product decision: Types of various trends affecting product decision - Social Trends (Demographic, Behavioral, Psychographic), Technical Trends (Technology, Applications, Tools, Methods), Economical Trends (Market, Economy, GDP, Income Levels, Spending Pattern, target cost, TCO), Environmental Trends (Environmental Regulations and Compliance), Political/Policy Trends (Regulations, Political Scenario, IP Trends and Company Policies); PESTLE Analysis.

Introduction to Product Development Methodologies and Management: Overview of Products and Services (Consumer product, Industrial product, Specialty products etc); Types of Product Development (NPD/ Re-Engineering (Enhancements, Cost Improvements)/ Reverse Engineering/ Design Porting & Homologation); Overview of Product Development methodologies (Over the Wall/ Waterfall/ V-Model/ Stage-Gate Process/ Spiral/Systems Engineering/ Agile); Product Life Cycle (S- Curve, Reverse Bathtub Curve); Product Development Planning and Management (Budgeting, Risk, Resources and Design Collaboration, Scheduling, Change Management, Product Cost Management).

REQUIREMENTS AND SYSTEM DESIGN **8Hours**

Requirement Engineering: Types of Requirements (Functional, Performance, Physical, Regulatory, Economical, Behavioral, Technical, Stakeholder, Environmental, Industry specific, Internal-Company Specific); Requirement Engineering (Gathering (VOC), Analysis (QFD), Design Specification); Traceability Matrix and Analysis; Requirement Management.

System Design & Modeling: Introduction to System Modeling; System Optimization; System Specification; Sub-System Design; Interface Design.

DESIGN AND TESTING **13Hours**

Conceptualization: Industrial Design and User Interface Design; Introduction to Concept generation Techniques; Concept Screening & Evaluation - Concept Design, S/W Architecture, Hardware Schematics and simulation.

Detailed Design: Component Design and Verification; High Level Design/Low Level Design of S/W Programs, S/W Testing; Hardware Schematic, Component design, Layout and Hardware Testing. **Prototyping:** Types of Prototypes (Mockups, Engineering Assessment Prototype, Alpha, Beta, Gama); Introduction to Rapid Prototyping and Rapid Manufacturing. **System Integration, Testing, Certification and Documentation:** Manufacturing/Purchase and

Assembly of Systems; Integration of Mechanical, Embedded and S/W systems; Introduction to Product verification processes and stages – Industry specific (DFMEA, FEA, CFD); Introduction to Product validation processes and stages - Industry specific (Sub-system Testing/ Integration Testing/ Functional Testing/ Performance Testing / Compliance Testing); Product Testing standards and Certification – Industry specific; Product Documentation (Compliance Documentation, Catalogue, Brochures, user manual, maintenance Manual, Spares Parts List, Warranty, Disposal Guide, IETMS, Web Tools).

SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT **6Hours**

Sustenance: Maintenance and Repair; Enhancements. **Product EoL:** Obsolescence Management; Configuration Management; EoL Disposal.

BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY **8Hours**

The Industry: Engineering Services Industry – Overview; Product development in Industry versus Academia.

The IPD Essentials: Introduction to vertical specific product development processes; Product development Trade-offs; Intellectual Property Rights and Confidentiality; Security and Configuration management.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Foundation Skills in Integrated Product Development (FSIPD), First Edition, 2013, Published by NASSCOM.
2. Ulrich, Karl T. and Eppinger, Steven D, "Product Design and Development", McGraw-Hill, Fifth Edition, 2012.
3. Kevin N. Otto, "Product design – Techniques in Reverse Engineering and New Product Development", PEARSON, New Delhi, 2011.

OPEN ELECTIVE

U15CEOE01 BASICS OF CIVIL ENGINEERING

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: select suitable construction materials for the projects.
CO2: advice on suitable site for construction.
CO3: suggest suitable type of flooring and roofing for the given building.
CO4: check the land survey works.
CO5: suggest water resources for drinking water and disposal techniques.
CO6: understand various transportation systems.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

BUILDING MATERIALS

9Hours

Introduction–Civil Engineering–Materials: Bricks–composition–classifications–properties–uses. Stone–classification of rocks–quarrying–dressing–properties–uses. Timber-properties–uses–ply wood. Cement–grades–types–properties–uses. Steel–types–mild steel–medium steel–hard steel–properties–uses–market forms. Concrete–grade designation–properties–uses.

BUILDING COMPONENTS

9Hours

Building–selection of site–classification–components. Foundations–functions–classifications–

bearing capacity. Flooring–requirements–selection–types–cement concrete marble–terrazzo floorings. Roof–types and requirements.

SURVEYING **9Hours**

Surveying–objectives–classification–principles of survey- Types of Survey – Measurement of Horizontal angle, Vertical angle, Horizontal and vertical distances – leveling – Advanced Survey - GIS

WATER SUPPLY AND SEWAGE DISPOSAL **9Hours**

Dams–purpose–selection of site–types–gravity dam (cross section only).Water supply–objective–quantity of water–sources–standards of drinking water–distribution system. Sewage–classification–technical terms–septic tank–components and functions.

TRANSPORTATION **9Hours**

Transportation–classification–cross section and components of road–classification of roads. Railway–cross section and components of permanent way–functions. Waterway–docks and harbor–classifications–components. Bridge–components of bridge.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Raju.K.V.B, Ravichandran.P.T, “Basics of CivilEngineering”, AyyappaPublications, Chennai, 2012.
2. Rangwala .S.C,”EngineeringMaterial”s, Charotar Publishing House, Anand, 2012.

U15CEOE02 SOLID AND FLUID MECHANICS

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: analyze the structural members and machines for stress and strain calculations.
CO2: analyze determinate beams to determine shear forces, bending moments.
CO3: analyze the shafts under torsion for shear stress calculations.
CO4: apply inter-relationship of various properties of fluid in practical problems.
CO5: measure the fluid pressure.
CO6: apply the working concepts of various devices used to measure the velocity and discharge of fluid.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

STRESS AND STRAIN

9Hours

Stress and strain at a point-Tension, Compression, Shear stress- Hooke's law-Relationship among elastic constants- Stress, strain diagram for Mild steel, TOR steel, Concrete- Ultimate stress-Yield Stress-Factor of safety

SHEAR AND BENDING IN BEAMS

9Hours

Beams and bending- Types of loads, supports- Shear force and bending moment diagrams for

statically determinate beams with concentrated load, UDL, uniformly varying load – Shear stress and bending stress in beams.

TORSION **6Hours**

Theory of torsion – Torsion equation – Polar Modulus – Stresses in Solid and Hollow Shafts – Power transmitted by a shaft.

PROPERTIES OF FLUID **5Hours**

Units of measurement, Newtonian and Non Newtonian fluids; Vapour pressure, compressibility and Elasticity; Surface Tension and Capillarity.

FLUID STATICS AND DYNAMICS **9Hours**

Variation of static pressure; Pascal's law; Atmospheric, Absolute and gauge pressure; Pressure measurement by mechanical gauges and manometers; pressure on plane surfaces and curved surfaces - Euler's equation of motion; Bernoulli's equation; Energy correction factor; momentum principle; Applications of momentum equation.

FLOW MEASUREMENTS IN PIPES **7Hours**

Discharge through Venturimeter; Discharge through orifice meter; Discharge through flow nozzle: Measurement of velocity by Pitot tube.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Rajput, R. K, "A Textbook of Strength of Materials", S. Chand Publications, 2007.
2. Subramanian R., "Strength of Materials", Oxford University Press, New Delhi 2005.
3. Premalatha J., "Mechanics of solids", Vignesh Publications, Coimbatore 2008.
4. R.K. Bansal, "Strength of materials", Laxmi Publications, New Delhi, 2010.
5. P.N. Modi& S.M. Seth, "Hydraulics and fluid mechanics including hydraulic machines," Standard book house, New Delhi, 2008
6. R.K. Bansal, "Fluid mechanics and hydraulic machines," Laxmi Publications (P) Ltd, 2012.

U15CEOE03 **ENERGY CONSERVATION IN BUILDINGS**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: perform energy estimation for buildings.
CO2: plan for the energy conservation methods in buildings.
CO3: plan for energy efficient buildings.
CO4: implement thermal insulation techniques in buildings.
CO5: apply monitoring and control of energy systems in buildings.
CO6: implement intelligent building design principles.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

CLIMATE AND ENERGY ESTIMATION **12Hours**

Climate and shelter – Historic buildings – Modern architecture – Examples from different climate zones – Thermal comfort – Solar geometry and shading – Heating and cooling loads – Energy estimates and site planning – Integrative Modeling methods and building simulation.

PRINCIPLES OF ENERGY **11Hours**

Principles of Energy conscious building design – Energy conservation in buildings – Day lighting – Water heating and photovoltaic systems – Advances in thermal insulation – Heat gain/loss through building components – Solar architecture.

ENERGY CONSERVATION **11Hours**

Passive solar heating – Direct gain – Thermal storage wall – Sunspace – Convective air loop – Passive cooling – Ventilation – Radiation – Evaporation and Dehumidification – Mass effect – Design guidelines.

MONITORING AND CONTROL SYSTEMS **11Hours**

Energy conservation in building – Air conditioning – HVAC equipment – Computer packages for thermal design of buildings and performance prediction – Monitoring and instrumentation of passive buildings – Control systems for energy efficient buildings – Illustrative passive buildings – Integration of emerging technologies – Intelligent building design principles.

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. J.A. Clarke, Energy Simulation in Building Design (2e) Butterworth 2001.
2. J.K. Nayak and J.A. PrajapatiHadbook on Energy Consious Buildings, Solar Energy Control MNES, 2006.
3. Energy Conservation Building Codes 2006; Bereau of Energy Efficiency.
4. J.R. Williams, Passive Solar Heating, Ann Arbar Science, 1983.
5. R.W. Jones, J.D. Balcomb, C.E. Kosiewiez, G.S. Lazarus, R.D. McFarland and W.O. Wray, Passive Solar Design Hanbook, Vol.3, Report of U.S. Department of Energy (DOE/CS-0127/3), 1982.
6. M.S. Sodha, N.K., Bansal, P.K. Bansal, A.Kumar and M.A.S. Malik. Solar Passive Building, Science and Design, Pergamon Press, 1986.
7. J.L. Threlkeld, Thermal Environmental Engineering, Prentice Hall, 1970.

U15CEOE04 **TRAFFIC ENGINEERING AND MANAGEMENT**

L	T	P	C
3	0	0	3

Course Outcomes

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

CO1: analyze traffic problems and plan for traffic systems for various uses.
CO2: plan for infrastructure for urban development.
CO3: conduct traffic survey.
CO4: design channels, intersections, signals and parking arrangements.
CO5: plan for integration of public transport system.
CO6: develop Traffic Management Systems.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Internal tests 2. Assignment 3. Presentation 4. End semester exam	Course End survey

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												
CO6												

TRAFFIC PLANNING AND CHARACTERISTICS **9Hours**

Road characteristics – Road User Characteristics - PIEV Theory – Vehicle - Performance characteristics – Fundamentals of Traffic flow – Urban Traffic problems in India- Integrated planning of town, country, regional and all urban infrastructure- Towards sustainable approach- land use & transport and modal integration

TRAFFIC SURVEYS **9Hours**

Traffic surveys- Speed, journey time and delay surveys – Vehicles- Volume Survey including

non-motorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation - Parking Survey – Accident Analysis – Methods, interpretation and presentation- Statistical applications in traffic studies and traffic forecasting – Level of Service – Concept, applications and significance.

TRAFFIC DESIGN AND VISUAL AIDS **9Hours**

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

TRAFFIC SAFETY AND ENVIRONMENT **9Hours**

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

TRAFFIC MANAGEMENT **9Hours**

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

Theory: 45Hrs **Total:45Hrs**

REFERENCES

1. Kadiyali. L.R “Traffic Engineering and Transport Planning”, Khanna Publishers, Delhi, 2016.
2. Indian Roads Congress (IRC) Specifications SP:43: Guidelines on Traffic Management Techniques for Urban Areas
3. Salter R.I and Hounsell N.B, “Highway Traffic Analysis and design”, Macmillan Press Ltd. 1996.
4. Fred L. Mannering, Scott S. Washbum and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt.Ltd., New Delhi, 2013.
5. Garber and Hoel, “Principles of Traffic and Highway Engineering”, CENGAGE Learning, New Delhi, 2010.

ONE CREDIT COURSES

U15CEI001 TOTAL STATION SURVEYING

Course Outcomes

After successful completion of this course, the students should be able to

CO1: survey the given area using total station and prepare the project report.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S					S		

Introduction to total station-fundamental measurements-horizontal axis-vertical axis-basic calculations-horizontal, vertical, distances-coordinate calculation- hands on training on total station-fixing of change point-total station traversing-calculation of distances between two in accessible points-columns marking using total station-contour mapping-application of total station for any one of the real time field problems including gaining of the knowledge on total station related software, coordinate to ground marking and ground point to coordinate calculation, etc- report preparation.

Total:15Hrs

U15CEI002 **TENDER DOCUMENT PREPARATION**

Course Outcomes

After successful completion of this course, the students should be able to

CO1: prepare tender document for Civil Engineering works

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1										S	S	

Definition of tender-reasons to float tender-competent agency to call tender- financial limit or powers to call a tender by various officials in state and central government-turnkey project-execution methods-Design Build Operate and then Transfer(DBOT)- Design Build Operate, Train and then Transfer DBOTT,etc- global tender-company tie up- technical bid-commercial bid-techno commercial bid-final selection-vested powers/authority to finalize the tender in public sector and in private sector-single or monopoly tender–delegation of powers-documents /drawings to be attached along with tender documents while selling the tender document and while filling the tender documents-tender document notification-newspaper references-tender related /associated terms definitions like specifications, rate analysis , lead, lift, estimates, locally available materials, contractors profit, compromise/arbitration, schedule of rates, etc-online submission of tender documents.

Total:15Hrs

U15CEI003 BUILDING BYE-LAWS AND APPROVAL DRAWING PREPARATION

Course Outcomes

After successful completion of this course, the students should be able to

CO1: implement building bye-laws for preparing the drawings to get the approval from competent authority.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						S				S		

Introduction to National Building Code (NBC), Building bye-laws formulated by Local Planning Authority (LPA), Town and Country Planning Authority (TCPA), Municipal Corporation, Punchayat Authorities, etc. preparation of drawings incorporating necessary standards and submitting for approval from competent authorities. Key factors to be included while preparing approval drawings- Role of Licensed Building Surveyor (LBS) in preparing and submitting the drawings for approval. Pros and Cons while violating the norm of building bye laws, advantages of getting the drawing approval from competent authorities- hierarchy in government sector departments, jurisdiction, delegation of powers, etc

Total:15Hrs

U15CEI004 CONSTRUCTION PLANNING USING SOFTWARE

Course Outcomes

After successful completion of this course, the students should be able to

CO1: prepare planning and scheduling for Civil Engineering project works.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S						S	

Need For Construction Planning - introduction to basic Construction Planning methods-bar chart, PERT, CPM networks, critical path-sequential approach of works in Civil engineering projects like building construction, road works, construction of dam works, water supply and irrigation projects, etc. construction resources management (i.e money material, men, ,machinery and time), fund flow, break even analysis-golden ratio of material management , labour management, outturn of men and machinery in project works, benefits and ill effects of in time completion of project and delay in construction works. Introduction to construction planning software (Primavera and MS Projects). Simple construction planning works using software. A case study report on construction planning works for any one of the civil engineering project works

Total:15Hrs

U15CEI005 GREEN BUILDING AUDIT

Course Outcomes

After successful completion of this course, the students should be able to
CO1: rate the building with respect to IGBC guidelines

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							S					

Green building- Definition - Myths of Green Buildings – difference between conventional and green buildings- elements in green building- reasons to go for green building construction- benefits and subsidies given to green buildings. Indian Green Building Council (IGBC) -IGBC Ratings for Green Buildings-Other rating systems for green buildings - Application of eQuest software for green building analysis. Simulation of data for the green concepts applied in conventional building-rating of green building from the simulation study.

Total:15Hrs

U15CEI006 ENVIRONMENTAL QUALITY MODELING

Course Outcomes

After successful completion of this course, the students should be able to
CO1: analyze and interpret data for developing Environmental quality model

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				S			S					

Introduction to Environmental Models (land, air and water)-Need for mathematical models-types of models with examples-water quality models, Water Quality Index (WQI) and its application. Classic Streeter Phelps Oxygen Sag Equation, and its application, wastewater quality models-bio degradability of wastewater-Industrial wastewater reactor models –Air Quality Models-Air Pollution Index (AQI) –air pollution dispersion model in the atmosphere-Maximum Mixing Depth (MMD) calculation in chimney/stack design for dispersing the pollutants for various plume rise conditions-application of pollutant dispersion model in under water disposal of pollutants in ocean/sea-statistics for environmental engineers-data analysis-simple statistical model calculation with respect to water, air and land

Total:15Hrs

U15CEI007 **APPLICATION OF REMOTE SENSING AND GIS IN CIVIL ENGINEERING**

Course Outcomes

After successful completion of this course, the students should be able to
CO1: integrate RS and GIS for execution of Civil Engineering projects.

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					S						S	

Introduction to Remote Sensing (RS)-classification of RS - historical background of RS- stages in an idealized RS system- basic principle of RS-electromagnetic energy-electromagnetic spectrum and spectral regions-wave length regions and its application in RS-EM radiation and the atmosphere-Atmospheric Windows-interaction of EM radiation with earth surface-RS observing platforms-IRS satellites-RS sensors- -Introduction to Geographical Information System(GIS) –Essentials of GIS-interdisciplinary approach in GIS-Hardware Components of GIS- GIS Software Packages-Arc/Info GIS Packages-Linkage of GIS to RS - Application of RS and GIS for urban sprawl-Urban Zoning-Watershed Management-Water Quality Management-EIA-Vehicle Routing For Municipal Solid Waste Management-Monitoring Urban Forestry

Total:15Hrs

U15CEI008 INTRODUCTION TO INDIAN TRADITIONAL ARCHITECTURE

Course Outcomes

After successful completion of this course, the students should be able to
CO1: apply vaastusastra in vernacular architecture

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								W		W		

Introduction to Indian Architecture- Vedic age, Indus Valley civilization, Gupta, Maurya period Indian Texts on Architecture -Vaastu Sastra, their role in design and construction, Introduction to Mayamatha, Maanasara, Styles in Indian Architecture- Historical evolution of Dravida, Vesara, Nagara Architecture with examples-Vernacular architecture- Introduction to vernacular architecture- residential & public buildings.

Total:15 Hrs

U15CEI009 STRUCTURAL DETAILING AND BAR BENDING SCHEDULE

Course Outcomes

After successful completion of this course, the students should be able to
CO1: prepare bar bending schedule for the structural elements like beams and columns

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			S									

IS codes-Types of reinforcements – tests on reinforcements – symbols – crank – curtailment – different shapes – bar bending methods - study of drawings – preparation and estimation of bar bending schedule for different RCC works - minimize bar waste - checking reinforcement before concreting – software applications.

Total:15 Hrs

U15CEI010 CONSTRUCTION SAFETY ENGINEERING

Course Outcomes

After successful completion of this course, the students should be able to

CO1: Understand importance of various aspects of safety during construction activity and apply principles of environmental safety to construction projects

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	W					M	W				

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

Safety Organization –Safety Policy, Safety Record Keeping, Safety Culture-Safe Workers Safety and First Line Supervisors-Safety and Middle Managers-Top Management Practices, Company Activities and Safety-Safety Personnel-Sub contractual obligation, Project Coordination and Safety Procedures

Total:15 Hrs

U15CEI011 UNDERGROUNG AND ELEVATED METRO PROJECTS

Course Outcomes

After successful completion of this course, the students should be able to
CO1: participate in planning of metro rail projects
CO2: design various infrastructures involved in metro rail projects

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping
(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M	S									
CO2		M	S									

Introduction to Metro - Planning and Monitoring - Under Ground Metro - TBM Tunnel, Station Buildings, Cross Passages - Design Aspect - UG Metro, Elevated Metro, Temporary Structures Utility and Traffic Diversions, Instrumentation, Cut and Cover Tunnels, Open Ramps and Box Pushing Methods.

Total:15 Hrs

U15CEI012 3D SOFTWARE FOR MODELING, ANIMATION AND RENDERING – REVIT ARCHITECTURE

Course Outcomes

After successful completion of this course, the students should be able to

CO1: prepare the detailed plan and 3D modeling for various buildings using Revit Architecture software

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M			S							S

Introduction to Revit Architecture - Exploring the User Interface - General commands, Wall Types - Doors & Windows - Floor, Roofs - Stair – Annotate – Visualization - Camera view, Rendering, walkthrough. .

Total:15 Hrs

U15CEI013 3D SOFTWARE FOR MODELING, ANIMATION AND RENDERING – 3D STUDIO MAX

Course Outcomes

After successful completion of this course, the students should be able to

CO1: prepare the detailed plan and 3D modeling for various buildings using 3D Studio Max software

Pre-requisite: NIL

Course Assessment methods:

Direct	Indirect
1. Quiz 2. Seminar	

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		M			S							S

Introduction to 3D Studio Max - Exploring the User Interface - General commands, create tools – shape tools, import files, material addition, Camera setting, light setting, water animation ,Camera view, Rendering, walkthrough.

Total:15 Hrs