MANAGEMENT AND ENTREPRENEURSHIP

Course Code: 19HS5ICMEP **Credits: 03**
L: P: T: S: 3: 0: 0: 0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**
Total Hours: 40

COURSE OBJECTIVES:

1. Understand the underlying principles of management.
2. To analyze and identify the functions of entrepreneurial activities and its prerequisites under practical conditions.
3. To develop and enhance one's decision making skills amidst competitive business market.

Course Outcomes: After completion of the course, the graduates will be able to

MANAGEMENT & ENTREPRENEURSHIP	
CO1	Apply the principles of management in business activities.
CO2	Use the managerial and entrepreneurial qualities & skills under real world condition.
CO3	Analyze the functions of Management & Entrepreneurship and apply those in practical situations.
CO4	Identify various schemes provided by government of India to support business enterprise.
CO5	Develop leadership skills to build a small scale industry.
CO6	Develop entrepreneurial personality, able to prepare project report and initiate SSI.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	3	3	2	2	-	-	-
CO2	-	-	-	-	-	3	3	2	2	-	-	-
CO3	-	-	-	-	-	3	3	2	2	-	-	-
CO4	-	-	-	-	-	3	3	2	2	-	2	-
CO5	-	-	-	-	-	3	3	2	2	-	2	-
CO6	-	-	-	-	-	3	3	2	2	-	2	-

Unit	Course Content	Hours	COs

1	MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and Functional areas of management – Management as a science, art and profession – Management & Administration – Roles of Management, Levels of Management. PLANNING: Nature, importance and purpose of planning process – Objectives – Types of plans.	06	CO1 CO2
2	ORGANIZING AND STAFFING: Nature and purpose of organization – Principles of organization – types of organization – Departmentation – Committees-Centralization Vs Decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning Only) Nature and importance of staffing. (Case studies discussion)	10	CO1 CO2
3	DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, Motivation (Definition),characteristics, motivational theories (Maslow's theory, theory 'X' and 'Y'), Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).	06	CO3 CO4
4	ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, and Entrepreneur – an emerging Class. Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship – its Barriers, EDP and its objectives (Case studies discussion, role play / group discussion)	08	CO3 CO4
5	SMALL SCALE INDUSTRY: Definition; Characteristics; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI, Steps to start an SSI, Impact of Liberalization, Privatization, Globalization on S.S.I, Effect of WTO/GATT. Overview of detailed project report/profile. Startup India: Benefits, Policies. Action plan- simplification and Handholding, Funding Support and incentives, Industry-Academia Partnership and Incubation. Salient features of Karnataka Startup Policy 2015-2020, Strategies encouraging entrepreneurship through NAIN. Venture capitalist, SSI funding schemes by banks and financial institutions, Government of India Initiatives on Thrust Areas, (Related case studies, supporting videos)	10	CO5 CO6

SELF-STUDY COMPONENT:
Preparation of Project report/Profile

Note:
1**.** At the end of the course students should have cultivated the ability to prepare project profile based on their selected business idea.
2. One Credit is allocated to project profile prepared by students.
3. Project profile/report shall be submitted before the end of the course.

Contents /Structure of project report/profile:

1. Introduction

2. Market potential

3. Basis and pre assumptions

4. Implementation schedule

5. Technical aspects

6. Financial aspects and analysis

8. Details of machinery and equipment/ service suppliers

TEXT BOOKS:
1. Principles of Management – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill.
2. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House.
3. Entrepreneurship Development – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).
4. Management & Entrepreneurship-N V R Naidu, IK International, 2008

REFERENCE BOOKS:
1 Management Fundamentals – Concepts, Application, Skill Development – Robers Lusier – Thomson.
2. Entrepreneurship Development – S.S.Khanka – S.Chand & Co.
3. Management – Stephen Robbins – Pearson Education/PHI – 17th Edition, 2003.
4. http://www.startupindia.gov.in/
5. http://startup.karnataka.gov.in/docs/Startup_Policy_Karnataka.pdf

Assessment Pattern:
CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Preparation of Project Report/ Profile
Marks (Out of 50)	30	20
Remember	--	02

Understand	10	02
Apply	10	04
Analyze	05	04
Evaluate	05	03
Create		05

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	10
Understand	10
Apply	10
Analyze	10
Evaluate	10
Create	

ANALYSIS OF INDETERMINATE STRUCTURES

Course Code	**: 19CV5GCISA**	**Credits**	**: 4**
L:P:T:S	**: 4:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 04**	**Total hours**	**: 50**

Course Objectives:

1. To analyze structures for different loading and support conditions.
2. To determine the appropriate method of analysis for structures with increased number of degrees of freedom.
3. To understand the concept of analysis for rolling loads and development of Influence Line Diagrams.

Course Outcomes: At the end of the course the students will be able to

	Course Outcome
CO 1	Analyze indeterminate beams and frames using Moment Distribution method
CO 2	Analyze indeterminate beams and frames using Slope Deflection method
CO 3	Analyze indeterminate beams and frames using flexibility and stiffness matrix method of analysis
CO 4	Understand the concept of degrees of freedom by basic structural dynamic approach
CO 5	Understand of rolling load and influence lines and use of commercial software on structural analysis

Mapping of Course outcomes to Program outcomes:

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

Module	Content	Hours	Co's
1	MOMENT DISTRIBUTION METHOD: Introduction, Definition of terms, Distribution factor, Carry over factor, Development of method and Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy ≤ 3)	**10**	**CO1**
2	SLOPE DEFLECTION METHOD: Introduction, Sign convention, Development of slope deflection equations and Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy ≤3. (Members to be axially rigid)Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy ≤ 3)	**10**	**CO2**
3	KANI'S METHOD: Introduction, Sign convention, Development of slope deflection equations and Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy ≤3. (Members to be axially rigid)Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy ≤ 3)	**10**	**CO3**
4	MATRIX METHOD: (Direct Approach) Introduction, Development of flexibility and stiffness matrix for plane truss elements and axially rigid plane framed structural elements. Analysis of axially rigid plane frames by flexibility and stiffness methods with static indeterminacy ≤ 3	**10**	**CO4**
5	INTRODUCTION TO STRUCTURAL DYNAMICS: Basic principles of Vibrations and causes, periodic and aperiodic motion, harmonic and non-harmonic motion. Period and frequency. Forced and Free Vibration, Damping and Equations of Single Degree of Freedom System with and without damping Introduction to Structural Analysis software – Staad.pro, Etabs, SAP, BIM	**10**	**CO5**

NOTE:

1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	SLOPE DEFLECTION METHOD: Slope deflection method for beams with kinematic redundancy >3	**CO1,CO3**

2	MOMENT DISTRIBUTION METHOD: Moment distribution method for beams with kinematic redundancy > 3	**CO1,CO4**
3	KANI'S METHOD: Kani's method for sway analysis	**CO1,CO5**
4	MATRIX METHOD OF STRUCTURAL ANALYSIS: Introduction to Finite Element Analysis.	**CO1,CO6**
5	ROLLING LOAD AND INFLUENCE LINES: Classification of loads as per IRC	**CO2**

Text Books

1. Theory of Structures, Pandit and Guptha, Vol. – II, Tata McGraw Hill, New Delhi.
2. Basic Structural Analysis, Azmi Ibrahim, K. U. Muthu, M. Vijay Anand, and MagantiJanardhana, I K International Publishing House Pvt. Ltd, 2001

References

1. Theory of Structures, S P Thimoshenko& D H Young, 2nd Edition, International Student Edition
2. Elementary Structural Analysis, Norris and Wilbur, International Student Edition. McGraw Hill Book Co: New York
3. Structural Analysis, Devdas Menon, Narosa Publications
4. Analysis of Structures, Thandava Murthy, Oxford University Press, Edition 2005
5. Structural Analysis, Russell C Hibbeler, Maxwell Machmillan International Editions.
6. NBasic Structural Analysis, Reddy C. S., Tata McGraw Hill, New Delhi.

DESIGN AND DRAWING OF RC STRUCTURES

Course Code : 19CV5GCDDR | **Credits : 4**
L:P:T:S : 4:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 04 | **Total hours : 50**

Course Objective:

1. To understand the basic concepts of behavior of reinforced concrete systems and elements
2. To learn the concept of design procedure of RC elements

	Course Outcome
CO 1	Incorporate the knowledge of different principles for designing RC elements
CO 2	Paraphrase the behaviour of concrete and reinforced steel in combination
CO 3	Interpret and use of relevant Indian Standard codes
CO 4	Differentiate the structural elements with respect to its behaviour under different loading conditions.
CO 5	Discriminate between uniaxial and biaxial moments prior to structural design.
CO 6	Design different structural elements manually with respect to field conditions

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2	-	2	-	3	3	3	1	3
CO2	3	3	3	3	-	2	-	3	3	3	-	3
CO3	3	3	3	3	-	2	-	3	3	3	1	3
CO4	3	3	3	3	-	2	-	3	3	3	1	3
CO5	3	3	3	3	-	2	-	3	3	3	-	3
CO6	3	3	3	3	-	2	-	3	3	3	2	3

Module	Content	Hours	Co's
1	GENERAL FEATURES OF REINFORCED CONCRETE: Introduction, Design Loads, Materials for Reinforced Concrete and Code requirements. Design Philosophy – Limit State Design principles. Factor of Safety, Characteristic and design loads, Characteristic and design strength. PRINCIPLES OF LIMIT STATE DESIGN OF R.C. SECTION: Limit state design – collapse, flexure, shear & torsion	**10**	**CO1,** **CO3**
2	DESIGN OF BEAMS: Design procedures for critical sections for moment and shears. Anchorages of bars, check for development length, Reinforcement requirements, Design examples for simply supported and Cantilever beams for rectangular and flanged sections. Bar bending schedule, beam drawings – singly reinforced and doubly reinforced	**10**	**CO1,** **CO2,** **CO3**
3	DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000 Drawings – one way and two way slabs	**10**	**CO1,** **CO3,** **CO4**
4	DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP – 16charts DESIGN OF FOOTINGS: Introduction, load for footing, Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment, design of pedestal Drawing – isolated footing with reinforcement detailing	**10**	**CO1,** **CO3,** **CO4,** **CO5**

5	DESIGN OF STAIRCASE: General features, types of staircase loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of dog legged and open-well staircases with waist slabs Drawing – Dog legged staircase with reinforcement detailing	**10**	**CO1, CO3, CO4, CO5**

Note: ALL THE DRAWINGS WILL BE CARRIED OUT IN GRAPH SHEETS ONLY

NOTE:

1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: Concept of WSM and Ultimate load method	**CO1,CO3**
2	DESIGN OF BEAMS*:* Detailing according with SP – 34, types of cracks in beams	**CO1,CO2,CO3**
3	DESIGN OF SLABS*:* Introduction to waffle slabs and its detailing	**CO1,CO3,CO4**
4	DESIGN OF COLUMNS*:* Concept of floating columns	**CO1,CO3,CO4,CO5**
5	DESIGN OF FOOTINGS*:* Concept of raft, eccentric	**CO1,CO3,CO4,CO5**
Design of single storey building as per plan – Evaluation for assignment		

Text Books:

1. Reinforced Concrete Design,Pillai and Menon, TMH Education Pvt. Ltd, 3rd Edition, 2009
2. Limit State Design of Reinforced Concrete, Krishnaraju, CBS Publications
3. Structural Design & Drawing Reinforced Concrete, Krishnaraju, University Press
4. Structural Desing and Drawing, Krishnamurthy, CBS Publisher.

References:

1. Design of reinforced concrete structures, S Ramamrutham
2. Reinforced concrete design, B C Punmia, Jain & Jain
3. Reinforced Concrete Design, W H Mosley and J H Bungey, 4th Edition
4. Reinforced Concrete Analysis and Design, S S Ray, Blackwell Science Publications,
5. IS 456-2000, Indian Standard code for Plain and Reinforced Concrete
6. SP-16 & SP -34 Design Aids for Reinforced Concrete

FOUNDATION ENGINEERING

Course Code : 19CV5GCFDE | **Credits : 3**
L:P:T:S : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives:

1. To enable the students to acquire the knowledge of sampling and exploration techniques,
2. To find stresses at any point due to surface loading

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Explain soil exploration and sample the soils
CO 2	Determine seepage loss and check stability of slopes
CO 3	Compute stresses below foundation due to surface loading
CO 4	Carryout stability check of slopes and earth retaining structures
CO 5	Design simple footings for strength and serviceability criteria
CO 6	Compute the settlement analysis.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	2									
CO2	2	1	3									
CO3	3	2	1									
CO4	3	1	2									
CO5	3	1	3									
CO6	1	3	2									

Module	Content	Hours	Co's
1	STRESSES IN SOILS: Boussinesq's and Westergaard's theories for concentrated, circular and rectangular loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, Contact pressure, Newmark's chart. DRAINAGE AND DEWATERING: Determination of ground water level by Hvorselev's method, Control of ground water during excavation.	8	**CO1** **CO2** **CO3**
2	FLOWNETS: Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter	8	**CO2** **CO3**
3	LATERAL EARTH PRESSURE: Active and Passive earth pressures, Earth pressure at rest. Rankine's and Coulomb's Earth pressure theories-–assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) – Culmann's and Rebhann's methods, Lateral earth pressure in cohesive and cohesionless soils, STABILITY OF EARTH SLOPES: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of infinite slopes, Stability of finite slopes by Method of slices and Friction Circle method, ground improvement techniques – geogrid, geosynthetics	8	**CO2** **CO3** **CO4**
4	BEARING CAPACITY: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's and Brinch Hansen's bearing capacity equations - assumptions and limitations, Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Field methods of evaluation of bearing capacity - Plate load test, Standard penetration test and cone penetration test. FOUNDATION SETTLEMENT: Importance and Concept of Settlement Analysis, Immediate, Consolidation and Secondary settlements (*Note:- No derivations, but, computation using relevant formula for Normally Consolidated soils*), Tolerance	8	**CO5**
5	INTRODUCTION TO FOUNDATION DESIGN: Allowable Bearing Pressure, Factors influencing the selection of depth of foundation, Factors influencing Allowable Bearing Pressure, Factors influencing the choice of foundation, Proportioning isolated, combined, strip and mat foundations, Classification of pile foundation, Pile load capacity.	8	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	SUBSURFACE EXPLORATION: Dewatering - Ditches and sumps, well point system, Vacuum method, Electro-Osmosis method	**CO1,CO2,CO3**
2	FLOWNETS: Piping and protective filter	**CO2,CO3**
3	LATERAL EARTH PRESSURE: Earth pressure distribution.	**CO2,CO3,CO4**
4	FOUNDATION SETTLEMENT: BIS specifications for total and differential settlements of footings and rafts.	**CO5**
5	PROPORTIONING SHALLOW AND PILE FOUNDATIONS: Proportioning pile foundation.	**CO6**

TEXT BOOKS:

1. Soil Engineering in Theory and Practice- Alam Singh and Chowdhary G.R. (1994), CBS Publishers and Distributors Ltd., New Delhi.
2. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16th Edition Laxmi Publications Co , New Delhi.

REFERENCES BOOKS:

1. Foundation Analysis and Design- Bowles J.E. (1996), 5thEdition, McGraw Hill Pub. Co. New York.
2. Soil Mechanics and Foundation Engineering- Murthy V.N.S. (1996), 4th Edition, UBS Publishers and Distributors, New Delhi.
3. Basic and Applied Soil Mechanics- Gopal Ranjan and Rao A.S.R. (2000), New Age international (P) Ltd., NeweDelhi.
4. Geotechnical Engineering- Venkatrahmaiah C. (2006), 3rdEdition New Age International (P) Ltd., Newe Delhi.
5. Soil Mechanics- Craig R.F. (1987), Van Nostrand Reinhold Co. Ltd.
6. Principles of Geotechnical Engineering- Braja M. Das (2002), 5th Edition, Thomson Business Information India (P) Ltd., India.
7. Text Book of Geotechnical Engineering- Iqbal H. Khan (2005), 2ndEdition, PHI, India.

ENVIRONMENTAL ENGINEERING LAB

Course Code	**: 19CV5GLEVE**	**Credits**	**: 2**
L:P:T:S	**: 0:1:2:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives:

1. Analyse water and wastewater samples different parameters

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Analyse the given water sample for the given parameters of drinking water-
CO 2	Perform the hardness test to assess the quality of water
CO 3	Conduct Solids BOD, COD tests of a given wastewater to assess the quality
CO 4	Perform residual chlorine and chlorine demand
CO 5	Analyse MPN of given waste water
CO 6	Analyse Sodium and potassium for water sample

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3									
CO2	3	2	2									
CO3	3	2	3									
CO4	3	1	2									
CO5	3	3	3									
CO6	3	3	3									

Experiment	Content	Hours	Co's
1	Determination of Solids in Sewage: Total Solids, Suspended Solids, Dissolved Solids, Volatile Solids, Fixed Solids, Settleable Solids.	10	CO1 CO4
2	Electrical conductivity. Determination of Chlorides and Sulphates.	20	CO2 CO3 CO4
3	Determination of Alkalinity, Acidity and pH.		
4	Determination of Calcium, Magnesium and Total Hardness.		
5	Determination of Dissolved Oxygen. Determination of BOD.		
6	Determination of COD.		
7	Determination of percentage of available chlorine in bleaching powder,		
8	Residual Chlorine and Chlorine Demand.		
9	Jar Test for Optimum Dosage of Alum, Turbidity determination by Nephelometer.		
10	Determination of Iron. Phenanthroline method.		
11	Determination of Fluorides SPANDS Method.		
12	MPN Determination	10	CO5 CO6
13	Determination Nitrates by spectrophotometer.		
14	Determination of sodium and potassium by flame photometer		

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Unit	**Contents of the unit**	**CO's**
1	NIL	
2	NIL	
3	NIL	
4	NIL	
5	NIL	

Text Books:

1. Manual of Water and Wastewater Analysis – NEERI Publication.
2. Standard Methods for Examination of Water and Wastewater (1995), American Publication – Association, Water Pollution Control Federation, American Water Works Association, Washington DC.
3. IS Standards : 2490-1974, 3360-1974, 3307-1974.
4. Chemistry for Environment Engineering. Sawyer and Mc Carthy,

HYDRAULICS AND HYDRAULIC MACHINE LABORATORY

Course Code	**: 19CV5GLHHM**	**Credits**	**: 2**
L:P:T:S	**: 0:2:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives:

1. Students are expected to learn basic experiments of fluid mechanics.
2. Students shall introduce to get exposure with turbines, pumps as practical application.

Course Outcomes: At the end of the course the students will be able to:

	Course Outcome
CO 1	Analyse application on fluid mechanics.
CO 2	Calibrate of fluidic components.
CO 3	Verify Bernoulli's equations.
CO 4	Verify Darcy's wesibach equations.
CO 5	Evaluate practical application of pumps.
CO 6	Analyse practical application of turbines.

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	1									
CO2	1	1	2									
CO3	1	1	3									
CO4	1	1	2									
CO5	1	2	1									
CO6	2	1	3									

Module	Content	Hours	Co's
1	1.Verification of Bernoulli's equation 2. Calibration of V-notch 3.Calibration of Trapezoidal notch	**10**	**CO1**
2	1.Calibration of Venturiflume 2. Determination of Hydraulic coefficients of orifice and mouthpiece. 3. Experiments on Ogee Weir and Orificemeter	**8**	**CO2** **CO3**
3	1.Calibration of Venturimeter 2.Determination of Darcy's friction factor for a straight pipe (Major & minor losses)	**8**	**CO4** **CO3**
4	1.Determination of vane coefficients for a flat vane 2.Performance characteristics of a single stage centrifugal pump	**8**	**CO5**
5	1.Performance characteristics of a Kaplan turbine 2. Performance characteristics of a Pelton turbine 3. Demo on digital measuring equipments on pressure gauge, flow meters, temperature sensors	**6**	**CO6**

References:

1. Experiments in fluid mechanics – Sarbjit Singh, PHI Pvt Ltd, New Delhi 2009
2. Hydraulics and Hydraulic Mechines Laboratory Manual – Dr. N. Balasubramanya

THEORY OF ELASTICITY

Course Code : 19CV5DETOE | **Credits : 3**
L:P:T:S : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives

1. To introduce the theoretical concepts of the fundamentals of elasticity
2. To impart the ability to use the principles in the civil engineering problems

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Apply the concept of theory of elasticity in solving and civil engineering problems
CO 2	Execute the shear state and strain state to solve the related problems
CO 3	Analyse two dimensional problems in Cartesian co-ordinate systems
CO 4	Analyse two dimensional problems in polar co-ordinate systems
CO 5	Evaluate torsion of prismatic bars
CO 6	Explain the transformation of compatibility condition from strain components to stress components.

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1									
CO2	2	1	2									
CO3	3	1	2									
CO4	3	3	1									
CO5	1	2	3									
CO6	3	2	1									

Module	Content	Hours	Co's
1	Introduction, assumption of linear elasticity, ANALYSIS OF STRESS– Introduction, concept of direct stress and shear stress, notation of stress, body forces and surface forces, stress tensor, two-dimensional state of stress at point, Cauchy's stress principle, direction Cosines, stress components on an arbitrary plane, stress transformation, principal stresses in three-dimensions, stress invariants, equilibrium of two-dimensional or plane element, Mohr's stress circle (for two-dimensional stress systems) and Numerical examples.	8	**CO1 CO2 CO3**
2	ANALYSIS OF STRAIN: Introduction, types of strain, change in length of linear element and linear components, strain tensors, strain transformation, principal strains, stain invariants, equations of compatibility for strain, measurement of surface strains, Mohr's circle for strains, Stain rosette, Numerical examples	8	**CO2 CO3**
3	STRESS- STRAIN RELATIONSHIP: Introduction, linear elasticity – Generalized Hooke's law, Boundary conditions, St. Venant's Principle, principle of superposition, numerical examples TWO DIMENSIONAL PROBLEMS IN CARTESIAN CO-ORDINATE SYSTEMS: Introduction, Equilibrium equations for Cartesian coordinates (2 & 3 Dimensional), Transformation of compatibility condition from strain components to stress components, relationship between plane stress and plane strain, stress function – plane stress and plane strain cases, solution of two-dimensional problems by the use of polynomials, pure bending of beams, bending of narrow cantilever beam subjected to end load.	**8**	**CO2 CO3 CO6**
4	TWO DIMENSIONAL PROBLEMS IN POLAR CO-ORDINATE SYSTEMS: Introduction, Equilibrium equations for polar co-ordinates (2 dimensional), general state of stress in three-dimensions in cylindrical co-ordinate system, Strain-displacement relations, compatibility equations, stress-strain relations, Airy's stress function, Biharmonic equation, axisymmetric problems, thick walled cylinder subjected to internal and external pressure, rotating disks - solid disk, hollow disk, stress concentration.	**8**	**CO5**
5	TORSION OF PRISMATIC BARS: Introduction, general solution of the torsion problems, boundary conditions, stress function method, torsion of circular cross-section, torsion in elliptical cross-section, torsion in thin-walled sections, torsion of thin-walled multiple cell closed sections, numerical examples, effect of circular boles on stress distribution in plates, numerical examples.	**8**	**CO1 CO2**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	Introduction,: Construction of Mohr's stress circle, Applications of linear elasticity, spherical and deviatoric stress tensors, indicial notations, types of stsses, octahedral stresses.	**CO1 CO2 CO3**
2	ANALYSIS OF STRAIN:: Dereformation of an infinitesimal line element, octahedral strain.	**CO2 CO3**
3	STRESS- STRAIN RELATIONSHIP: Elastic strain energy for uniaxial stress, strain energy in an elastic body, existence and uniqueness of solution, bending of simply supported beam under udl.	**CO2 CO3 CO6**
4	TWO DIMENSIONAL PROBLEMS IN POLAR CO-ORDINATE SYSTEMS: Bars with large initial curvature, Winkler's Bach theory, Stress in closed rings.	**CO5**
5	TORSION OF PRISMATIC BARS: Prandtl's membrane analogy	**CO1 CO2**

Text Books:

1. Theory of Elasticity - International StudentsTimoshenko. S.P. and Goodier. J.N. - Edition, McGraw Hill Book Co. Inc., New Delhi.
2. Applied Elasticity-Dr L GovindaRaju, T G Sitaram, Interline Publishing Pvt Ltd.

References:

1. Contiuum Mechanics Fundamentals- Valliappan. C : Oxford and IBH Publishing Co. Ltd., New Delhi.
2. Advanced Mechanics of Solids- Srinath.L.S. : Tata McGraw Hill Publications Co.Ltd., New Delhi.
3. Structural Mechanics with Introduction to Elastity and Plasticity- Venkataraman and Patel : McGraw Hill Book Inc., New York.
4. Mechanics of Solids- Arbind Kumar Singh : Prentice hall of India Pvt. Ltd. New Delhi - 2007.

HYDROLOGY AND IRRIGATION ENGINEERING

Course Code	**: 19CV5DEHIE**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives:

To educate the students about hydrological properties & different types of irrigation systems

Course Outcomes: At the end of the course the students will be able to:

	Course Outcome
CO 1	Summarize applications of water resources
CO 2	Compute hydrologic mass balance in closed basin
CO 3	Develop unit hydrograph based on stream flow data and conduct basic unit hydrograph analysis
CO 4	Aware of the needs, types & scheme of irrigation
CO 5	Analyse the soil-water-crop relationship and its use for computation of water requirement for command area
CO 6	Develop the basis of irrigation canals design, procedures to design unlined canals in alluvial soils

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2									
CO2	1	2	3									
CO3	3	1	1									
CO4	1	1	2									
CO5	1	2	2									
CO6	2	2	1									

Module	Content	Hours	Co's
1	INTRODUCTION & PRECIPITATION: Introduction, Hydrologic cycle (Horton's representation). Water budget equation Precipitation: introduction, measurement of precipitation (Simon's gauge & Siphon gauge only), selection of rain gauge station. Adequacy of rain gauges, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall.	**8**	**CO1 CO2**
2	LOSSES FROM PRECIPITAION: Evaporation-Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer's and Rower's equation), evaporation control. Evapo-transpiration: Definition, factors affecting, measurement, estimation (Blaneycriddle method) Infiltration: Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton's equation of infiltration.	**8**	**CO1 CO2**
3	HYDROGRAPHS Definition, components of hydrographs, unit hydrograph and its derivation from simple storm hydrograph, base flow separation, Prepositions of unit hydrograph- problems ESTIMATION OF FLOOD: Definition of flood, factors affecting flood, methods of estimation (envelope curves, empirical formulae, rational method	**8**	**CO2 CO3**
4	SOIL-WATER-CROP RELATIONSHIP: Introduction, soil profile, physical properties of soil, soil classification. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil moisture. Irrigation relationship, frequency of irrigation	**8**	**CO4 CO5**
5	WATER REQUIREMENT OF CROPS: Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period. Consumptive use. Canals Definition, Types of canals, Alignment of canals, Design of canals by Kenedy's method- Problems	**8**	**CO5 CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	**INTRODUCTION & PRECIPITATION**: Forms of precipitation, types of precipitation. Delineation of catchment area from the topo sheet	**CO1, CO2**
2	**LOSSES FROM PRECIPITAION :**Total Loss calculations	**CO1, CO2**
3	**ESTIMATION OF FLOOD :**Flood routing – Introduction and methods & preposition of unit hydrograph	**CO2, CO3**
4	**SOIL-WATER-CROP RELATIONSHIP**: Need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation,	**CO4,CO5**
5	**WATER REQUIREMENT OF CROPS** :Irrigation efficiencies. Assessment of irrigation water.	**CO5,CO6**

Text Books

1. Engineering Hydrology, Subramanya K, TMH New Delhi, 2008.
2. Irrigation and water power engineering, Madan Mohan Das & Mimi Das Saikia, PHI Learning Pvt Ltd, New Delhi, 2009

References

1. Textbook of Hydrology, Jayaram Reddy, Lakshmi Publications, New Delhi 2007
2. Irrigation Engineering and Hydraulic structures, S K Garg, Khanna Publications.
3. Hydrology & Water Resources Engineering, Patra K C, Narosa Book Distributors Pvt Ltd, New Delhi 2008
4. Hydrology & Soil Conservation Engineering, Ghanshyam Das, PHI Learning Pvt Ltd
5. Irrigation & Water power engineering, Dr B C Punmia, Dr Pande B BLal

CONSTRUCTION PROJECT MANAGEMENT

Course Code	**: 19CV5DECPM**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives
1.To understand the different components of project management
2. To understand design and construction process, effective use of labor & equipments and different costs involved in the project
3. To understand the rate analysis and cost involved in the project .

	Course Outcome
CO1	Determine the importance of planning an efficient project
CO2	Execute the project effectively by understanding the risks involved
CO3	Design cost effective project
CO4	Develop organization chart for the project
CO5	Justify the quality of project
CO6	Utilization of labour & equipments effectively (resources

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	1	3								
CO2	3	1	2	3								
CO3	3	2	2	3								
CO4	1	3	2	2								
CO5	3	2	2	3								
CO6	2	3	1	3								

Module	**Content**	**Hours**	**Co's**
1	THE OWNERS' PERSPECTIVE: Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers.	8	**CO1,CO2 CO3**

2	ORGANIZING FOR PROJECT MANAGEMENT: Project Management – modern trends - Strategic Planning, PERT & CPM - Effects of Project Risks on Organization - Organization of Project Participants -Traditional Designer-Constructor Sequence - Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team.	8	**CO2** **CO3**
3	DESIGN AND CONSTRUCTION PROCESS: Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment	8	**CO2** **CO3** **CO4**
4	LABOUR, MATERIAL AND EQUIPMENT UTILIZATION: Historical Perspective - Labor Productivity - Factors Affecting Job-Site Productivity - Labor Relations in Construction - Problems in Collective Bargaining - Materials Management - Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates - Construction Processes Queues and Resource Bottlenecks	8	**CO5**
5	COST ESTIMATION: Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs	8	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	THE OWNERS' PERSPECTIVE: Study of PPP, significance of cost benefit ratio, CPM & PERT	**CO1** **CO2,CO3**
2	ORGANIZING FOR PROJECT MANAGEMENT: Lump sum rate analysis	**CO2** **CO3**
3	DESIGN AND CONSTRUCTION PROCESS: Labor charges as per SR books	**CO2, CO3, CO4**

4	LABOUR, MATERIAL AND EQUIPMENT UTILIZATION: Design rates for irrigation projects	**CO5**
5	COST ESTIMATION: Rate analysis of 2 storey, 2 BHK building	**CO6**

Text Books:

1. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Frederick E. Gould, Construction Project Management, Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.

References:

1. Chitkara, K.K. Construction Project Management: Planning, Scheduling and Control, Tata McGraw-Hill Publishing Company, New Delhi, 1998.
2. George J.Ritz , Total Construction Project Management - McGraw-Hill Inc, 1994.
3. ChoudhuryS , Project Management, McGraw-Hill Publishing Company, New Delhi, 1988.

PAVEMENT MATERIALS AND CONSTRUCTIONS

Course Code :19CV5DEPMC **Credits : 3**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives

1.To consider the suitable soil improvement programme and types of Mechanical modification

2. To study the effect of compaction on soil and Hydraulic modification on soil.

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Students should identify types, source, functions, requirements, properties, tests and specifications of soil used in highway construction
CO 2	Students should identify types, source, functions, requirements, properties, tests and specifications of aggregates used in highway construction
CO 3	Students should choose the required proportions of ingredients for the mix design of both asphalt mixtures and cement concrete.
CO 4	Student should design flexible pavement for given material properties
CO 5	Student should design rigid pavement for given material properties
CO 6	Students should be able to determine appropriate stabilization technique

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	-	-	1					
CO2	3	2	1	1	-	-	1					
CO3	3	2	1	1	-	-	1					
CO4	3	3	3	2	1	1	1					
CO5	3	3	3	2	1	1	1					
CO6	3	2	1	1	-	-	1					

Module	Content	Hours	Co's
1	**Aggregates** – Origin, classification, requirements, properties. Tests and specifications on road aggregates for flexible and rigid pavements. Importance of aggregate gradation problems on Rotchfutch and its applications, Critical sieve methods and Shape factor in mix design.	8	**CO1 CO2 CO3**
2	**Bituminous binders** – different types, properties and uses, physical tests on bitumen, Rheological and pavement performance related properties, Modified binders, ideal pavement binders, characteristics and applications in road construction, criteria for selection of different binders. Bituminous mixes, types, requirements, properties, tests, Marshall Method of mix design, Criteria and super pave mix design, Additives & Modifiers in Bituminous mixes, problems on mix design.	8	**CO2 CO3**
3	**Portland cement and cement concrete for use in road works** – requirements, design of mix for CC pavement, use of additives, IRC specifications & Tests, joint filler and sealer materials.	8	**CO2 CO3 CO6**
4	**Equipments in highway construction:** Various types of equipments for excavation, grading and compaction- their working principles, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction. **Sub grade:** Earthwork grading and Construction of embankments and cuts for roads, Preparation of subgrade, quality control tests.	8	**CO5**
5	**Flexible Pavements:** Specifications of materials, Construction method and field control checks for various types of flexible pavement layers. **Cement Concrete Pavements:** Specifications and method of cement concrete pavement construction (PQC, importance of providing DLC as sub base and polythene thin layer between PQC and sub base). Quality control tests, Construction of various types of joints	8	**CO1**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	Sustainable alternatives to materials	**CO1,CO2 CO3**
2	Effects of different shapes of aggregate on the rheological properties	**CO2 CO3**
3	Warm-mix Asphalt – Materials, mix design & salient features	**CO2,CO3 CO6**
4	CRCP, ICBP – Materials Construction Methodology & Quality Control tests	**CO5**
5	Use of Geo-textiles in roads, embankments, retaining walls & slope protection	**CO1**

TEXT BOOKS:

1. Khanna and Justo, "Highway Engineering"- Nem Chand and Bros., Roorkee
2. Khanna and Justo, "Highway Materials Testing"- Nem Chand and Bros., Roorkee.
3. "Soil Mechanics for Road Engineers"- HMSO Publication
4. "Bituminous materials in Road Construction"- HMSO Publication.

REFERENCES:

1. MORTH 'Specifications for Roads and Bridges Works'- Indian Roads Congress
2. IS 73, revised 2006, IS 2720, IS 2386, IS 1201 to 1220, IS 8887- 1995, IS 217- 1986
3. State of art, special report 3 – "compaction of earthwork and sub grade"- IRC, HRB, 1999
4. IRC: 51-1992, 63-1976, 74 –1979, 88-1984, "Indian Roads Congress".
5. IRC SP: 53 – 2002, IRC SP: 58 – 2000, "Indian Roads Congress".
6. "Guidelines for use of Geotextiles in Road Pavements and Associated works"- 2002, Indian Roads Congress
7. Highway Hand Book by FAW, Publication from NUS, Singapore.
8. Freddy L Roberts, Prithvi S Kandhal et al, "Hot Mix Asphalt Materials, mixture design and construction"- (2nd Edition), National Asphalt Pavement Association Research and Education Foundation, Maryland, USA.

REHABILITATION AND RETROFITTING OF STRUCTURES

Course Code	**: 19CV5DERRS**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives
3.To understand the different components of project management
2. To understand design and construction process, effective use of labor & equipments and different costs involved in the project
3. To understand the rate analysis and cost involved in the project .

	Course Outcome
CO1	Understand the cause of deterioration of concrete structures.
CO2	Able to assess the damage for different type of structures
CO3	Summarize the principles of repair and rehabilitation of structures
CO4	Recognize ideal material for different repair and retrofitting technique
CO5	Justify the quality of project
CO6	Utilization of labour & equipments effectively (resources

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	3	1	3								
CO2	3	1	2	3								
CO3	3	2	2	3								
CO4	1	3	2	2								
CO5	3	2	2	3								
CO6	2	3	1	3								

Module	**Content**	**Hours**	**Co's**
1	**General:** Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.	8	**CO1,CO2 CO3**

2	**Damage Assessment:** Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems	8	**CO2** **CO3**
3	**Influence on Serviceability and Durability:** Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.	8	**CO2** **CO3** **CO4**
4	**Maintenance and Retrofitting Techniques:** Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, Externally bonding (ERB) technique, near surface mounted (NSM) technique, External post-tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building	8	**CO5**
5	**Materials for Repair and Retrofitting:** Artificial fibre reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning. Instrumentation and application for industry experts, Introduction to structural health monitoring (SHM)	8	**CO6**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

4. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	NDT test on hardened concrete	**CO1** **CO2,CO3**
2	Forensic Science application in rehabilitation	**CO2** **CO3**
3	Remodeling process with case study	**CO4**
4	Demolition process with case study	**CO5**

5	Renovation Process with case study	**CO6**

Text Books:

1. Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures"
2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"- Longman Scientific and Technical

References:

1. R.T.Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"- R&D Center (SDCPL).

REINFORCED EARTH STRUCTURES

Course Code	**: 19CV5DERES**	**Credits**	**: 3**
L:P:T:S	**: 3:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**
Hours/Week	**: 03**	**Total hours**	**: 40**

Course Objectives

1. The introduction to basic components of soil and reinforcement in soil.
2. Soil nailing techniques and Introduction to geosynthetics.

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Explain the various materials used as reinforced earth structure material.
CO 2	Design of reinforced earth structure.
CO 3	Explain soil nailing techniques.
CO 4	Explain the concept of Reinforced earth retaining wall
CO 5	Analyse Physical, Chemical, Mechanical and Hydraulic properties
CO 6	Determine the modes of failure of foundation

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	1									
CO2	1	2	1									
CO3	3	1	1									
CO4	3	2	1									
CO5	3	1	2									
CO6	3	3	1									

Module	**Content**	**Hours**	**Co's**
1	BASICS OF REINFORCED EARTH CONSTRUCTION: Definition, Historical Background, Components, Mechanism and Concept, Sandwich technique for clayey soil. GEOSYNTHETICS AND THEIR FUNCTIONS: Historical developments, Recent developments, manufacturing process swoven & non-woven, Raw materials – polypropylene (polyolefin),Polyethylene (Polyolefin), Polyester, Polyvinyl chloride, Elastomers, Classification based on materials type – Metallic and Non-metallic, Natural and Man-made, Geosynthetics –	8	**CO1 CO2 CO3**

	Geotextiles, Geogrids, Geomembranes, Geocomposites, Geonets, Geofoam, Geomats, Geomeshes, Geowebs etc.		
2	PROPERTIES AND TESTS ON MATERIALS: Properties – Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, testing of properties.	8	**CO2 CO3**
3	DESIGN OF REINFORCED EARTH RETAINING WALLS: Concept of Reinforced earth retaining wall, Internal and external stability, typical design problems	**8**	**CO2 CO3 CO6**
4	DESIGN OF REINFORCED EARTH FOUNDATIONS AND EMBANKMENTS **Foundations -** Modes of failure of foundation, Determination of force induced in reinforcement ties – Location of failure surface, tension failure and pull out resistance, length of tie and its curtailment, Bearing capacity improvement in soft soils, General guidelines. **Embankments -** Concept of Reinforced Embankments, Internal and external stability, typical design problems.	**8**	**CO6**
5	SOIL NAILING TECHNIQUES Concept, , comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects and precautions to be taken.	**8**	**CO1 CO3**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	BASICS OF REINFORCED EARTH CONSTRUCTION: Advantages and Disadvantage of reinforced earth Construction	**CO1, CO2, CO3**
2	PROPERTIES AND TESTS ON MATERIALS: Evaluation properties of materials	**CO2, CO3**
3	DESIGN OF REINFORCED EARTH RETAINING WALLS: Selection of materials for reinforced earth retaining walls	**CO2, CO3, CO6**
4	DESIGN OF REINFORCED EARTH FOUNDATIONS AND EMBANKMENTS : Selection of materials for Reinforced Embankments	**CO6**
5	SOIL NAILING TECHNIQUES : Advantages & limitations of soil nailing techniques	**CO1, CO3**

TEXT BOOKS:

1. Design with geosynthetics- Koerner. R.M. - Prince Hall Publication, 2005.
2. Construction and Geotechnical Engineering using synthetic fabrics- Koerner. R.M. &Wesh, J.P.- Wiley Inter Science, NewYork, 1980.

REFERENCE BOOKS:

1. Earth reinforcement and Soil structure- Jones CJEP, Butterworths, London, 1996.
2. Geotextile Hand Book- Ingold, T.S. & Millar, K.S. - Thomas, Telford, London.
3. Earth Reinforcement Practices - Hidetoshi Octial, Shigenori Hayshi& Jen Otani -Vol. I, A.A. Balkema, Rotterdam, 1992.
4. Ground Engineer's reference Book- Bell F.G. - Butterworths, London, 1987.
5. Reinforced Earth- Ingold, T.S. - Thomas, Telford, London.
6. Geosynthetics in Civil Engineering, Editor Sarsby R W, Woodhead Publishing Ltd & CRC Press, 2007

AIR POLLUTION AND CONTROL

Course Code : 19CV5DEAPC **Credits : 3**
L:P:T:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**
Hours/Week : 03 **Total hours : 40**

Course Objectives

2. To improve substantially the health, quality of life and productivity of citizens by providing a comprehensive air quality
3. To assess the existing air quality

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Provide recommendations for air pollutants emission reduction strategies
CO 2	**Control of pollution at source to the maximum extent possible with due regard to technological achievement and economic viability**
CO 3	Assess current and historical air quality
CO 4	Develop long-term air-management strategies and evaluate progress
CO 5	Guide decisions on the permitting of new or modified facilities
CO 6	Analyse of Air Pollutants, Smoke and Smoke Measurement

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1									
CO2	1	2	3									
CO3	1	1	2									
CO4	3	1	2									
CO5	1	2	3									
CO6	3	1	1									

Module	**Content**	**Hours**	**Co's**
1	INTRODUCTION: Definition – Classification and Characterization of Air Pollutants, Emission Sources, Chemical Reactions in the Atmosphere, Photo-chemical Smog, Coal-induced smog, Air Pollution Inventories. EFFECTS OF AIR POLLUTION: On Human Health, Animals, Plants and Materials – Major Environmental Air Pollution Episodes – London Smog, Los Angeles Smog & Bhopal Gas Tragedy.	8	**CO1 CO2 CO3**

2	METEOROLOGY: Introduction – Meteorological Variables, Primary and Secondary Lapse Rate, Inversions, Stability Conditions, Wind rose, General Characteristics of Stack Plumes. Gaussain plume dispersion model and its applications.	8	**CO2 CO3**
3	Factors to be considered in Industrial Plant Location and Planning Noise pollution – sources, measurement units, effects and control SAMPLING, ANALYSIS AND CONTROL: Sampling and Measurement of Gaseous and Particulate matter, Stack Sampling, Analysis of Air Pollutants, Smoke and Smoke Measurement.	8	**CO2 CO3 CO6**
4	Air Pollution Control Methods– Particulate, Emission Control, Gravitational Sett ling Chambers, Cyclone Separators, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Selection of a Particulate Collecting Equipment, Control of Gaseous Emissions, Adsorption by Liquids, Adsorption by Solids.	8	**CO5**
5	AIR POLLUTION DUE TO AUTOMOBILES, INCINERATORS: Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control. Air and noise pollution due to construction activities, effects & control as per EIA, CPCB standards. Global Warming, acid rain, greenhouse effect. Introduction to software use like Gaussian Plume Air Dispersion Model, Air pollution dispersion models.	8	**CO1 CO2**

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.

2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents of the unit**	**CO's**
1	INTRODUCTION: Behaviour and Fate of air Pollutants	**CO1,CO2 CO3**
2	METEOROLOGY: Meterological Models.	**CO2,CO3**
3	SAMPLING, ANALYSIS AND CONTROL: Environmental Legislation, Environmental Acts of Air, Water and Noise Pollution	**CO2,CO3 CO6**
4	Air Pollution Control Methods: Combustion Odors and their control.	**CO5**
5	AIR POLLUTION DUE TO AUTOMOBILES:: Indoor Air Pollution.	**CO1,CO2**

Text Books:

1. Boubel, R.W., Donald, L.F., Turner, D.B., and Stern, A.C., (1994),Fundamentals of Air Pollution –Academic Press.
2. Crawford, M., (1980), Air Pollution Control Theory –TMH Edition, Tata McGraw Hill

Publishing Co. Ltd., New Delhi.

References:

1. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G., (1986), EnvironmentalEngineering – McGraw Hill Book Co.
2. Sincero, A.P and Sincero, G.A., (1999), Environmental Engineering - ADesign Approach – Prentice Hall of India.
3. Wark, K., Warner, C.F. and Davies, W.T., (1998), Air Pollution- Its Originand Control –Harper & Row Publishers, New York

URBAN TRANSPORT PLANNING

Course Code : 19CV5DEUTP | **Credits : 3**
L:P:T:S : 3:0:0:0 | **CIE Marks : 50**
Exam Hours : 03 | **SEE Marks : 50**
Hours/Week : 03 | **Total hours : 40**

Course Objectives:

1. To understand the concept of urban transport for multiple objectives
2. To analyze the trip generation, distribution and modal split analysis

Course Outcomes: At the end of the course the student will be able to

	Course Outcome
CO 1	Analyse transport planning for a city in comprehensive manner taking into consideration various requirements like trip generation and distribution in different stages
CO 2	Plan for conduction of transport survey in a city after inventory survey
CO 3	Design the trip generation and its distribution in planning area under consideration
CO 4	Estimate trip generation and distribution from different zones
CO 5	Analyze modal split of trips generated and its use in transport planning
CO 6	Analyse different trip assignment techniques for transport planning for small and big cities

Mapping of Course outcomes to Program outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1									
CO2	3	2	1									
CO3	3	3	3									
CO4	3	1	1									
CO5	3	2	2									
CO6	3	2	1									

Module	Content	Hours	COs
1	INTRODUCTION: Scope of Urban transport planning – Inter dependency of land use and traffic – System Approach to urban planning. STAGES IN URBAN TRANSPORT PLANNING: Trip generation – Trip production - Trip distribution – Modal split – Trip assignment	8	CO3
2	URBAN TRANSPORT SURVEY - Definition of study area-Zoning-Types of Surveys – Inventory of transportation facilities – Expansion of data from sample TRIP GENERATION: Trip purpose – Factors governing trip generation and attraction – Category analysis – Problems on above	8	CO4
3	TRIP DISTRIBUTION: Methods – Growth factors methods – Synthetic methods – Fractor and Furness method and problems on the above.	8	CO2
4	MODAL SPLIT: Factors affecting – characteristics of split – Model split in urban transport planning – problems on above	8	CO1
5	TRIP ASSIGNMENT: Assignment Techniques – Traffic fore casting – Land use transport models – Lowry Model – Garin Lowry model – Applications in India – (No problems on the above) URBAN TRANSPORT PLANNING FOR SMALL AND MEDIUM CITIES: Introduction – Difficulties in transport planning – Recent Case Studies	8	CO3

NOTE: 1. Questions for CIE and SEE not to be set from self-study component.
2. Assignment Questions should be from self-study component only.

Self Study Component		
Module	**Contents**	**CO's**
1	To evaluate effectiveness of local transport service	CO3
2	To do transport survey for a ward area	CO4
3	Trip generation and distribution characteristics for an area	CO5
4	Analyze the modal split analysis for an educational institution	CO1

TEXT BOOKS:
1. Traffic Engineering and Transport Planning- L.R. Kadiyali - Khanna Publishers.
2. Principles of urban transport system planning - B.G. Hutchinson - Scripta Book Co., Washington D.C. & McGraw Hill Book Co.
3. Introduction to transportation engineering- Jotin Kristey and Kentlal - PHI, New Delhi.
REFERENCE BOOKS:
1. Urban Transport planning- Black John - Croom Helm ltd, London.
2. Urban and Regional models in geography and planning- Hutchison B G - John Wiley and sons London.

EMERGING TECHNOLOGIES IN CIVIL ENGINEERING

Course Code: 18CV5GCETC **Credits: 02**
L: P: T: S: 2: 0: 0: 0 **CIE Marks: 50**
Total Hours: 25

COURSE OBJECTIVES:

1. Exposing the students to emerging technologies in wastewater treatment and recycle and reuse of wastewater.
2. Exposing the students to emerging technologies in water resources and geology

Course Outcomes: After completion of the course, the graduates will be able to

CO1	Apply sustainable and upcoming technologies of water resource engineering
CO2	Understand the advancement in material science in design and Construction.
CO3	SOFT COMPUTING in water resources application.
CO4	Explain engineering properties, uses of masonry units, defects, crack in masonry and its remedial measures.
CO5	Factors affecting compressive strength of masonry units

Mapping of Course outcomes to Program outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3										2
CO2	3	3										2
CO3	3	3					2					2
CO4	3	3										2
CO5	3	3					2					2

Module	**Course Content**	**Hours**	**COs**
1	Prerequisites for extensive survey camp, Total station and its applications, Drone Surveying and its applications in Civil Engineering, introduction to LIDAR	6	CO1 CO2
2	Methods used to estimate runoff in a catchment area. Hydrograph, Runoff estimation in ungauged catchment area, effect of climate change. Types of engineering surveys conducted during reservoir planning, zones of reservoir,	6	CO3

	capacity contours to find storage capacity of reservoirs, waste weir-functions and design concept of waste-weir. Canal design. Introduction to software like StormCAD, PONDPack		
3	**Ground water hydrology:** Introduction, occurrence of ground water, aquifers parameters, ground water moment, steady radial flow to wells, artificial recharge techniques.	6	CO4
4	**Masonry Units, Materials, types and masonry construction:** Bricks, Stone and Block masonry units- strength, modulus of elasticity and water absorption of masonry materials – classification and properties of mortars. Defects and Errors in masonry construction – cracks in masonry, types, reason for cracking, methods of avoiding cracks.	6	CO5 CO6
5	**Strength and Stability:** Strength and stability of axially loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of ageing, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.	6	

References

1. A textbook of Hydrology, Dr. P Jaya Rami Reddy, Laxmi Publications Ltd, 2nd Edition
2. Henry, A.W., " Structural Masonry" , Macmillan Education Ltd.,
3. M. L. Gambhir, " Building and Construction Materials", Mc Graw Hill education Pvt. Ltd
4. IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi
5. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1 st revision) BIS, New Delhi.
6. Water Resource research, willey-Blackwell publication.

Assessment Pattern:
CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Report	Presentation
Marks (Out of 50)	20	30

***Note: If marks obtained by the student is less than 20 (<20), he/she should repeat in supplementary semester**