MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT [As per NEP, Outcome Based Education, and Choice Based Credit System (CBCS) Scheme] SEMESTER-V			
Subject Code	22HSM51	CIE Marks	50
Number Lecture Hour/Week	2L+1T	SEE Marks	50
Number of Lecture Hours	40	Exam Hours	03
CREDITS-03			

Course Objectives The objectives of the course is to enable students to:

1. Understand basic skills of Management.
2. Understand the need for Entrepreneurs and their skills.
3. Identify the Management functions and Social responsibilities.
4. Distinguish between management and administration.
5. Understand Project identification and Selection.

Module -1	**Teaching Hours**
Management: Introduction-Meaning-Nature and characteristics of management, Scope and Functional areas of management- Management as art of science, art or profession-Management & Administration-Roles of Management, Levels of Management, Development of Management Thought-Early management approaches-Modern management approaches. **Planning**: Nature, Importance and purpose of planning process objectives-types of plans (meaning only)-decision making, Importance of planning-steps in planning & planning premise- Hierarchy of plans.	08 Hours
Module -2	
Organizing and Staffing: Organization-Meaning, Characteristics, Process of Organizing, Principles of Organizing, Span of Management (meaning and importance only), Departmentalization, Committees–Meaning, Types of Committees; Centralization Vs Decentralization of Authority and Responsibility; **Staffing**-Need and Importance, Recruitment and Selection Process. **Directing:** Meaning and Requirements of Effective Direction, Giving Orders; Motivation-Nature of Motivation, Motivation Theories (Maslow's Need-Hierarchy Theory and Herzberg's Two Factor Theory); Communication – Meaning, Importance and Purposes of Communication; Leadership-Meaning, Characteristics, Behavioral Approach of Leadership.	08 Hours
Module -3	
Coordination: Coordination-Meaning, Types, Techniques of Coordination; **Controlling** – Meaning, Need for Control System, Benefits of Control, Essentials of Effective Control System, Steps in Control Process. **Authority delegation:** Meaning, advantage of effective delegation, barriers to effective delegation, guidelines for effective delegation. **Decentralization**: Decentralization of authority meaning, distinction between delegation and decentralization, the trade-off of centralization and decentralization.	08 Hours
Module -4	
Entrepreneurship: Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle.	08 Hours

Modern Small Business Enterprises: Role of Small Scale Industries, Impact of Globalization and WTO on SSIs, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Ancillary Industry and Tiny Industry (Definition only) .	
Module -5	
Projects Management: A Project. Search for a Business idea: Introduction, Choosing an Idea, Selection of product, The Adoption process, Product Innovation, Product Planning and Development Strategy, Product Planning and Development Process. Concepts of Projects and Classification: Introduction, Meaning of Projects, Characteristics of a Project, Project Levels, Project Classification, Aspects of a Project, The project Cycle, Features and Phases of Project management, Project Management Processes. Project Identification: Feasibility Report, Project Feasibility Analysis. Project Formulation: Meaning, Steps in Project formulation, Sequential Stages of Project Formulation, Project Evaluation. **Project Design and Network Analysis:** Introduction, Importance of Network Analysis, Origin of PERT and CPM, Network, Network Techniques, Need for Network Techniques, Steps in PERT, CPM, Advantages, Limitations and Differences.	08 Hours
Course Outcomes: After studying this course, students will be able to: CO-1-Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business. CO-2-Select a best Entrepreneurship model for the required domain of establishment. CO-3-Compare various types of Entrepreneurs. CO-4-Awareness about various sources of funding and institutions supporting entrepreneurs. CO-5-Analyze the Institutional support by various state and central government agencies.	
Text Books: 1. Principles of Management – P.C Tripathi, P.N Reddy, McGraw Hill Education, 6th Edition, 2017. ISBN-13:978-93-5260-535-4. 2. Entrepreneurship Development Small Business Enterprises- Poornima M Charantimath, Pearson Education 2008, ISBN 978-81-7758-260-4. 3. Dynamics of Entrepreneurial Development and Management by Vasant Desai. HPH 2007, ISBN: 978- 81-8488-801-2. 4. Robert D. Hisrich, Mathew J. Manimala, Michael P Peters and Dean A. Shepherd, "Entrepreneurship", 8th Edition, Tata Mc-graw Hill Publishing Co.ltd.-new Delhi, 2012	
Reference Books: 1. Essentials of Management: An International, Innovation and Leadership perspective by Harold Koontz, Heinz Weihrich McGraw Hill Education, 10th Edition 2016. ISBN- 978-93-392-2286-4.	

Design of RC Structural Elements
B.TECH., V Semester, Civil Engineering
[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Course Code	22CV52	**CIE**	50
Number of Lecture Hour/Week	03L+01T	**SEE**	50
Total Number of Lecture Hours	52	**Exam Hours**	03

CREDITS –4

Course Objectives: This course will enable students to

1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
2. Follow a procedural knowledge in designing various structural RC elements.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. To provide a through understanding of IS456-2000 standards for design and analysis of RCC Structure.
5. Provide knowledge in analysis and design of RC elements for the success in competitive examinations.

Modules	Teaching Hours
Module -1 Introduction to Limit State Design and Serviceability: Introduction to working stress, Ultimate load and Limit State Method. Difference between Working stress,ultimate load and Limit State Method of design, Modular Ratio and Factor of Safety. Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section. Importance of bond, anchorage length, lap length and Developed Length. Limiting deflection, short-term deflection, long-term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slenderness limits of beams for stability.	10hours
Module -2 Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced, and flanged beams for flexure and shear.	10Hours
Module -3 Limit State Design of Beams: Design of singly reinforced beams, doubly reinforced beams & Design of flanged beams for shear, combined bending and torsion as per IS-456-2000	10Hours
Module -4 Limit State Design of Slabs and Stairs: Introduction to one way and two-way slabs, Design of cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions. Introduction, Structural Behavior of Stair case, Loads and Distribution of load on staircase as per IS 456-2000, Design of dog legged and open well staircases.	11Hours
Module -5 Limit State Deign of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments. Introduction of Footing, Types of Footing, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment using IS-456-2000 and sp-16	11Hours

Course Outcomes: After studying this course, students will be able to:

CO#	**Course outcomes**: After studying this course, students will be able to:
CO1	Apply the design philosophy and principles.
CO2	Analysis of RCC elements subjected to flexure, shear and torsion.
CO3	Demonstrate procedural knowledge in designs of RCC structural elements such as able to design beams slabs, columns and footings.
CO4	Apply the conceptual designs of RCC structural elements such as design slabs and stairs
CO5	Apply the conceptual designs of RCC structural elements such as design columns and footing.

Question Paper Pattern:

1) The question paper will have ten full questions carrying equal marks.
2) Each full question will be for 20 marks.
3) There will be two full questions (with a maximum of four sub- questions) from each module.
4) Each full question will have sub - question covering all the topics under a module.
5) The students will have to answer five full questions, selecting one full question from each module.

Text Books: ·

1. Unnikrishnan Pillai and Devdas Menon, “Reinforced Concrete Design”, McGraw Hill, New Delhi

2. Subramanian, “Design of Concrete structures”, Oxford university Press

3. H J Shah, “Reinforced Concrete Vol 1 (Elementary Reinforced Concrete)”, Charotar Publishing House Pvt. Ltd.

4. S.S Bhavikatti “Design of RCC structural elements” vol-1

5.A.K Jain “Reinforced Concrete Design”limit state design

Reference Books:

1. P C Varghese, “Limit State design of reinforced concrete” , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, “Reinforced Concrete Design”, MacMillan Education, Palgrave publishers
3. Kong and Evans, “Reinforced and Pre-Stressed Concrete”, Springer Publications
4. A W Beeby and Narayan R S, “Introduction to Design for Civil Engineers”, CRC Press
5. Robert Park and Thomas Paulay, “Reinforced Concrete Structures”, John Wiley & Sons, Inc.

Course Articulation Matrix / Course mapping:

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1		1			1								1	2	3
CO2		2		1										3	3
CO3		1	1	1										3	3
CO4			1	1										3	3
CO5			1	1										3	3

STRUCTURAL ANALYSIS-II

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Subject Code	22CV53	IA Marks	50
Number of Lecture Hours/Week	03L+0T	CIE	50
Total Number of Lecture Hours	42	SEE	03

CREDITS – 03

Course objectives:

This course will enable students to

1. Apply knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using slope deflection, moment distribution method and Kani's method.
2. Identify, formulate and solve problems in structural analysis.
3. Analyze structural system and interpret data.
4. Use the techniques, such as stiffness and flexibility methods to solve engineering problems.
5. To study the basic principles of structural dynamics.

Modules	Teaching Hours
Module -1	
Slope Deflection Method: Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane non sway frames with kinematic indeterminacy ≤ 3	08 Hours
Module -2	
Moment Distribution Method: Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of orthogonal rigid plane sway & non sway frames with kinematic indeterminacy ≤ 3	08 Hours
Module -3	
Kani's Method: Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of orthogonal rigid plane non sway frames with kinematic indeterminacy ≤ 3	08 Hours
Module -4	
Matrix Method of Analysis : Introduction, **Flexibility matrix**, Analysis of continuous beams and plane trusses using system approach, with static indeterminacy ≤ 3 **Stiffness matrix**, Analysis of continuous beams and plane trusses using system approach, with kinematic indeterminacy ≤ 3	10 Hours
Module -5 **Basic Principles of 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.	08 Hours

Course Outcomes (COs):

On completion of this course ,the student will be able to

CO#	Course Outcomes
CO1	Analyse the structures using slope defection method and construct BMD AND SFD.
CO2	Analyse the structures using moment distribution method and construct BMD AND SFD.
CO3	Analyse the structures using Kani's method and construct BMD AND SFD.
CO4	Understanding concept of flexibility and stiffness matrix.
CO5	Basic concept of structural dynamics

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 10marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from eachmodule.

REFERENCE BOOKS:

1. Reddy C S, **"Basic Structural Analysis",** *Tata McGraw-Hill* Publishing Company Ltd.
2. Gupta S P, G S Pundit and R Gupta, **"Theory of Structures"**, Vol II, Tata McGraw Hill Publications company Ltd.
3. V N Vazirani and M MRatwani, **"Analysis Of Structures** ", Vol. 2, Khanna Publishers
4. Wang C K, **"Intermediate Structural Analysis",** McGraw Hill, International Students Edition.
5. S.Rajasekaran and G. Sankarasubramanian, **"Computational Structural Mechanics",** PHI Learning Pvt. Ltd.

Course Articulation Matrix / Course mapping :

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	2	2					1			1		3	2
CO2	3	2	2	2					1			1		3	3
CO3	3	2	2	2					1			1		3	3
CO4	2	2	2	2					1			1		3	2
CO5	2	2	2	2					1			1		3	2

ADVANCED GEOTECHNICAL ENGINEERING

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Subject Code	22CV541	**CIE**	50
Number of Lecture Hours/Week:	03L+0T	**SEE**	50
Total Number of Lecture Hours	42	**Exam Hours**	03

CREDITS – 03

Course objectives: This course will enable students to

1. Appreciate basic and advanced concepts of soil mechanics as an integral part in the knowledge of civil engineering also to become familiar with foundation engineering terminology and understand how the principles of geotechnical are applied in the design of foundations
2. Learn introductory concepts of geotechnical investigations required for civil engineering projects emphasizing in situ investigations
3. Conceptually learn various theories related to bearing capacity of soil and their application in the design of shallow foundations and estimation of load carrying capacity of pile foundation
4. Estimate internal stresses in the soil mass and application of this knowledge in proportioning of shallow and deep foundation fulfilling settlement criteria
5. Study about assessing stability of slopes and earth pressure on rigid retaining structures.

Modules	**Teaching Hours**
Module -1	
Soil Exploration: Introduction, Objectives and Importance, Stages and Methods of exploration- Test pits, Borings, Geophysical methods, stabilization of boreholes, Sampling techniques, Undisturbed, disturbed and representative samples, Geophysical exploration and Bore hole log. Drainage and Dewatering methods, estimation of depth of ground water table (GWT) (Hvorslev's method).Numerical problem on above.	08Hours
Module -2	
Stresses in Soils: Introduction, Boussinesq's and Westergaard's theory concentrated load, circular and rectangular load, equivalent point load method, pressure distribution diagrams and contact pressure, Newmark's chart Foundation Settlement - Approximate method for stress distribution on a horizontal plane, Types of settlements and importance, Computation of immediate and consolidation settlement**.** Numerical problem on above.	08 Hours
Module -3	
Lateral Earth Pressure: Active, Passive and earth pressure at rest, Rankine's theory for cohesionless and cohesive soils, Coulomb's theory, Rebhann's and Culmann's graphical construction. consolidation settlement**.** Numerical problem on above. **Stability of Slopes**: Assumptions, infinite and finite slopes, factor of safety, use of Taylor's stability charts, Swedish slip circle method for C and C-Φ soils (Method of slices), Fellineous method for critical slip circle. Numerical problem on above.	09 Hours

Module -4	
Bearing Capacity of Shallow Foundation: Types of foundations, determination of bearing capacity theories (Prandtl, Rankine, Terzaghi, Skempton) and BIS method (IS: 6403-1981), Presumptive bearing capacity, Effect of water table and eccentricity, field methods - plate load test and standard penetration method (SPT), settlement of foundation. Proportioning of combined footing(rectangular and trapezoidal)**.** Numerical problem on above.	08 Hours
Module -5	
Deep Foundations: Pile foundation: Types and classification of piles, single loaded pile capacity in cohesionless and cohesive soils by static formula, efficiency of pile group, group capacity of piles in cohesionless and cohesive soils, negative skin friction, pile load tests, Settlement of piles, under reamed piles (only introductory concepts – no derivation). Well foundation: Types –Different shapes of wells –Components of wells and its functions. Numerical problem on above.	09 Hours

Course outcomes: On the completion of this course students are able to attain the following outcomes;

1. To plan and execute geotechnical site investigation program for different civil engineering projects
2. Analysis of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
3. Estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
4. Determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
5. Estimate the load carrying capacity of single and group of piles and to know the basics of well foundation.

Question paper pattern:

The question paper will have ten questions.

1. Each full question consists of 10 marks.
2. There will be 2 full questions (with a maximum of four sub questions) from each module.
3. Each full question will have sub questions covering all the topics under a module.
4. The students will have to answer 5 full questions, selecting one full question from each module

Text Books:

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co.New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors,New Delhi.
4. Dr K. R. Arora., Soil mechanics and foundation engineering. Standard publishers. New Delhi.
5. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India

Reference Books:

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi
3. Shashi K. Gulathi& Manoj Datta, Geotechnical Engineering-. Tata McGraw Hill Publications
4. DebashisMoitra, “Geotechnical Engineering”, Universities Press.,
5. Malcolm D Bolton, “A Guide to soil mechanics”, Universities Press.,
6. Bowles J E, Foundation analysis and design, McGraw- Hill Publications

Course Articulation Matrix / Course mapping:
Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2					1		1	2	1	2
CO2	3	2	2	2	1					1		1	2	2	3
CO3	3	2	2	2	1					1		1	2	2	3
CO4	3	2	2	2	1					1		1	2	2	3
CO5	3	2	2	2	1					1		1	2	2	3

MASONRY STRUCTURES

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Course Code:	22CV542	**CIE**	50
Number of Lecture Hour/Week	3L+OT	**SEE**	50
Total Number of Lecture Hours	42	**Exam Hours**	03

CREDITS –03

Course Objectives: This course will enable students to

1. To understand the behavior of masonry structure
2. To make use of fundamental of design methodologies for design of masonry structure.
3. To identify different component of masonry structure.
4. Become familiar with basic masonry materials, including clay brick, concrete block, mortar, grout, and reinforcing accessories.
5. Understand the behavior of reinforced masonry structures under flexure, shear, axial forces, combined flexure and axial forces, and in-plane shear forces.

Modules	Teaching Hours
Module -1 **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. **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.	9 hours
Module -2 **Permissible stresses:** Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and lateral load, permissible tensile stress and shear stresses. **Design Considerations:** Effective height of walls and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. Problems on design considerations for solid walls, cavity walls, wall with pillars.	9 Hours
Module -3 **Load considerations and design of Masonry subjected to axial loads:** Design criteria, design examples of walls under UDL, solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers.	8 Hours
Module -5 **Design of Laterally and transversely loaded walls:** Design criteria, design of solid wall under wind loading and Earthquake loading , design of shear wall – design of compound walls.	8 Hours

Introduction to reinforced brick masonry, lintels and slabs. **In-filled frames**: Types – modes of failures – design criteria of masonry retaining walls.	

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Explain engineering properties, uses of masonry units, defects, crack in masonry and its remedial measures and factors affecting compressive strength of masonry units.
CO2	Explain the different masonry elements, permissible stresses, design considerations and criteria as per IS: 1905 and SP-20.
CO3	Design different types of masonry walls subjected to axial loads.
CO4	Design different types of masonry walls subjected to eccentric loads.
CO5	Design laterally and transversely loaded walls.

Question Paper Pattern:

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of four sub- questions) from each module.
- Each full question will have sub- question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. Henry, A.W., "Structural Masonry", Macmillan Education Ltd., 1990.
2. Dayaratnam P, "Brick and Reinforced Brick Structures", Oxford & IBH, 1987.
3. M. L. Gambhir, "Building and Construction Materials", Mc Graw Hill education Pvt. Ltd.

Reference Books:

1. IS 1905–1987 "Code of practice for structural use of un-reinforced masonry- (3rd revision) BIS, New Delhi.
2. SP 20 (S&T) – 1991, "Hand book on masonry design and construction (1st revision) BIS, New Delhi.

Course Articulation Matrix / Course mapping:

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	1	-	-	-	-	-	1	2	2	2
CO2	3	1	-	-	-	1	-	-	-	-	-	1	3	2	3
CO3	3	3	3	1	-	-	-	-	-	-	-	1	3	3	3
CO4	3	3	3	1	-	-	-	-	-	-	-	1	3	3	3
CO5	3	3	3	1	-	-	-	-	-	-	-	1	3	3	3

Water Conservation and Rainwater Harvesting [As per Choice Based Credit System (CBCS) scheme] V Semester			
Course Code	22CV551	**CIE**	50
Number of Lecture Hour/Week	4	**SEE**	50
Total Number of Lecture Hours	52	**Exam Hours**	3hr
CREDITS –04			

Course Objectives: This course will enable students to:

- Appreciate basic concepts of Water and its importance.
- Learn elementary knowledge of groundwater.
- Conceptually learn various theories related to Ground water recharge.
- Understand the importance of water conservation/saving of water in daily use.
- Study about Subsurface investigation of Groundwater.

Modules	**Teaching Hours**
Module -1 **Water and its importance.** Monsoon– types and behavior in India, rainfall – characteristics and distribution, onset and withdrawal of effective rains, dry spells and wet spells, critical dry spells, water loss from the soil, measurement and factors, hydrological cycle, Importance and issues relating water status Scenario of water in Karnataka: sources, geographical distribution, quality. Water (hydrological) cycle.	11 hours
Module -2 **Elementary knowledge of groundwater:** General aquifer. Water quality and its impact on human beings. Water harvesting: need, principles of water harvesting, general water harvesting methods - rain water harvesting - methods, classes, benefits, approach, subsurface barrier/dykes, farm ponding, etc mostly used in rural areas.	11 Hours
Module -3 **Groundwater recharge.** Factors affecting groundwater recharge, Revival of traditional techniques with modern approach for water harvesting. Calculation of available rainwater for harvesting. Preparation of suitable technical drawing and design of rain water harvesting structure.	10 Hours
Module-4 **Elementary conservation of water**:	10 Hours

Importance ,knowledge regarding conservation/saving of water in daily use, in agriculture, in industries. Water Conservation strategies-Limiting the consumption, Re use and recycling, Elimination of losses, Pollution prevention.	
Module-5 **Subsurface investigation of Groundwater:** General, geophysical methods and its importance. Present law regarding water management. Water foot prints-Blue water footprint, green water footprint, grey water footprint. Sustainability assessment.	10 Hours

Course Outcomes: After studying this course, students will be able to:

CO#	Course Outcomes
CO1	Rain Water Characteristics and Distribution of rainfall in India
CO2	Ground water quality, need of groundwater harvesting and its methods
CO3	Traditional methods of groundwater recharge with modern approach
CO4	Water conservation Methods.
CO5	Investigation of subsurface groundwater.

Question Paper Pattern:

1) The question paper will have ten questions. Each question is set for 20 marks.
2) There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.
3) The students have to answer 5 full questions, selecting one full question from each module.
4) Marks scored shall be proportionally reduced to 50marks

Text Books:

1. Patel, A.S. and Shah, D.L., (2017) Water Management, New Age International, New Delhi
2. Patel, A.S. et al., (2003) Manual of Water Harvesting, GSFC Science Foundation, Vadodara, India.
3. Huisman, L. And Olsthoorm, T.N. (1983) Artificial Groundwater Recharge, Pitman Advanced Publishing Program, Boston.

Reference Books:

1. Hillel, I.S., (1977) Water Renovation and Reuse, Academic Press, New York.
2. Jawad, A.S. and Akashi, A. (2000) Wastewater Reclamation and Reuse, New Age International Pvt Ltd., New Delhi. UNDP (1998, 2001), State of the Environment, India, United Nations Environmental Program.
3.Manual on Rain Water Harvesting CPWD, http://cpwd.gov.in

Course Articulation Matrix / Course mapping:

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2												2		
CO2	3												2		
CO3	2	3		2			2						2	2	
CO4	2		3				2						2		

CO5	2		3	2									2		2

Smart Cities

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Course Code	**22CV552**	**CIE**	50
Number of Lecture Hour/Week	**04**	**SEE**	50
Total Number of Lecture Hours	**52**	**Exam Hours**	03

CREDITS –04

Course Objectives: This course will enable students to:

1. To make aware about code of practice for Smart & sustainable City.
2. To understand the concept of smart city and associated challenges.
3. To carry out feasibility study for infrastructure planning.
4. To understand process of planning and drafting a plan for smart city.
5. To understand the importance of different smart system.

Modules	Teaching Hours
Module -1 **Introduction to Smart cities**: Introduction to smart & sustainable cities- Definition, dimensions, scope Smart Cities –Global Standards and Performance Benchmarks, Practice Code, Principal stakeholders, key trends in smart cities developments, Concept of Sustainable cities.	11 hours
Module -2 **Smart Cities Planning and Development**: Planning for Urban Infrastructure, Introduction to city planning, key trends in smart cities developments, Sustainable features for smart cities. Role of Planner in the provision of urban networks for different services, Case Study.	9 hours
Module -3 **Infrastructure Planning and Development for smart Cities:** Feasibility studies for infrastructure projects, planning for major infrastructure projects, Various Infrastructure Program and policies by MOUD, PPP (DBOOT, BOOT, etc.) in infrastructure projects. Dimension of smart cities, Financing smart cities development, Governance of smart cities, Smart Cities Regulations & Smart Techniques, Case Study.	12 Hours
Module -4 **Transportation system for Smart Cities:** Urbanization and urban mobility, urban land use and transport. Concepts of sustainable mobility, public transportation, pedestrians and bicyclists and parking, fundamentals of the intelligent transportation systems (ITS), Case Study.	10 Hours
Module -5 **Project management in Smart Cities :** Phases, Stages of project and work break down Structure,Project organization structure, Planning, Scheduling and CPM , Project cost analysis, resource allocation & leveling, Line of balancing technique ,Project monitoring and control, Project risk management	10 Hours
Course Outcomes: After studying this course, students will be able to:	

CO1 : Understand the concept of smart & sustainable city and associated challenges.
CO2 : Identify latest technologies used in Infrastructural Planning.
CO3 : Evaluate feasibility analysis for infrastructural planning.
CO4 : Apply various smart technique used for Smart City development.
CO5 : Develop work break down structure, scheduling and project management of smart cities.

Question Paper Pattern:

5) The question paper will have ten full questions carrying equal marks.
6) Each full question will be for 20 marks.
7) There will be two full questions (with a maximum of four sub- questions) from each module.
8) Each full question will have sub - question covering all the topics under a module.
9) The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. Jo Beall (1997); "A city for all: valuing differences and working with diversity"; Zed books limited, London (ISBN: 1- 85649-477-2).
2. UN-Habitat; "Inclusive and sustainable urban planning: a guide for municipalities"; Volume 3: Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978- 92-1-132024-4).
3. Arup Mitra; "Insights into inclusive growth, employment and wellbeing in India"; Springer (2013), New Delhi (ISBN: 978- 81-322-0655-2 \
4. Mission statement &guidelines on Smart City Scheme". Government of India - Ministry of Urban Development http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf

Reference Books:

1. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); "Remaking the city: Social science perspective on urban design"; State University of New York Press, Albany (ISBN: 0-87395-678-8)
2. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science.
3. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_3.12.2014__REVISED_AND_LATEST_.pdf)

Course Articulation Matrix / Course mapping:

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1					1	2	1					1	2		
CO2					1	1	1					1	1	1	
CO3					1	1	1	1			2	1	1	2	
CO4					1	2	1	1				1	1		
CO5					1	1						3	1	2	

CONCRETE & HIGHWAY MATERIAL TESTING LAB

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Course Code	22CVL56	**CIE**	50
Number of lecture hours per week	02	**SEE**	50
Total number of practical hours	28	**Exam hours**	03

CREDITS 01

Course Learning Objectives: This course will enable students,

1. Able to interpret the experimental results of concrete and highway materials based on laboratory tests and apply it to real site conditions.
2. Determine the quality and suitability of cement in making concrete.
3. Design appropriate concrete mix Using Professional codes.
4. Determine strength and quality of concrete requiring to various site conditions.
5. Evaluate the strength of structural elements using NDT techniques.

	EXPERIMENTS	**Teaching Hours**
01	Normal consistency and Setting time test on cement.	2 Hours
02	Fineness test of cement by Blaine's permeability test and Sieve analysis and Compressive strength test on cement.	1 Hours
03	Specific gravity of cement and Aggregate Crushing value test.	2 Hours
04	Los Angeles abrasion test on aggregates and Aggregate impact test.	2 Hours
05	Aggregate shape tests. (combined index and angularity number)	2 Hours
06	Determining workability of fresh concrete using slump cone, compaction factor, Vee-Bee consistometer and flow table.	3 Hours
07	Determination of compressive strength of hardened concrete.	2 Hours
08	Determination of Split tensile strength of hardened concrete.	2 Hours
09	Determination of flexural strength of hardened concrete.	2 Hours
10	NDT test by re-bound hammer.	2 Hours
11	Penetration test on bitumen.	2 Hours
12	Determination of specific gravity of bitumen.	2 Hours
13	Determination of softening value by ring and ball test of bitumen.	2 Hours
14	Determination of flash and fire point of bitumen.	2 Hours

CO#	Course Outcomes
CO1	Able to interpret the experimental results of concrete and highway materials based on laboratory tests and apply it to real site conditions.
CO2	Determine the quality and suitability of cement in making concrete.
CO3	Design appropriate concrete mix Using Professional codes.
CO4	Determine strength and quality of concrete requiring to various site conditions.
CO5	Evaluate the strength of structural elements using NDT techniques.

Question paper pattern:

Two experiments shall be asked from the above set of experiments.

One experiment to be conducted and for the other student should write detailed procedure.

Text books

1. M. L. Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual", Nem Chand Bros, Roorkee.

References:

1. Relevant BIS codes

Course Articulation matrix/ Course mapping.

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	3			2	3	1	2	2		2	1	2	
CO2	3	2	3			2	3	1	2	2		2	1	2	
CO3	3	2	3			2	3	1	2	2		2	1	2	
CO4	3	2	3			2	3	1	2	2		2	1	2	
CO5	3	2	3			2	3	1	2	2		2	1	2	

GEOTECHNICAL ENGINEERING LAB

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Subject Code	22CVL57	**CIE**	50
Number of practical Hours/Week	02	**SEE**	50
Total Number of Lecture Hours	28	**Exam Hours**	03

CREDITS -01

Course Objectives: This course will enable students to;

1. To carry out laboratory tests and to identify soil as per IS code procedures
2. To perform laboratory tests to determine index properties of soil
3. To perform laboratory tests to determine compaction properties of soil.
4. To perform tests to determine shear strength
5. To perform tests to determine consolidation characteristics of soils.

EXPERIMENTS

1. Water content determination by oven drying method and infrared moisture method
2. Specific gravity test (pycnometer and density bottle method)
3. Grain size analysis
   - i. Sieve analysis
   - ii. Hydrometer analysis
4. In-situ density tests
   - i. Core-cutter method
   - ii. Sand replacement method
5. Consistency limits
   - i. Liquid limit test (by Casagrande's and cone penetration method)
   - ii. Plastic limit test
   - iii. Shrinkage limit test
6. Standard compaction test (light and heavy compaction)
7. Co-efficient of permeability test
   - i. Constant head test
   - ii. Variable head test
8. Shear strength tests
   - i. Unconfined compression test
   - ii. Direct shear test
   - iii. Triaxial test (undrained unconsolidated)

iv. vane shear test

9. Consolidation test: Demonstration of oedometer apparatus to determine compression index and co- efficient of Consolidation

10. Demonstration of standard penetration test apparatus in the field.

Course outcomes: Students will be able to conduct appropriate laboratory/field experiments and interpret the results to determine

1. Physical and index properties of the soil
2. Classify soil based on index properties and field identification
3. To determine OMC and MDD, plan and assess field compaction program
4. Shear strength and consolidation parameters to assess strength and deformation characteristics
5. In-situ shear strength characteristics (SPT- Demonstration)

Question paper pattern:

· All experiments are to be included in the examination except demonstration exercises.
· Candidate to perform experiment assigned to him
· Marks are to be allotted as per the split up of marks shown on the cover page of answer script.

Reference Books:

1. Punmia B C, Soil Mechanics and Foundation Engineering- (2017), 16th Edition, Laxmi Publications co., New Delhi.
2. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi.
3. Head K.H., "Manual of Soil Laboratory Testing" Vol. I, II, III, Princeton Press
4. Bowles J.E., "Engineering Properties of Soil and Their Measurements",- McGrawHill Book Co. New York.
5.Relevant BIS Codes of Practice: 2720(Part-3/Sec. 1) – 1987
IS 2720 (Part – 2)-1973;
IS 2720 (Part – 4) – 1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) –1972;
IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) – 1983; IS 2720 (Part – 17) –1986;
IS 2720 (Part - 1 0) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) –1971;
IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977;
IS 2720 (Part – 14) – 1983; IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966,
IS 2720 (Part-60) 1965.

Course Articulation Matrix / Course mapping:
Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		1					1			1	1	2
CO2	3	2	1		1					1			1	1	2
CO3	3	2	1		1					1			1	2	3

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

SOFTWARE APPLICATION LAB-1

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Course Code	22CVL58	CIE	50
Number of lecture hours per week	02	SEE	50
Total number of lecture hours	28	Exam hours	03

CREDITS 01

Course Learning Objectives: This course will enable students,

1. Use industry standard software in a professional set up.
2. understand the elements of finite element modeling, specification of loads and boundary condition, performing analysis and interpretation of results for final design
3. Develop customized automation tools

Sl. No	EXPERIMENTS	Teaching Hours
1	Analysis of plane trusses, continuous beams using software	28
2	Analysis of portal frames using software	
3	RCC design (beam, column) using software	
4	Importing simple plan from AutoCAD and performing analysis and design of G+1 Building using software	
5	Design of singly reinforced and doubly reinforced rectangular beams using Excel	
6	Design of one way and two-way slabs using Excel	
7	Computation of earthwork using Excel	
8	Design of horizontal curve by offset method using Excel	
9	Design of super elevation Using Excel	
10	**Demonstration experiment**: create a plan and set of structural drawings for a multi-storied building	

CO#	Course Outcomes
CO1	To use Analysis software (Civil Engineering)
CO2	To analyse beams, frames and truss members in software.
CO3	To Design simple building
CO4	To use Excel spread sheets in Rcc structures.
CO5	To use Excel spread sheets in Design of Highway Geometrics

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
  Four questions are set for SEE. Two questions from Analysis and design and other two questions using Excel spread sheet each question carries 25 marks.

Students have to answer one question from each part.

REFERENCE BOOKS:

Training manuals and User manuals and Relevant course reference books

Course Articulation Matrix / Course mapping :

Note: 1-Low, 2-Medium, 3-High

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	2	2	2	2					1			1		3	3
CO2	3	2	2	2					1			1		2	3
CO3	3	2	2	2					1			1		3	3
CO4	2	2	2	2					1			1		3	3
CO5	2	2	2	2					1			1		3	3

PROJECT-V

B.TECH., V Semester, Civil Engineering

[As per NEP, Outcome Based Education(OBE) and Choice Based Credit System(CBCS) Scheme]

Subject Code	22PRJ59	CIE Marks	50
Number Lecture Hour/Week	2P	SEE Marks	50
Total Number of Lecture Hours	24	Exam Hours	03

CREDITS-01

Course Objectives: Students will be taught to:

1. Get exposure about the civil engineering coursework to solve real-world problems.
2. Design the working model of the open ended problem.
3. Understand concepts of safety durability and environmental impacts.
4. Understand the latest technology and software tools.
5. Prepare technical documentation of the project.

STUDENTS WILL BE GIVEN A OPEN ENDED PROBLEM OF THE SOCIETY AND ASKED TO SOLVE BY DESIGNING AND IMPLEMENTING THE SYSTEM IN TEAM.

Course outcomes: After studying this course, students will be able to:

CO1. Apply the knowledge of civil engineering and to solve the real time problems of the society.

CO2. Analyze the various existing solutions available to solve the real time problem and propose the best solution.

CO3. Design and implement the system to solve the real time problem of the society.

CO4. Conduct investigations on the output and prepare the technical documentation of the designed system in a team.

CO5. Use the modern tool available like advanced software tools.

COURSE OUTCOME AND PROGRAMME OUTCOME MAPPING (1/2/3):

Note: 1-Low, 2-Medium, 3-High

CO/PO	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	3	-	-	-	-	-	-	-	-	-	-	2	3	3
CO2	-	3	-	-	-	-	-	-	-	-	-	2	3	3
CO3	-	-	3	-	-	3	-	-	-	-	-	2	3	3
CO4	-	-	-	3	-	3	3	3	3	3	3	3	3	3
CO5	-	-	-	-	3	-	-	-	-	-	-	2	-	-

FIELD TRAINING
[As per Choice Based Credit System (CBCS) scheme]
SEMESTER –V

Subject code	22ACV510A	**CIE**	50
Number of lecture hours per week	01	**SEE**	50
Total number of practical hours	15	**Exam hours**	03

CREDITS 01

Course Learning Objectives: This course will enable students to:

1. Study the drawings and executive on field
2. Work properly in the construction field
3. Initiate the work at construction field

Modules	**Teaching Hours**
Module-1	
Building Plan and mark outs 2D AutoCAD drawings of the centerline of column and footing layout, marking of centerline, column, and footing on site.	3 Hours
Module-2	
Quantity Survey of Construction Works Calculating the material requirements for execution of footing and slab works with sample examples.	3 Hours
Module-3	
BBS of RCC Elements: Bar bending schedule for footing, column, beam, and slab works with some sample drawings	3 Hours
Module-4	
Construction tools and machines Introduction to construction tools and machine and their functions.	3 Hours
Module-5	
Site visits and case studies on going projects.	3 Hours

Course outcomes: After studying this course, students will be able to:

1. Read the drawing of the centerline of RCC elements.
2. Initiate the work at the site.
3. Take safety measures at the construction site.
4. Study the steel details of RCC elements
5. Understand the Construction tools and Machines

Text Books:

1. B. C Punmia, “Building Construction” Laxmi Publication, New Delhi
2. Arun K R Jain, B.C. Punmia “R.C.C. Designs” Laxmi Publication, New Delhi
3. B.N.Dutta, “Estimation and Costing in Civil Engineering” UBS Publishers' Distributors Ltd

Reference Books:

1. S S Bhavikatti, M V Chaitawadagi, "Building planning and Drawing",I K International Publishing House
2. M.S Shetty, "Concrete Technology", S. Chand &Co. Ltd, New Delhi.
3. Is SP 34 Handbook on concrete reinforcement and detailing.
4. IS 456-2000

Course Articulation Matrix / Course mapping

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2	1					1			1	3	2	2
CO2	3	2	3	1					1			1	3	2	2
CO3	3	2	2	1					1			1	3	2	2
CO4	1	1	1	1					1			1	3	2	2
CO5	3	2	1	1					1			1	3	2	2

CIVIL 3D [As per Choice Based Credit System (CBCS) scheme] SEMESTER –V			
Subject code	21ACV510B	**CIE**	50
Number of lecture hours per week	01	**SEE**	50
Total number of practical hours	15	**Exam hours**	03
CREDITS 01			

Course Learning Objectives: This course will enable students to:

- Study the drawings and executive on field
- Work properly in the construction field
- Initiate the work at construction field

Modules	**Teaching Hours**
Module-1	
INTRODUCTION Land Survey Land Development Transportation Design AutoCAD Civil 3D Working Environment Work Space Tool Space Object Object Style Label Style Creating Template Creating Reports working with Point Data Creating and Editing Points Miscellaneous Intersection Working with Point Data Creating and Editing Points Slope Interpolate Point Styles Point Group Import/Export Points	3 Hours
Module-2	
Earthwork Calculation Create surface by Breaklines Contours Drawing Objects O Alignment Creation	3 Hours

Horizontal Profile View generation Customising Profile Views Create a Volume Surface Volume Calculation	
Module-3	
Alignment Design as per IRC Design Criteria Editor Alignment from Polyline Alignment Style Alignment Label Style Design Criteria Design Check Set Alignment by Layout Edit Alignment Geometry	3 Hours
Module-4	
Profile Design as per IRC Profile by Layout Multiple Profile Views Super Imposed Profile Edit Profile Geometry Design Criteria Editor Profile View Labels	3 Hours
Module-5	
Pipe Network by Layout Pipe Network from Object Edit Pipe Network Draw Parts in Profile View Create and Apply Rules Pipe Network Labels Pipe Network Tables	3 Hours
Course outcomes: After studying this course, students will be able to: 6. Read the drawing of the centerline of RCC elements. 7. Initiate the work at the site. 8. Take safety measures at the construction site. 9. Study the steel details of RCC elements 10. Understand the Construction tools and Machines	
Text Books: 4. B. C Punmia, "Building Construction" Laxmi Publication, New Delhi 5. Arun K R Jain, B.C. Punmia "R.C.C. Designs" Laxmi Publication, New Delhi 6. B.N.Dutta, "Estimation and Costing in Civil Engineering" UBS Publishers' Distributors Ltd	
Reference Books: 5. S S Bhavikatti, M V Chaitawadagi, "Building planning and Drawing",I K International Publishing House 6. M.S Shetty, "Concrete Technology", S. Chand &Co. Ltd, New Delhi. 7. Is SP 34 Handbook on concrete reinforcement and detailing. 8. IS 456-2000	

Course Articulation Matrix / Course mapping

CO#	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	2	2	1					1			1	3	2	2
CO2	3	2	3	1					1			1	3	2	2
CO3	3	2	2	1					1			1	3	2	2
CO4	1	1	1	1					1			1	3	2	2
CO5	3	2	1	1					1			1	3	2	2