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CIVIL ENGINEERING (CE)

Semester V (third year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Schemeof Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Professional core course	20APC0116	Soil Mechanics	3	0	0	3	30	70	100
2	Professional core course	20APC0117	Building Technology	3	0	0	3	30	70	100
3	Professional core course	20APC0118	Engineering Geology	3	0	0	3	30	70	100
4	Open Elective course / Job Oriented Elective	20APE0417	Sensor Networks	3	0	0	3	30	70	100
		20APC0323	Operations Research							
		20AOE0301	Management Science							
5	Professional Elective courses	20APE0101	Structural Analysis-II	3	0	0	3	30	70	100
		20APE0102	Water Harvesting and Conservation							
		20APE0103	Cost Effective Housing Techniques							
6	Professional core courses (LAB)	20APC0119	Soil Mechanics Lab	0	0	3	1.5	30	70	100
7	Professional core courses (LAB)	20APC0120	Engineering Geology Lab	0	0	3	1.5	30	70	100
8	**Skill Oriented Course***	20APC0121	Building planning & Drawing Lab	1	0	2	2	100	-	100
9	Mandatory course (AICTE suggested)		Professional Ethics and Human Values	2	0	0	0	30	-	30
Community service project				0	0	0	1.5	0	-	50
Summer Internship 2 months (Mandatory) after second Year (to be evaluated during V semester				0	0	0	1.5	50	-	50
Total credits							23.0	390	490	930
Honors/ Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				4	0	0	4	30	70	100

Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0116	Soil Mechanics	3	0	0	3

Course Outcomes: At the end of the course the student will able to
1. Understand soil formation and determine the index properties of soil
2. Determine the coefficient of permeability and effective stress
3. Estimate stresses under various loading conditions and compaction characteristics.
4. Analyze the compressibility of the soils
5. Understand the strength of soils under various drainage conditions

UNIT – I
Introduction: Soil formation– Mass, volume relationships–moisture content – Specific Gravity-Field density by core cutter and sand replacement methods-Relative density.
Index Properties of Soils: Grain size analysis – consistency limits and indices – I.S. Classification of soils.

UNIT –II
Permeability: Soil water – capillary rise – flow of water through soils – Darcy's law-permeability – Factors affecting permeability – laboratory determination of coefficient of permeability-layered permeability.
Effective Stress: Total, neutral and effective stresses – principle of effective stress - quick sand condition — Flow-nets: Characteristics and Uses.

UNIT –III
Stress Distribution in Soils: Boussinesq's and Westergaard's theories for point load, uniformly loaded pressure bulb and Newmark's influence chart.
Compaction: Mechanism of compaction – factors affecting compaction – effects of compaction on soil properties – Field compaction Equipment – compaction quality control.

UNIT – IV
Consolidation: Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation - stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – coefficient of consolidation: square root time and logarithm of time fitting methods.

UNIT - V
Shear Strength of Soils: Importance of shear strength – Mohr's– Coulomb Failure theories – Direct shear test, Un-confined compressive strength and vane shear test– strength tests based on drainage conditions - critical void ratio

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TEXT BOOKS:
1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
2. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd
3. Soil Mechanics and Foundation by by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
4. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
5. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).

REFERENCE BOOKS:
1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
3. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.

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Year: III			Semester: I		
Subject Code	Subject Name	L	T	P	Credits
20APC0117	**BUILDING TECHNOLOGY**	3	0	0	3

Course Outcomes: After the completion of the course student should be able to
1. Classify and understand the applications of basic building materials.
2. Understand the applications of advanced building materials
3. Explain the principles and methods of construction of building components
4. Understand the building services and principles of building planning.
5. Apply the principles and bye-laws in planning Residential buildings

UNIT I
BASIC BUILDING MATERIALS:
BRICKS: Composition of good brick earth – Methods of manufacturing of bricks– comparison between clamp burning and kiln burning – Testing of bricks.
WOOD: Seasoning of timber – Defects in timber.
OTHER MATERIALS: Properties and uses of glass, plastics, steel, aluminum, bitumen.

UNIT - II
ADVANCED BUILDING MATERIALS:
NANO MATERIALS: Introduction – Types and its applications.
SMART MATERIALS: Introduction - Types of smart materials and its applications.
MODERN BUILDING MATERIALS: Building products made of gypsum and their uses - GFRG.

UNIT – III
BUILDING CONSTRUCTION:
MASONRY: Bonds in brick masonry – Cavity & Partition walls.
FLOORS: Different types of floors – concrete, mosaic, terrazzo, tiled floors.
STAIRS: Terminology – Types of stairs.
SURFACE FINISHES: Plastering – Pointing – White washing, distempering and Painting – Damp proofing - Form work and scaffolding.

UNIT – IV
BUILDING SERVICES:
PLUMBING SERVICES: Different types of pipes – Pipe fitting.
PRINCIPLES OF BUILDING PLANNING: Introduction – Selection of site – Aspect, prospect, roominess, grouping, circulation, privacy, sanitation, elegance, economy, flexibility and practical considerations. Lighting and ventilation requirements.

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UNIT – V
BUILDING BYE–LAWS AND REGULATIONs*:* Introduction – Objectives of building bye-laws – Principles underlying building bye-laws – Terminology – Floor area ratio (FAR), Floor space index (FSI) – Classification of buildings – Open space requirements – Built up area limitations – Height of the buildings – Wall thickness
PLANNING OF RESIDENTIAL BUILDINGS: Introduction – Minimum standards for various parts of the buildings – Bed room – Kitchen – Dining room – Bath room – Water closet.

TEXT BOOKS:
1. Dr. N. Kumara Swamy & A. Kameswara Rao, Building Planning & Drawing, Charotar
    Publishers, Anand.
2. Dr. B.C. Punmia [2008], *Building construction*, Laxmi Publications (P) Ltd., New Delhi
3. Gurucharan Singh and Jagdish Singh [2009], *Building Planning Designing and
    scheduling*, Standard publishers Distributors

REFERENCES:
 1. S.K. Duggal [2012], *Building materials*, New Age international (P) Ltd., New Delhi.
 2. Bureau of Indian Standards, *National Building Code of India – 2005*, New Delhi.
 3. M. Chakraborty, Civil Engineering Drawing, Third Edition, Bhakti Vedanta Book Trust.
 4. S.C. Rangwala [2009], *Civil Engineering Drawing*, Charotar Publishing House

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Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0118	Engineering Geology	3	0	0	3

Course Outcomes: At the end of the course the student will able to
1. Understand principles of engineering geology.
2. Understand properties of various rocks and minerals
3. Understand the suitability of sites for various civil engineering structures.
4. Understand geological strata in the analysis and design the civil engineering structures.
5. Understand the concept of remote sensing and GIS.

UNIT – I
Introduction:
Application of Earth Science in Civil Engineering Practices, Understanding the earth, internal structure and composition. Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers Mineralogy: Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group; Feldspar Group; Kaolin; Asbestos; Carbonate Group ; Gypsum; Mica Group; Ore minerals - Iron ores; pyrite; Chlorite

UNIT – II
Petrology:
Definition of rock - Rock forming processes - Geological classification of rocks - Dykes and sills, common structures and textures - Megascopic study, Chemical and Mineralogical Composition of rock (Granite, Gabbro, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Tuff, Felsite, Gneiss, Schist, Quartzite, Breccia, Marble, Porphyries, Charnockite and Slate).

UNIT – III
Structural Geology:
Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints – their important types. Their importance insitu and drift soils, common types of soils, their origin and occurrence in India

UNIT –IV
Geomorphology, hydrogeology and seismology:
Ground water, Water table - ground water exploration. site selection for dams and tunnels – analysis of failures in dams and tunnels - Seismic zones of India - Earth quakes, their causes and effects. Seismic waves, Richter scale. Landslides - causes and effects; Tsunami –causes and effects.

UNIT – V
REMOTE SENSING :
Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

GEOGRAPHIC INFORMATION SYSTEM:
Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS.
TEXT BOOKS:
1. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005
2. Engineering Geology by Vasudev Kanthi, Universities Press, Hyderabad.
3. Remote Sensing and GIS by B.Bhatta, Oxford University Press,New Delhi

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Year: III   **Semester: I**   **Branch of Study: CE**

Course Code	Course Title	L	T	P	Credits
20APE0417	Sensor Networks	3	0	0	3

Course Outcomes: Students will be able to
CO1. Understand the concepts of Converters and **Sensor data acquisition systems**
CO2: Understand the concepts of Sensor Measurements in Structural Monitoring
CO3: Understand the concepts of commonly used sensing technologies and algorithms
CO4: Understand the concepts of **Piezoelectric transducers for assessing and monitoring infrastructures**
CO5: Understand the concepts of **Fiber optic sensors for assessing and monitoring infrastructures**

Unit-1 Sensor data acquisition systems and architectures
Introduction, General measurement system, Analog-to-digital converter architectures-Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC Digital-to-Analog conversion-Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, Data acquisition systems-Analog Systems-Digital Systems

Unit-II Sensors and Sensing Technology for Structural Monitoring
Introduction, Sensor Types, Sensor Measurements in Structural Monitoring- Structural Responses- Environmental Quantities- Operational Quantities- Typical Quantities for Bridge Monitoring- Fibre Optic Sensors- Classification of Fibre Optic Sensors- Typical Fibre Optic Sensors in SHM- Fibre Optic Sensors for Structural Monitoring- Wireless Sensors- Components of Wireless Sensors- Field Deployment in Civil Infrastructure-Case Study

Unit-III Commonly used sensors for civil infrastructures and their associated algorithms
Introduction, commonly used sensing technologies- Displacement-Strain-Acceleration-Environment- Prevalence of commonly used sensors in SHM systems- Associated algorithms-Displacement sensors- Strain gages- Accelerometers- Environmental measurements- Examples of continuous monitoring systems

Unit-IV Piezoelectric transducers for assessing and monitoring civil infrastructures
Introduction, Principle of piezoelectricity, Piezoelectric materials and the fabrication of piezoelectric transducers, Piezoelectric transducers for SHM applications, Bonding effects, Limitations of piezoelectric transducers, SHM techniques using piezoelectric transducers

Unit-V Fiber optic sensors for assessing and monitoring civil infrastructures

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Introduction**,** Optical fiber concepts, Sensing mechanisms, Sensor packaging, Cables, connectors, and splicing, Common optical fiber sensors**-** Coherent interferometers, Low-coherence interferometers, Fabry-Perot interferometers, Fiber Bragg gratings, Brillouin and Raman scattering distributed sensors

Text Books:
1. "Sensor Technologies for Civil Infrastructures", Volume 1 Sensing Hardware and Data Collection Methods for Performance Assessment **Woodhead Publishing in Civil and Structural Engineering**
   Ming L. Wang Jerome P. Lynch Hardcover ISBN: 9780857094322
2. "Wireless Sensor Networks for Civil Infrastructure Monitoring: A Best Practice Guide" ICE   Publishing **David Rodenas-Herráiz**, **Kenichi Soga**, **Paul R A Fidler** and **Nicholas de Battista**

References:
1. Ghatak A and Thyagarajan K. (1998) Introduction to Fiber Optics; Cambridge University Press: Cambridge, UK.
2. Barthorpe, R.J. and Worden, K. (2009) Sensor Placement Optimization. *Encyclopaedia of Structural Health Monitoring*, Boller, Chang and Fujino (ed.), John Wiley & Sons, Chichester, UK.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO: 1	PO 1: Engineering Knowledge	1.4	1.4.1
CO: 2	PO 2: Problem Analysis	2.4	2.4.3
CO: 3	PO 2: Problem Analysis	2.4	2.4.3
CO: 4	PO 3: Design/Development of solutions	3.4	3.4.2
CO: 5	PO 3: Design/Development of solutions	3.4	3.4.2

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Year: III **Semester: I** **Branch of Study: Common to all**

Subject Code	Subject Name	L	T	P	Credits
20APC0323	Operations Research	3	0	0	3

Course Outcomes:
CO: 1 Able to create mathematical models of the real-life situations and capable of obtaining best solution using Graphical Method and Simplex Method
CO: 2 To implement the theory of duality for simplifying the solution procedure for certain LPPs, and solve the special cases of LPP and Assignment problems
CO: 3 Knowledge of choosing the best strategy out of the available strategies which is an essential skill for any business manager to successfully face the competition
CO: 4 Able to represent any project in the form of a network and estimate the parameters like Project Completion Time
CO: 5 Applying Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems

UNIT I Introduction to OR and Linear Programming-1 OR definition– Classification of Models – Types of Operations Research models; Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Two–Phase Simplex Method, Big-M Method Special Cases of LP-Degeneracy, Infeasibility and Multiple Optimal Solutions.

UNIT II Linear programming-2: Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution- North-West Corner Rule, Least Cost Method, Vogel's Approximation Method; OptimalityTesting. Special Cases -Unbalanced Transportation Problem, Degenerate Problem; Assignment Problem – Formulation; Optimal Solution -Traveling Salesman problem.

UNIT III Game Theory: Introduction – Minimax (Maximin) Criterion and Optimal Strategy, Saddle Point, Solution of Games with Pure Strategy –Games with Mixed Strategies– Dominance Principle–Graphical Method, Algebraic methods, sub matrices method.

UNIT IV
Queuing Theory: Introduction –Terminology, Service Channel, Arrival Pattern, Population, Departure Pattern (Service Pattern), Queue Discipline Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length.
Sequencing -Assumptions-n-jobs-2 Machines model, n-jobs-3-machines models & n jobs – m Machines models.

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UNIT V Dynamic Programming: Introduction – Bellman's Principle of Optimality – Applications of Dynamic Programming- Capital Budgeting Problem – Shortest Path Problem – Solution of Linear Programming Problem by DP.

Replacement Models: Introduction –Types of Replacement Problem, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

Text Books:

1. Operations Research, Dr. C.Nadhamuni Reddy & Sri Gopal Krishna, Kurnool Publishers
2. Operation Research, J.K.Sharma,MacMilan, 5th edition, 2013.
3. Introduction to Operations Research, H.A.Taha, PHI, 9th edition, 2013

Reference Books:

1. Operations Research, A.M.Natarajan,P.Balasubramani,A. Tamilarasi,Pearson Education, 8th edition, 2011
2. Operations Research by R Panneerselvam, PHI, 2nd edition, 2012.
3. Operations Research, Wagner, PHI Publications , 2nd edition.
4. Operations Research, S.R.Yadav, A.K.Malik, Oxford, 2015

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 1: Engineering knowledge	1.4	1.4.1
CO 2	PO 2: Problem analysis	2.1	2.1.3
CO 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO 4	PO 2: Problem analysis	2.1	2.1.2
CO 5	PO 1: Engineering knowledge	1.4	1.4.1

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Year: III   **Semester : I**   **Branch of Study : Common to all**

Subject Code	Subject Name	L	T	P	Credits
20AOE0301	Management Science	3	0	0	3

Course Outcomes:
CO: 1   Understand the concepts & principles of management and designs of organization in a practical world.
CO: 2   Apply the knowledge of Work-study principles & Quality Control techniques in industry.
CO: 3   Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
CO: 4   Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
CO: 5   Create Modern technology in management science

UNIT I
Introduction to Management:

Management - Concept - Nature - Functions – Levels - Evolution of Management Thought - Taylor's Scientific Theory - Henry Fayol's principles - Elton Mayo's Human relations - Leadership styles - Autocratic leadership - Democratic & Free rein leadership.
Organizational Designs: Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization.

UNIT II
 Operations Management:

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study. **Material Management** - Objectives – Inventory classification - Inventory Techniques - EOQ-ABC Analysis

Marketing Management: Concept - Meaning - Nature- Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III
 Human Resources Management (HRM):

HRM - Definition and Meaning - Managerial and Operative functions - Evolution of HRM - Job Analysis & Job Evaluation - Human Resource Planning (HRP) Process/Procedure- Employee Recruitment Process - Employee Selection Process and Tests in Employee Selection - Employee Training and Development - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

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UNIT IV

Strategic Management:

Definition & Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - SWOT Analysis

Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT V

Contemporary Management:

The concept of Management Information System (MIS) - Materials Requirement Planning (MRP) - Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking - Balanced Score Card.

Textbooks:

1. A.R Aryasri, "Management Science", TMH, 2013

2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

References:

   1. Koontz & Weihrich, "Essentials of Management", 6th edition, TMH, 2005.

2. Thomas N.Duening & John M.Ivancevich, "Management Principles and Guidelines", Biztantra.

3. Kanishka Bedi, "Production and Operations Management", Oxford University Press, 2004.

List of COs	PO no. and keyword	Competency	Performance Indicator
CO 1	PO 1: Engineering knowledge	1.4	1.4.1
CO 2	PO 2: Problem analysis	2.1	2.1.3
CO 3	PO 4: Conduct investigations of complex problems	4.1	4.1.2
CO 4	PO 2: Problem analysis	2.1	2.1.2
CO 5	PO 1: Engineering knowledge	1.4	1.4.1

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Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APE0101	Structural Analysis - II	3	0	0	3

Course Outcomes: At the end of the course the student will able to
1. Analyse the behaviour of arches through different methods of analysis
2. Analyze the frames using slope deflection and moment distribution method
3. Analyze the beams and frames using Kani's method
4. Analyze the beams using Matrix method
5. Analyze the beams using plastic analysis

UNIT –I
ARCHES : Three hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

UNIT – II
SLOPE-DEFLECTION & MOMENT DISTRIBUTION METHOD: Analysis of single bay, single storey, portal frame including side sway– Stiffness and carry over factors – Distribution factors – Analysis of single storey portal frames – including Sway.

UNIT - III
KANI`S METHOD: Analysis of continuous beams – including settlement of supports and single bay, single storey portal frames with side sway by Kani's method.

UNIT –IV
FLEXIBILITY & STIFFNESS METHODS: Flexibility methods, Introduction, application to continuous beams including support settlements-Introduction to stiffness method and its application application to continuous beams including support settlements.

UNIT – V
PLASTIC ANALYSIS: Introduction – Idealized stress – Strain diagram – shape factors for various sections – Moment curvature relationship – ultimate moment – Plastic hinge – lower and upper bound theorems – ultimate strength of fixed and continuous beams.
TEXT BOOKS:
1. S.S. Bhavikatti, "Structural Analysis", Volume 1 and 2, Vikas Publishing House, Pvt. Ltd.
2. S. Ramamurtham, "Theory of Structures", Dhanpat Rai Publishing Company (p) Ltd, 2009
3. C. S. Reddy, "Basic Structural Analysis", Tata McGraw Hill

REFERENCES:
1. Timoshenko & Young, "Theory of Structures", Tata McGraw Hill

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2. S. B. Junarkar, "Structural Mechanics" Vol I & II, Charotar Publishers
3. C. K. Wang, "Intermediate Structural Analysis", McGraw Hill

Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APE0102	Water Harvesting and Conservation	3	0	0	3

Course Outcomes: At the end of the course the student will able to
1. Appreciate the importance of movement of ground water
2. Understand the methods of Water Harvesting
3. Understand water recovery and reuse
4. Understand the principles of Watershed Management and its importance in sustainability
5. Understand soil and water conservation

UNIT – I
Origin, Occurrence & Movement of Groundwater:-Introduction-sources of ground water – Hydro geological Cycle – Infiltration – natural openings in rocks – zones of aeration , saturation and water table – classification of ground water – laboratory and field methods of sampling ground water- aquifers – aquifuges- aquicludes – aquitards – ill effects due to lowering of water table -Artificial recharge.

UNIT – II
Water Harvesting: Principles of water harvesting-methods of rainwater harvesting-design of rainwater harvesting structures-Purification Techniques for direct use- Harvesting of surface runoff-onsite detention basin - ponds - types - Recycling of harvested water

UNIT – III
Water Recovery and Reuse: Perspective on recycle and reuse- factors affecting the development of water reclamation and reuse criteria- elements/components of water reclamation and reuse criteria / guidelines- sewage irrigation- Waste water reclamation-waste water recharge for reuse – Treatment Requirements for Water Reuse-methods.

UNIT – IV
Sustainable Watershed Approach & Watershed Management Practices: Concept of watershed-Introduction to watershed management- Integrated water resources management-natural resources management-agricultural practices-integrated farming-Conjunctive use of water resources-Community participation-Watershed Management Practices in Arid and Semiarid Regions-Case studies-Short term and long term strategic planning.

UNIT – V
Soil and Water Conservation: Scope of soil and water conservation-Mechanics and types of erosion-their causes-Soil erosion control measures - bank protection-vegetative barriers-contour bund- contour trenches-contour stone walls-contour ditches-terraces-outlets and grassed waterways-Gully control structures - temporary and permanent - design of permanent soil conservation structures-Design of farm ponds and percolation ponds.

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Text books:
1. Watershed Management by Murty, J.V.S, New Age Intl., New Delhi .
2. Water Resources Conservation and Management by Chatterjee, S. N.,Atlantic Publishers.
3. Ground Water by S.Ramakrishnan, SCITECH Publishers.

Reference books:

Advances in Soil and Water Conservation by Pierce, F.J. and Frye, W. W. (1998):, Ann Arbor

Press, Michigan

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Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APE0103	Cost Effective Housing Techniques	3	0	0	3

Course Outcomes: At the end of the course the student will able to
1. Apply the concept of housing techniques.
2. Understand housing programmes and projects.
3. Understand development and adoption of low cost housing technology
4. Understand low cost housing in rural areas
5. Understand housing in disaster prone areas

UNIT – I:-
Introduction to Housing: Definition of Basic Terms – House, Home, Household, Apartments, Multi storied Buildings, Special Buildings, Objectives and Strategies of National Housing Policies including Slum Housing Policy, Principle of Sustainable Housing – Integrated approach on arriving holding capacity and density norms - All basic infrastructure consideration - Institutions for Housing at National, State and Local levels.

UNIT – II:-
Housing Programmes: Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighborhoods- Plotted land development programs, Open Development Plots, Apartments, Gated communities, Townships, Rental Housing, Co-operative Housing, Slum Housing Programmes – Slum improvement – Slum redevelopment and Relocation – Use of GIS and MIS in Slum Housing Projects,, Role of Public housing agencies, and Private sector in supply , quality, infrastructure and pricing – Role of Non-Government Organizations in slum housing.

UNIT – III:-
Development And Adoption Of Low Cost Housing Technology: Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements - Adopting of total prefabrication of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall - Fly ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT – IV:-
Alternative Building Materials for Low Cost Housing and Infrastructure Services in Rural Houses: Introduction - Substitute for scarce materials – Ferrocement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - Low cost Infrastructure services: Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy.Rural Housing**:**Introduction traditional practice of rural housing continuous - Mud Housing technology-Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing program

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UNIT – V:-
Housing in Disaster Prone Areas: Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin pre-cost roofing units against Earthquake forces -Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

TEXT BOOKS
1. Hand book of Low Cost Housing by A.K.Lal – New Age International publishers.
2. Low Cost Housing – G.C. Mathur, IBH Publishers.
3. Housing in India by Francis Cherunilam and Odeyar D Heggade, Himalaya Publishing House, Bombay, 1997.

REFERENCES:-

1. Disaster Management by Rajib Shaw, Universities Press, India.
2. Disaster Science and Management by Tushar Bhattacharya, TMH Publications.
3. Building Materials For Low –Income Houses – International Council For Building Research Studies And Documentation.
4. Modern Trends In Housing In Developing Countries – A.G. Madhava Rao, D.S. Ramachandra Murthy & G.Annamalai.
5. Properties of Concrete – Neville A.M. Pitman Publishing Limited, London.
6. Light Weight Concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.

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Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0119	Soil Mechanics Lab	0	0	3	1.5

Course Outcomes: On the completion of the course, the students will be able to:
- Classify the soil based on IS Code.
- Determine the index properties of soil.
- Determine the engineering properties of soil.

LIST OF EXPERIMENTS

1. Determination of Atterberg Limits (Liquid Limit, Plastic Limit, and shrinkage limit)
2. a) Determination of Field density by core cutter method and
   b) Determination of Field density by sand replacement method
3. Determination of Specific gravity of soil
4. Determination of Grain size distribution by dry sieve analysis
5. Determination of Coefficient of Permeability of soil by constant and variable head test methods
6. Determination of OMC & MDD by Standard Proctor's Compaction Test
7. Determination of California Bearing ratio test
8. Determination of Unconfined compression test
9. Determination of Cohesion and internal friction by Direct shear test
10. Determination of Free swell index (FSI) test

REFERENCES:
Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International

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Year: III   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0120	Engineering Geology Lab	0	0	3	1.5

Course Outcomes: After the completion of the course student should be able to
1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
4. Simple Structural Geology problems.

LIST OF THE EXPERIMENTS

1. Description and identification of SIX minerals

2. Description and identification of Six (including igneous, sedimentary and metamorphic rocks)

3. Interpretation of a Geological map along with a geological section.

4. Simple strike and Dip problems.

TEXT BOOKS:-
1. Elementary Exercises in Geology by CVRK Prasad, Universities press.

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B.Tech III Year   **Semester: I**   **Branch of Study: Common to all**
MANDATORY COURSE

Subject Code 20AMC9904	Subject Name Professional Ethics And Human Values	L 3	T 0	P 0	Credits: 0

Course Outcomes:

1. It ensures students sustained happiness through identifying the essentials of human values and skills.

2. The students will understand the importance of Values and Ethics in their personal lives and professional careers.

3. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

4. Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.

5. Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.

Syllabus

UNIT - I: **12hrs**

Introduction to Human Values: Need, basic Guidelines, Content and Process for Value Education, Self Exploration - 'Natural Acceptance' and Experiential Validation. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities. Understanding Happiness and Prosperity correctly.

UNIT - II: **12hrs**

Understanding Harmony in the Family and Society: Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the harmony in the society (society being an extension of family). Visualizing a

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universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT – III: **12hrs**

Introduction to Professional Ethics: Basic Concepts, Governing Ethics, Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts of Ethics, Value Education, Dimensions of Ethics, Profession and professionalism, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

UNIT – IV: **15hrs**

Professional Practices in Engineering: Work Place Rights & Responsibilities, Professions and Norms of Professional Conduct, Norms of Professional Conduct vs. Profession; Responsibilities, Obligations and Moral Values in Professional Ethics, Professional codes of ethics, the limits of predictability and responsibilities of the engineering profession. Central Responsibilities of Engineers – The Centrality of Responsibilities of Professional Ethics; lessons from 1979 American Airlines DC-10 Crash and Kansas City Hyatt Regency Walk away Collapse.

UNIT – V: **12hrs**

Global issues in Professional Ethics: Introduction – Current Scenario, Technology Globalization of MNCs, International Trade, World Summits, Issues, Business Ethics and Corporate Governance, Sustainable Development Ecosystem, Energy Concerns, Ozone Depletion, Pollution, Ethics in Manufacturing and Marketing, Media Ethics, War Ethics, Bio Ethics, Intellectual Property Rights.

Text Books:

1.R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2.Professional Ethics: R. Subramanian, Oxford University Press, 2015. 3.Ethics in Engineering Practice & Research, Caroline Whitbeck, 2e, Cambridge University Press 2015.

Reference Books:

1.Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

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2.Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

3.Engineering Ethics, Concepts Cases: Charles E Harris Jr., Michael S PritchaMichael J Rabins,

4e , Cengage learning, 2015.

4.Business Ethics concepts & Cases: Manuel G Velasquez, 6e, PHI, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO2	PO8:Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO3	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO4	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1
CO5	PO8: Ethics: Apply Ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.	8.1	8.1.1