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Nandamuru, Pedana Mandal, Krishna Dist – 521369

DEPARTMENT OF CIVIL ENGINEERING

B.Tech III Year I Semester

S.NO.	CATEGORY	SUBJECT CODE	TITLE	L	T	P	CREDITS
1	Professional Core	B23CE51	Design and Drawing of Reinforced Concrete Structures	3	0	0	3
2	Professional Core	B23CE52	Engineering Hydrology	3	0	0	3
3	Professional Core	B23CE53	Geotechnical Engineering -I	3	0	0	3
4	Professional Elective-I	B23CE54A	Advanced structural analysis	3	0	0	3
		B23CE54B	Architecture and town planning				
		B23CE54C	Construction Technology and Management				
5	Open Elective-I	B23CC51	OR Entrepreneurship Development & Venture Creation	3	0	0	3
		B23CEO1A	1.Green Buildings				
		B23CEO1B	2.Construction technology and management				
		B23CEO1C	3. Climate Change impact on Eco system				
6	Professional Core	B23CE56	Geotechnical Engineering Lab	0	0	3	1.5
7	Professional Core	B23CE57	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
8	Skill Enhancement course	B23CE58	Estimation, Specifications & Contracts	0	1	2	2
9	Engineering Science	B23CE59	Tinkering Lab	0	0	2	1
10	Evaluation of Community Service Internship	B23CSP50		-	-	-	2
			Total	15	1	10	23

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B.Tech III Year II Semester

S.NO.	CATEGORY	SUBJECT CODE	TITLE	L	T	P	CREDITS
1	Professional Core	B23CE61	Design and Drawing of Steel Structures	3	0	0	3
2	Professional Core	B23CE62	Highway Engineering	3	0	0	3
3	Professional Core	B23CE63	Environmental Engineering	3	0	0	3
4	Professional Elective-II	B23CE64A	Ground Improvement Techniques	3	0	0	3
		B23CE64B	Repair and Rehabilitation of Structures				
		B23CE64C	Valuation and Quantity Survey				
5	Professional Elective-III	B23CE65A	Finite element method	3	0	0	3
		B23CE65B	Bridge Engineering				
		B23CE65C	Water Resource Engineering				
6	Open Elective-II	B23CEO2A	1.Disater management	3	0	0	3
		B23CEO2B	2.Sustainability in Engineering practices				
		B23CEO2C	3.Water Supply Systems				
7	Professional Core	B23CE66	Environmental Engineering lab	0	0	3	1.5
8	Professional Core	B23CE67	High Way Engineering lab	0	0	3	1.5
9	Skill Enhancement course	B23CE68	CAD Lab	0	1	2	2
			Total	18	1	08	23
10	Mandatory course	B23CC6A	Technical paper writing & IPR	2	0	0	-
		Mandatory Industry Internship of 08 weeks duration during summer vacation					

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OPEN ELECTIVES

S.NO	Category	Titles
1	Open Elective –I	1. Entrepreneurship Development & Venture Creation
		2. Green Buildings
		3. Construction technology and management
		4. Climate Change impact on Eco system
2	Open Elective-II	1. Disaster management
		2. Sustainability in Engineering practices
		3. Water Supply Systems

PROFESSIONAL ELECTIVES

S.NO	Category	Titles
1	Professional Elective –I	1. Advanced structural analysis
		2. Architecture and town planning
		3. Construction technology and management
2	Professional Elective-II	1. Ground Improvement Techniques
		2. Repair and rehabilitation of Structures
		3. Valuation and Quantity Survey
3	Professional Elective-III	1. Finite element method
		2. Bridge Engineering
		3. Water Resource Engineering

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DEPARTMENT OF CIVIL ENGINEERING

III YEAR - I SEMESTER

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III Year I Semester

L	T	P	C
3	0	0	3

DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES

Course Learning Objectives:

The objective of this course is to enable the students to:

1. Familiarize Students with different types of design philosophies.
2. Equip student with concepts of design of flexural members.
3. Understand Concepts of shear, bond and torsion.
4. Familiarize students with different types of compressions members and Design.
5. Understand different types of footings and their design.

Course Outcomes:

At the end of this course the student will be able to

CO	CO STATEMENT	TAXONAMY
CO1	Work on different types of design philosophies	**L2**
CO2	Carryout analysis and design of flexural members and detailing	**L6**
CO3	Design structures subjected to shear, bond and torsion.	**L6**
CO4	Design different type of compression members and footings	**L6**
CO5	Design and detail different types of slabs.	**L6**

CO-PO Mapping:

Co/Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	-	-	3	2	3	-	2	-	-
CO2	3	3	3	3	3	3	-	-	3	2	3	-	2	-	-
CO3	3	3	3	3	3	3	-	-	3	2	3	-	2	-	-
CO4	3	3	3	3	3	3	-	-	3	2	3	-	2	-	-
CO5	3	3	3	3	3	3	-	-	3	2	3	-	2	-	-

UNIT –I

Introduction: Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

Limit State Design: Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

UNIT–II

Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T)- Effective width of flange –Behavior- Analysis and Design.

UNIT–III

Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion for L Beam – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

Limit state design for serviceability: Deflection, cracking and code provision

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UNIT-IV

Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

Footings: Different types of footings – Design of isolated footings, Square footings – Rectangular footings – circular footing – spread & sloped footings - subjected to axial loads.

UNIT-V

Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

NOTE: All the designs to be taught in Limit State Method. Drawing classes must be conducted every week and the Following plates should be prepared by the students.

- Reinforcement detailing of T-beams, L-beams and continuous beams and cantilevers.
- Reinforcement detailing of columns and isolated footings.
- Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. Part A consists of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXTBOOKS:

1. **A.K. Jain**, 'Limit State Design'
2. **S.Unnikrishna Pillai & Devdas Menon**,'Reinforced Concrete Structures',Tata Mc.Graw Hill, New Delhi.

REFERENCES:

1. **N. Krishna Raju**,'Design of concrete structures'
2. **Park and Pauley, John Wiley and Sons**,'Reinforced Concrete Structures'

IS Codes:

1) IS -456-2000 (Permitted to use in examination hall)
2) IS – 875, 3) SP-16

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III Year-I Semeter

L	T	P	C
3	0	0	3

ENGINEERING HYDROLOGY

Course Learning Objectives:

The objective of this course is to:

1. Understand hydrologic cycle and its relevance to Civil engineering.
2. Learn physical processes and their interactions in hydrology.
3. Learn measurement and estimation of the components of hydrologic cycle.
4. Have an overview and understanding of Hydrographs.
5. Learn flood frequency analysis, design flood and flood routing methods.
6. Study the concepts of groundwater movement and well hydraulics.

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Be able to quantify major hydrologic components and apply key concepts to several practical areas of engineering hydrology	**L3**
CO2	Develop Unit hydrograph, Intensity-Duration-Frequency to design hydraulic structures	**L3**
CO3	Be able to develop design storms and carry out frequency analysis	**L4**
CO4	Be able to estimate flood magnitude and carry out flood routing	**L3**
CO5	Be able to determine aquifer parameters and yield of wells	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	2	3	-	-	-	-	2	3	2	-
CO2	3	3	3	3	3	-	2	-	-	-	-	2	3	3	-
CO3	3	3	2	3	2	-	3	-	-	-	-	2	3	2	-
CO4	3	3	3	3	3	2	3	-	-	-	-	2	3	3	-
CO5	3	2	2	3	2	-	2	-	-	-	-	3	3	3	-

UNIT - I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II

Abstractions: Initial abstractions, **Evaporation**: factors affecting, measurement, estimation, reduction**, Evapotranspiration**: factors affecting, measurement, estimation, control, **Infiltration**: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT-III

Runoff: Factors affecting runoff, components, empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

UNIT-IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT-V

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of an open well-recuperation test.

TEXTBOOKS:

1. **Subramanya.K** 'Engineering Hydrology',Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. **Jayarami Reddy** 'Engineering Hydrology',P.Laxmi Publications Pvt. Ltd., (2013), New Delhi

3. **Chow V.T., D.R Maidment and L.W. Mays** 'Applied hydrology', Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. **Ojha C.S.P, R. Berndtsson and P. Bhunya** 'Engineering Hydrology', Oxford University Press, (2010).

REFERENCES:

1. **Mays L.W** ,'Water Resources Engineering', Wiley India Pvt. Ltd, (2013).
2. **Raghunath. H.M ,**'Hydrology' , New Age International Publishers, (2010)
3. **Ponce V.M,** 'Engineering Hydrology – Principles and Practice', Prentice Hall International, (1994)
4. **Patra K.C,** 'Hydrology and Water Resources Engineering', Narosa Publications, (2011).

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III Year I Semester

L	T	P	C
3	0	0	3

GEOTECHNICAL ENGINEERING– I

Course Learning Objectives:

The objective of this course is:

1. To enable the student to determine the index properties of the soil and classify it.
2. To impart the concept of seepage of water through soils and determine the discharge of water through soils.
3. To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Understand soil formation, its index properties and classification.	**L2**
CO2	Understand soil moisture and flow of water through soils and its effects.	**L2**
CO3	Understand stress distribution in soils.	**L2**
CO4	Understand Compressibility characteristics under partially saturated and fully saturated conditions.	**L2**
CO5	Understand shear strength of soil at different loading & drainage conditions for different soils	**L2**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	2	2	1	1	-	-	-	-	-	-	-	-
CO3	3	3	2	2	2	1	1	-	-	-	-	-	-	-	-
CO4	3	2	2	2	2	1	1	-	-	-	-	-	-	-	-
CO5	3	3	2	2	2	1	1	-	-	-	-	-	-	-	-

UNIT – I

Introduction: Soil formation – Structure of Soils – Texture of Soils – Three phase system and phase relationships.

Index Properties and Classification Tests of Soils: Index properties **–** Density Index **-** Grain size analysis – Sieve and Hydrometer methods – Consistency of Clay Soils – Activity of Clays – Thixotropy of clays **-** soil Classification – Unified soil classification and I.S. Soil classification.

UNIT – II

Soil moisture and Capillarity: Soil moisture and modes of occurrence – Total, Neutral and Effective Pressures – Capillary Rise in soils.

Permeability: Flow of water through soils –- One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems.

UNIT –III

Seepage and Flow Nets: Flow net for one-dimensional flow – two-dimensional flow – Basic equation for Seepage – Flow nets & Characteristics and Uses – Quicksand condition –Seepage forces

Stress Distribution in Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– New mark's influence chart – 2:1 stress distribution method. - Pressure Blubs.

UNIT – IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) - Over consolidated and normally consolidated clays.

UNIT – V

Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – total and effective shear strength parameters – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions – stress paths.

TEXTBOOKS:

1. **Dr. K.R. Arora,**'Soil Mechanics and Foundation Engineering,Standard Publishers and Distributors, New Delhi.
2. **GopalRanjan and A.S.R.Rao**,'Basic and Applied Soil Mechanics',New Age International Publishers.
3. **V.N.S.Murthy,** 'Soil Mechanics and Foundation Engineering', CBS publishers
4. **C. Venkataramaiah**,'Geotechnical Engineering',New Age International Publishers

REFERENCES:

1. **D.W.Taylor**., Wiley,'Fundamentals of Soil Mechanics'
2. **Holtz and Kovacs**,'An introduction to Geotechnical Engineering',Prentice Hall
3. **BrajaM.Das** ,'Principles of Geotechnical Engineering',CengageLearing.

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III Year I Semester

L	T	P	C
3	0	0	3

ADVANCED STRUCTURAL ANALYSIS

Course Learning Objectives:

The objective of this course is to:

1. Introduce the behaviour and analysis of arches (three-hinged and two-hinged) under various loading and support conditions.

2. Equip students with approximate methods for analyzing multi-storey building frames subjected to lateral and gravity loads.

3. Familiarize students with the principles of cable structures and suspension bridges, including their structural behaviour and analysis.

4. Enable students to perform structural analysis using Kani's method for indeterminate beams and portal frames.

5. Introduce matrix methods (flexibility and stiffness) for the analysis of indeterminate structures including support settlements.

Course Outcomes:

At the end of this course the student will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Analyze three-hinged and two-hinged arches under various load conditions, including the effects of temperature and support elevation differences.	**L4**
CO2	Apply approximate methods such as portal, cantilever, and substitute frame methods for analysing multi-storey frames under lateral and gravity loads.	**L3**
CO3	Understand and analyze cable structures and suspension bridges, including stiffening girders under different loading systems.	**L2 & L4**
CO4	Perform structural analysis using Kani's method for continuous beams and portal frames, considering support settlements and side sway.	**L4**
CO5	Apply flexibility and stiffness matrix methods for the analysis of continuous beams and indeterminate structures up to three degrees of freedom.	**L3**

CO-PO Mapping:

Co/Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	-	2	-	-	-	-	2	3	2	-
CO2	3	3	3	3	3	-	2	-	-	-	-	2	3	3	-
CO3	3	3	2	3	2	-	2	-	-	-	-	2	3	3	-
CO4	3	3	3	3	3	-	2	-	-	-	-	2	3	3	-
CO5	3	3	3	3	3	-	2	-	-	-	-	2	3	3	-

UNIT–I

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question)

UNIT–II

Approximate Methods of Analyses: Application to building frames. (i) Portal Method (ii) Cantilever Method (iii) Substitute frame method for approximate analysis of multi-storey frames subjected to gravity loads and lateral loads. Shear force and bending moment diagrams - Elastic curve.

UNIT–III

Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables Subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT-IV

Kani's Method: Analysis of continuous beams –including settlement of supports and single bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve.

UNIT-V

Introduction to Flexibility and Stiffness matrix methods: Analyses of using 'system approach' up to three degree of indeterminacy– Analysis of continuous beams including settlement of supports using flexibility and stiffness methods

TEXTBOOKS:

1.**R.C. Hibbeler**,'Pearson, by Structural Analysis',New Delhi.

2.**V. N. Vazirani and M. M. Ratwani**, 'Analysis of Structures- Vol. I and II ', S.Unnikrishna Pillai & Devdas Menon, Khanna Publishers,New Delhi**.**

REFERENCES:

1.**H.J.Shah and S.B.Junnarkar**, 'Mechanics of Structures Vol – II ', Charotar Publishing House Pvt.Ltd

2. **Devdas Menon**, 'Structural Analysis',Narosa Publishing Housing Pvt.Ltd.

3.**G.S.Panditand S.P. Gupta**, 'Structural Analysis: A Matrix Approach',Mc Graw Hill Pvt. Ltd.

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III Year – I Semester

L	T	P	C
3	0	0	3

ARCHITECTURE AND TOWN PLANNING

Course Learning Objectives:

The objectives of this course are:

1. Initiating the students to different architectures of the world. The distinctions between the eastern and western architecture styles are focused.
2. The salient features of Egyptian, Greek, Roman, and Indian Vedic, Indus valley civilization, Buddhist, Hindu and Indo-Sarsanic Architecture are introduced.
3. Architectural design concepts, principles of planning and composition are imparted.
4. Enabling the student to understand town planning from ancient times to modern times.
5. To impart the concepts of town planning standards, landscaping and expansion of towns.

Course Outcomes*:*

Upon the successful completion of this course, the student should be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Distinguish architectural styles of eastern and western world.	**L4**
CO2	Understand the importance of Orders of architecture	**L2**
CO3	Compose spaces of buildings using design concepts, planning principles	**L6**
CO4	Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities	**L2**
CO5	Understand the importance of modern and standards town planning	**L2**

CO-PO Mapping:

Co/Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	1	1	2	1	1	1	1	1	1	2	1	1
CO2	3	1	1	1	1	2	1	1	1	1	1	1	2	1	1
CO3	2	2	3	2	3	2	2	1	2	2	1	2	3	2	1
CO4	2	2	2	2	3	2	3	2	2	2	1	2	3	2	1
CO5	2	2	2	2	2	3	3	2	2	2	1	2	3	2	1

UNIT–I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization.

Temples of Religions: Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhubaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT-II

Principles of designing and Planning: Principles of planning a residence-site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

Post-classic Architecture: Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT–III

Historical Back Ground of Town Planning: Town planning in India –Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjo- Daro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT–IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighborhood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT–V

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns-garden cities, satellite towns-floating towns-skyscrapers-pyramidal cities.

TEXT BOOKS:

1. **G.K.Hiraskar,** 'The great ages of World Architecture'
2. **Y.S.Sane,** 'Planning and Design of Buildings by Section of Architecture'
3. **G.K. Krishnamurthy, S.V.Ravindra** 'Professional Practice', PHI Learning,New Delhi.
4. **Percy Brown,** 'Indian Architecture–Vol. I & II', Taraporevala Publications, Bombay.
5. **G.K.Haraskar,** 'Fundamentals of Town Planning'

REFERENCES:

1. **Hepler, Cengage Learning,** 'Drafting and Design for Architecture'
2. **John Patten Guthrie,** 'Architect's Portable Hand book' –McGraw Hill International Publications.
3. **R.S.Deshpande,** 'Modern Ideal Homes for India'
4. A**.J.Brown and H.M.Sherrard**, 'Town and County Planning'
5. **Federik Glbbard,** 'Town Design', Architectural press,London.

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Nandamuru, Pedana Mandal, Krishna Dist – 521369

III Year I Semester

L	T	P	C
3	0	0	3

CONSTRUCTION TECHNOLOGY & MANAGEMENT

Course Learning Objectives:

The objective of this course is:

1. To introduce to the student, the concept of project management including network drawing and monitoring
2. To introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery
3. To introduce the importance of safety in construction projects

Course Outcomes:
Upon the successful completion of this course, the students will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Explain the importance of construction planning, networking and monitoring in construction projects.	**L2**
CO2	Analyze the cost of a construction project and Identify the optimum and crash cost of the project	**L4**
CO3	Describe the functioning of various earth-moving equipment.	**L2**
CO4	Explain the methods of production of aggregate products, mixing and placing of concrete.	**L2**
CO5	Apply the gained knowledge to project management and construction techniques.	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	2	2	3	2	-	-	-
CO4	3	3	3	2	3	-	-	-	2	2	3	2	-	-	-
CO5	3	2	2	-	2	2	3	3		2	2	2	-	-	-

UNIT-I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT-II

Project evaluation and review technique–cost analysis updating crashing for optimum cost–crashing for optimum resources–allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent.

UNIT-III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

Hoisting and earth work equipment–hoists–cranes–tractors-bulldozers–graders–scrapers–draglines-clam shell buckets

UNIT-IV

Concreting equipment— concrete mixers– Batching plants, mobile using plants like "Ajax"etc. mixing and placing of concrete – consolidating and finishing.

UNIT-V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering. BIM for Civil Engineers (Building Information Modelling)

TEXTBOOKS:

1. **Peurifoy, Schexnayder and Shapira,** 'Construction Planning, Equipment and Methods' Tata McGraw hill.
2. **Kumar Neeraj Jha** 'Construction Project Management Theory and Practice', Pearson, 2011.
3. **Subir K.Sarkar and Subhajit Sarasvati** 'Construction Technology', Oxford University press

REFERENCES:

1. Peter Fewings,'Construction Project Management-An Integrated Approach', Taylor and Francis Group,
2. Trefor Williams 'Construction Management Emerging Trends and Technologies', Cengage learning

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III Year I Semester

L	T	P	C
3	0	0	3

ENTREPRENEURSHIP

Course Learning Objectives:

The objective of this course is to enable the students to:

1.To develop and strengthen entrepreneurial quality and motivation in students.

2.To impart basic entrepreneurial skills and understandings to run a business efficiently and effectively

Course Outcomes:

Upon the successful completion of this course:

CO	CO STATEMENT	TAXONAMY
CO1	Study the concept of entrepreneurship, knowledge and skills of entrepreneur.	L2
CO2	Get the awareness on business environment	L1 & L2
CO3	Get the awareness on industrial policies	L1 & L2
CO4	Gain the competency on preparing business plan	L3 & L6
CO5	Study the impact of launching small business and understand resource planning for start up	L2

CO-PO Mapping:

Co/Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	2	-	2	-	2	2	2	-	-	-
CO2	2	-	-	-	-	3	2	-	-	-	2	-	-	-	-
CO3	1	-	-	-	-	3	2	2	-	-	2	-	-	-	-
CO4	3	-	3	-	-	2	-	-	-	2	2	2	-	-	-
CO5	2	-	3	-	-	3	2	-	-	-	2	2	-	-	-

UNIT–I

ENTREPRENEURAL COMPETENCE :Entrepreneurship concept – Entrepreneurship as a Career – Entrepreneurial Personality - Characteristics of Successful, Entrepreneur – Knowledge and Skills of Entrepreneur.

UNIT–II

ENTREPRENEURAL ENVIRONMENT

Business Environment – Role of Family and Society – Entrepreneurship Development Training and Other Support Organisational Services.

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UNIT-III:

INDUSTRIAL POLICIES: Central and State Government Industrial Policies and Regulations - International Business.

UNIT-IV :

BUSINESS PLAN PREPARATION: Sources of Product for Business - Prefeasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

UNIT- V:

LAUNCHING OF SMALL BUSINESS: Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Venture capital, IT start ups. Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units- Effective Management of small Business.

TEXT BOOKS

1. **Hisrich**, 'Entrepreneurship',Tata McGraw Hill, New Delhi, 2001.
2. **S.S.Khanka**, 'Entrepreneurial Development', S. Chand and Company Limited, NewDelhi, 2001.

REFERENCES

1.**Mathew Manimala**,'Entrepreneurship Theory at the Crossroads', Paradigms &Praxis, Biztrantra ,2nd Edition ,2005
2.**Prasanna Chandra**,'Projects – Planning, Analysis, Selection, Implementation and Reviews', Tata McGraw-Hill, 1996.
3.**P.Saravanavel**,'Entrepreneurial Development, Ess Pee kay Publishing House', Chennai -1997.
4.**Arya Kumar**, Entrepreneurship. Pearson. 2012
5. **Donald F Kuratko, T.V Rao**,'Entrepreneurship: A South Asian perspective. Cengage Learning. 2012

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III Year I Semester

L	T	P	C
3	0	0	3

GREEN BUILDINGS

Course Learning Objectives:

The objective of this course is:

1. Understand the Fundamentals of Green Building Concepts
2. Familiarize with Green Building Standards and Rating Systems
3. Learn Energy-Efficient Building Design Techniques
4. Understand Eco-friendly HVAC and Lighting Design
5. Explore Sustainable Material Use and Indoor Environmental Quality

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Explain the basic concepts, definitions, and significance of green buildings, including sustainable features and materials.	**L2**
CO2	Illustrate the practices, strategies, and rating systems adopted by the Indian Green Building Council (IGBC) and other rating agencies to promote sustainable development in residential and commercial buildings.	**L2**
CO3	Analyze energy conservation techniques and identify energy-saving approaches in green building design including the use of renewable energy and on-site sources.	**L4**
CO4	Evaluate HVAC system components, lighting systems, and eco-friendly power solutions used in green buildings to enhance energy efficiency and indoor comfort.	**L5**
CO5	Apply principles of material conservation and indoor air quality (IAQ) to enhance occupational health and sustainability in green construction practices.	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	2	-	-	1	-	1	-	-	-
CO2	3	2	-	-	2	2	3	-	-	1	-	2	-	-	-
CO3	3	3	2	-	2	2	3	-	-	-	-	2	-	-	-
CO4	2	2	3	2	2	-	3	-	-	-	-	2	-	-	-
CO5	3	3	2	2	1	2	3	-	2	2	2	2	-	-	-

UNIT – 1:

Introduction

What is Green Building, Why to go for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, What are key Requisites for Constructing a Green Building, Important Sustainable features for Green Building,

UNIT – 2:

Green Building Concepts And Practices Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency,

UNIT-3:

Green Building Design Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximise System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Ecofriendly captive power generation for factory, Building requirement,

UNIT- 4:

Air Conditioning Introduction,CII Godrej Green business centre,Design philosophy,Design interventions,Energy modeling, HVAC System design,Chiller selection,pump selection,Selection of cooling towers,Selection of air handing units,Precooling of fresh air,Interior lighting system,Key feature of the building. Eco-friendly captive power generation for factory,Building requirement.

UNIT –5:

Material Conservation Handling of non process waste, waste reduction during construction,materials with recycled content,local materials,material reuse, certified wood,Rapidly renewable building materials and furniture; Indoor Environment Quality And Occupational Health: Air conditioning, Indore air quality, Sick building syndrome, Tobacco smoke control, Minimum fresh air requirements avoid use of asbestos in the building, improved fresh air ventilation, Measure of IAQ, Reasons for poor IAQ, Measures to achieve Acceptable IAQ levels,

TEXTBOOKS:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. **Tomwoolley and Samkimings**,' Green Building Hand Book',2009.

REFERENCES:

1. **Trish riley**,' Complete Guide to Green Buildings'
2. **Kent Peterson**,' Standard for the design for High Performance Green Buildings',2009

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L	T	P	C
3	0	0	3

CONSTRUCTION TECHNOLOGY & MANAGEMENT

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Course Outcomes*:*
Upon the successful completion of this course, the students will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Explain the importance of construction planning, networking and monitoring in construction projects.	**L2**
CO2	Analyze the cost of a construction project and Identify the optimum and crash cost of the project	**L4**
CO3	Describe the functioning of various earth-moving equipment.	**L2**
CO4	Explain the methods of production of aggregate products, mixing and placing of concrete.	**L2**
CO5	Apply the gained knowledge to project management and construction techniques.	**L3**

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CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO2	3	2	2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	2	2	3	2	-	-	-
CO4	3	3	3	2	3	-	-	-	2	2	3	2	-	-	-
CO5	3	2	2	-	2	2	3	3		2	2	2	-	-	-

UNIT-I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT-II

Project evaluation and review technique–cost analysis updating crashing for optimum cost–crashing for optimum resources–allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent.

UNIT-III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

Hoisting and earth work equipment–hoists–cranes–tractors-bulldozers–graders–scrapers–draglines-clam shell buckets

UNIT-IV

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UNIT-V

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TEXTBOOKS:

1. **Peurifoy, Schexnayder and Shapira,** 'Construction Planning, Equipment and Methods' Tata McGraw hill.
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3. **Subir K.Sarkar and Subhajit Sarasvati** 'Construction Technology', Oxford University press

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1. Peter Fewings,'Construction Project Management-An Integrated Approach', Taylor and Francis Group,
2. Trefor Williams 'Construction Management Emerging Trends and Technologies', Cengage learning

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III Year-I Semester

L	T	P	C
3	0	0	3

CLIMATE CHANGE IMPACT ON ECO SYSTEM

Course Learning Objectives:

The objective of this course is to:

1. Understand the components of the climate system, the structure of the atmosphere, and temperature dynamics.
2. Comprehend the hydrologic cycle, global and local water balance, and the processes that govern water movement.
3. Analyze climate variables such as precipitation, humidity, monsoon, and wind circulation.
4. Evaluate the occurrence and impact of climate variability including extreme events like floods and droughts.
5. Understand the science behind climate change, its causes, and modeling techniques using global and regional models.

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Differentiate between weather, climate, and climate change, and explain atmospheric structure and temperature dynamics	**L2**
CO2	Analyze the global water cycle, construct water balance models, and interpret hydrological processes.	**L4**
CO3	Identify and explain the variables affecting precipitation, wind patterns, and atmospheric stability.	**L2**
CO4	Assess the occurrence, indicators, and impacts of climate variability and extremes such as floods, droughts, and heat waves.	**L5**
CO5	Interpret climate change models, scenarios (IPCC), and downscaling techniques to analyze future climate conditions	**L4**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	1	1	3	-	1	-	1	3	-	-	-
CO2	3	2	1	2	1	1	2	-	-	1	1	2	-	1	-
CO3	3	2	2	2	2	2	3	-	-	2	2	2	-	1	-
CO4	3	2	1	2	1	2	2	-	-	1	1	1	-	-	-
CO5	3	3	2	3	3	2	3	2	2	3	3	2	-	-	-

UNIT I:

Climate System; Climate, weather and Climate Change; Overview of Earth's Atmosphere; Vertical Structure of Atmosphere; Radiation and Temperature; Laws of Radiation; Heat-Balance of Earth Atmosphere System; Random Temperature Variation; Modelling Vertical Variation in Air Temperature; Temporal Variation of Air temperature; Temperature Change in Soil; Thermal Time and Temperature Extremes.

UNIT II:

Hydrologic Cycle: Introduction; Global water balance; Cycling of water on land, a simple water balance model;

UNIT III:

Climate Variables affecting Precipitation: Precipitation and Weather, Humidity, Vapor Pressure, Forms of Precipitation, Types of Precipitation; Cloud; Atmospheric Stability; Monsoon; Wind Pattern in India; Global Wind Circulation; Evaporation and Transpiration, Processes of Vadose Zone, Surface Runoff, Streamflow

UNIT IV:

Climate Variability: Floods, Droughts, Drought Indicators, Heat waves, Climate Extremes.

UNIT V:

Climate Change: Introduction; Causes of Climate Change; Modeling of Climate Change, Global Climate Models, General Circulation Models, Downscaling; IPCC Scenarios

TEXTBOOKS:

1. **Subramanya.K** 'Engineering Hydrology',Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. **Jayarami Reddy** 'Engineering Hydrology',P.Laxmi -Publications Pvt. Ltd., (2013), New Delhi

REFERENCES:

1. Thomas E. Lovejoy & Lee Hannah ,"Climate Change and Biodiversity"- Publisher: Yale University Press

2. Andrew Dessler , "Introduction to Modern Climate Change"- **Publisher:** Cambridge University Press

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III Year I Semester

L	T	P	C
0	0	3	1.5

GEOTECHNICAL ENGINEERING LAB

Learning Objectives:

The objective of this course is

1. To determine the index properties for soil classification– Grain size distribution &

Atterberg's limits.

2. To determine the engineering properties–Permeability, Compaction, consolidation,shear strength parameters & CBR value.

3. To find the degree of swelling by DFS test.

4. To impart knowledge of determination of index properties required for classification

of soils.

5. To teach how to determine compaction characteristics and consolidation behaviour from relevant lab tests; to determine permeability of soils.

6. To teach how to determines hear parameters of soil through different laboratory tests.

Course Outcomes*:*

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

CO	CO STATEMENT	TAXONAMY
CO1	Determine index properties of soil and classify them.	**L3**
CO2	Determine permeability of soils.	**L3**
CO3	Determine Compaction, Consolidation and shear strength characteristics.	**L3**

CO-PO Mapping:

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

LIST OF EXPERIMENTS:

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Permeability of soil-Constant and Variable head tests
6. Compaction test
7. Consolidation test (to be demonstrated)
8. Direct Sheartest

9. Triaxial Compression test
10. Unconfined Compression test
11. VaneSheartest
12. Differential freeswell (DFS)
13. Field Plate Load Test demo
14. Field CBR demo.

Atleast **Eight** experiments shall be conducted.

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrink age limits
3. Field density apparatus for

a) Core cutter method

b) Sand replacement method

4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for

a) Constant head test

b) Variable head test

7. Universal auto compactor fo rI. Slight and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10tons loading frame with proving rings of 0.5 tons and 5tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38mm dia specimens.
13. Box shear test apparatus
14. Laboratory vanesh ear apparatus.
15. Hot air ovens (rangeoftemperature50 0 -150 0 C)
16. Field plate load Test equipment
17. Field CBR test equipment

References:

1. J.E.Bowles, 'Determination of Soil Properties'.

2. IS Code2720 –relevant parts**.**

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III Year – I Semester

L	T	P	C
0	0	3	1.5

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Learning Objectives*:*
The objective of this course is

1. Demonstrate fundamental hydraulic principles such as Bernoulli's theorem and flow measurement techniques.
2. Develop practical skills in calibrating flow measuring devices like venturi meters, orifice meters, and notches.
3. Analyze energy losses in pipelines due to friction, bends, expansions, and contractions.
4. Enable students to evaluate coefficients of discharge and flow through small openings and mouthpieces.
5. Understand the working principles of Pelton and Francis turbines. Explain the working mechanism of centrifugal and reciprocating pumps

Course Outcomes*:*
Upon the successful completion of this course, the students will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Verify Bernoulli's theorem and calibrate hydraulic measuring devices like Venturi and orifice meters	**L3**
CO2	Determine discharge coefficients for orifices, mouthpieces, and notches under various flow conditions	**L3**
CO3	Analyze energy losses in pipes due to friction, bends, expansions, and contractions using standard experimental setups	**L4**
CO4	Analyze the force exerted by a jet on different types of vanes, Conduct a performance test on a Pelton wheel, Francis turbine and determine its efficiency.	**L4**
CO5	Carry out an efficiency test on a centrifugal pump and reciprocating pump and assess its performance.	**L5**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	-	2	2	1	-	-	1	1	2	1	-
CO2	3	3	2	1	-	2	2	1	-	-	1	1	2	1	-
CO3	3	3	3	2	1	3	3	2	-	-	2	2	3	2	-
CO4	3	3	2	2	1	3	3	2	-	-	2	2	3	2	-
CO5	3	3	2	2	1	3	3	2	-	-	2	2	3	2	-

List of Experiments:

1. Verification of Bernoullis' equation.
2. Calibration of Venturimeter.
3. Calibration of orificemeter.
4. Determination of coefficient of discharge of a small orifice by constant head method
5. Determination of coefficient of discharge of an external cylindrical mouth piece by variable head method.
6. Calibration of a contracted rectangular notch.
7. Calibration of a triangular notch.
8. Determination of friction factor of the pipe material.
9. Determination of coefficient of loss of head due to a sudden expansion/ contraction in a pipeline.
10. Determination of coefficient of head loss due to a bend in pipe line.
11. Impact of jet on vanes
12. Performance test on Pelton wheel turbine or Francis turbine
13. Efficiency test on centrifugal pump or reciprocating pump.

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III Year I Semester

L	T	P	C
0	1	2	2

ESTIMATION, SPECIFICATION AND CONTRACTS

Course Learning Objectives:

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

Course Outcomes:

Upon the successful completion of this course:

CO	Course Outcome	Bloom's Level
CO1	Understand various types of contracts, conditions, valuation methods, and digital procurement tools.	**L2**
CO2	Apply standard units and estimation methods to compute quantities for different components of buildings.	**L3**
CO3	Analyze cost components using rate analysis, and prepare bar bending schedules for earthworks and structures.	**L4**
CO4	Prepare detailed estimates using the individual wall method for various types of buildings.	**L3**
CO5	Evaluate building estimates using the centre line method and estimation software tools.	**L5**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	2	-	2	1	-
CO2	3	3	2	-	1	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	-	2	-	-	-	-	-	2	-	3	1	-
CO4	3	2	3	-	1	-	-	-	-	-	1	-	3	1	-
CO5	3	2	3	-	3	-	-	-	-	-	3	-	3	3	-

UNIT–I

Contracts–Types of contracts–Contract Documents–Conditions of contract, Valuation of buildings- concepts of e-procurement and reverse auctions. Standard specifications for different items of building construction.

UNIT–II

General items of work in Building–Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT–III

Rate Analysis– Working out data for various items of work over head and contingent charges. Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT-IV

Detailed Estimation of Buildings using individual wall method for single, double and four roomed buildings.

UNIT-V

Detailed Estimation of Buildings using centre line method for single, double and four roomed buildings. Standard software's like building estimator etc.

TEXT BOOKS:

1. **B.N. Dutta**, 'Estimating and Costing', UBS publishers, 2000.
2. **B.S.Patil**, 'Civil Engineering Contracts and Estimates', Universities Press (India) Pvt. Ltd., Hyd.
3. **Rajiv Gupta**, 'Construction Planning and Technology', CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. **G.S. Birdie** ,'Estimating and Costing'

REFERENCES:

1. 'Standard Schedule of rates and standard data book' by public works department.
2. IS1200 (PartsItoXXV-1974/ Method of Measurement of Building & Civil Engg Works–B.I.S.)
3. **M.Chakraborthi**, 'Estimation, Costing and Specifications', Laxmi publications
4. National Building Code

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III Year I Semester

L	T	P	C
0	0	2	1

TINKERING LAB

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Course Objectives : To

CO No.	Course Outcome	Taxonomy
CO1	Apply creativity and innovation to design functional electronic/mechanical models.	**L3**
CO2	Demonstrate hands-on proficiency in using prototyping tools and embedded platforms.	**L3**
CO3	Collaborate in teams to build and test prototypes solving real-world problems.	**L4**
CO4	Develop interdisciplinary solutions using sensors, actuators, and software tools.	**L6**
CO5	Apply problem-solving and critical thinking for designing practical applications.	**L5**
CO6	Exhibit entrepreneurial mind-set through innovative project development.	**L6**

CO \ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	3	2	3	-	-	-	2	2	-	2	3	3
CO2	2	2	3	2	3	-	-	-	2	1	-	2	3	3
CO3	2	2	3	2	3	-	-	-	3	2	1	2	2	2
CO4	2	3	3	3	3	-	-	-	2	2	1	3	3	3
CO5	3	3	3	3	3	-	-	-	2	2	1	3	3	3
CO6	2	2	3	2	2	2	1	1	3	2	3	3	2	2

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of experiments:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Demonstrate a traffic light circuit using breadboard.
3) Build and demonstrate automatic Street Light using LDR.
4) Simulate the Arduino LED blinking activity in Tinkercad.
5) Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6) Interfacing IR Sensor and Servo Motor with Arduino.
7) Blink LED using ESP32.
8) LDR Interfacing with ESP32.
9) Control an LED using Mobile App.
10) Design and 3D print a Walking Robot
11) Design and 3D Print a Rocket.
12) Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13) Demonstrate all the steps in design thinking to redesign a motor bike.

Students need to refer to the following links:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

Course Outcomes: The students will be able to experiment, innovate, and solve real-world challenges.

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III YEAR
II - SEMESTER

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III Year II Semester

L	T	P	C
3	0	0	3

DESIGN AND DRAWING OF STEEL STRUCTURES

Course Learning Objectives:

The objective of this course is to:

1. Familiarize students with different types of connections and relevant IS codes
2. Equip student with the concepts of designing flexural members
3. Understand design concepts of tension and compression members in trusses
4. Familiarize students with different types of columns and column bases and their design
5. Familiarize students with Plate girder and Gantry Girder and their design

Course Outcomes*:*

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

CO	CO STATEMENT	TAXONAMY
CO1	Analyze and design steel structural members with relevant IS codes	**L4**
CO2	Carryout analysis and design of flexural members and detailing	**L4**
CO3	Design compression members of different types with connection detailing	**L6**
CO4	Design Plate Girder and Gantry Girder with connection detailing	**L6**
CO5	Produce the drawings pertaining to different components of steel structures	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	1	1	2	1	1	1	1	-	-	-
CO2	3	3	3	2	1	1	1	2	1	1	1	1	-	-	-
CO3	3	3	3	2	1	1	1	2	1	1	1	1	-	-	-
CO4	3	3	3	2	1	1	1	2	1	1	1	1	-	-	-
CO5	2	2	2	3	1	1	1	3	1	1	1	1	-	-	-

UNIT – I

Connections: Riveted connections – definition, rivet strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT – II

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams**.**

UNIT –III

Tension Members and compression members: Effective length of members, slenderness ratio-permissible stresses. Design compression members subjected to axial and eccentric loading. Design of members subjected to direct tension and bending.

Roof Trusses:

Different types of roof trusses – Design loads – Load combinations as per IS Code Recommendations, structural details –Design of purlins, members and joints.

UNIT – IV

Design of Columns: Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected to moment.

UNIT – V

Design of Plate Girder: Design consideration – IS Code Recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

Design of Gantry Girder: impact factors - longitudinal forces, Design of Gantry girders.

NOTE: Welding connections should be used in Units II – V. Drawing classes must be conducted every week and the students should prepare the following plates.

Plate 1 Detailing of simple beams

Plate 2 Detailing of Compound beams including curtailment of flange plates.

Plate 3 Detailing of Column including lacing and battens.

Plate 4 Detailing of Column bases – slab base and gusseted base

Plate 5 Detailing of steel roof trusses including joint details.

Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.

Plate 7 Detailing of gantry girder.

FINAL EXAMINATION PATTERN:

The end examination paper should consist of Part A and Part B. part A consist of two questions in Design and Drawing out of which one question is to be answered. Part B should consist of five questions and design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXTBOOKS:

1. **N.Subramanian**,'Steel Structures Design and Practice', Oxford University Press.
2. **Ramachandra**, 'Design of Steel Structures', Vol – 1, Universities Press.
3. **S.K. Duggal**, 'Design of steel structures', Tata Mcgraw Hill, and New Delhi

REFERENCES:

1. **SarwarAlamRaz** ,'Structural Design in Steel', New Age International Publishers, New Delhi
2. **P. Dayaratnam**,'Design of Steel Structures'; S. Chand Publishers
3. **M. Raghupathi** ,'Design of Steel Structures', Tata Mc. Graw-Hill
4. **N. Krishna Raju** ,'Structural Design and Drawing'; University Press

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III Year – II Semester

L	T	P	C
3	0	0	3

HIGHWAY ENGINEERING

Course Learning Objectives:

The objectives of this course are:

1. To impart different concepts in the field of Highway Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. To acquire design principles of Intersections

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Understand the principles of highway planning, classifications, and alignment, including the historical development of road networks in India.	**L2**
CO2	Apply geometric design standards for highways, including sight distances, horizontal and vertical alignment, and super elevation	**L3**
CO3	Analyze traffic characteristics and perform traffic studies; design intersections and traffic signals using IRC and Webster methods	**L4**
CO4	Evaluate the properties and testing methods of highway construction materials such as soils, aggregates, and bitumen; perform mix design using the Marshall method	**L5**
CO5	Design flexible and rigid pavements using CBR, IRC, Burmister, and mechanistic methods, considering stresses and IRC guidelines.	**L6**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	2	1	1	1	1	1	1	1	3	1	1
CO2	3	3	3	1	2	1	1	1	1	1	1	1	3	1	1
CO3	3	3	3	1	2	1	1	1	1	1	1	1	3	1	1
CO4	3	3	3	1	2	1	1	1	1	1	1	1	3	1	1
CO5	3	3	3	1	2	1	1	1	1	1	1	1	3	1	1

UNIT – I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans– First, second, third road development plans, road development vision 2021,Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment-Engineering Surveys – Drawings and Reports.

UNIT – II

Highway Geometric Design: Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment-Gradients- Vertical curves.

UNIT – III

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

UNIT –IV

Highway Materials: Sub grade soil: classification –Group Index–Subgrade soil strength – California Bearing Ratio–Modulus of Subgrade Reaction. Stone aggregates: Desirable properties– Tests for Road Aggregates–Bituminous Materials: Types–Desirable properties—Testson Bitumen -Bituminous paving mixes: Requirements – Marshall Method of Mix Design

UNIT–V

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements: Design factors–Flexible Pavement Design Methods–CBR method–IRC method–Burmister method–Mechanistic method–IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses–Combination of stresses–Design of slabs–Design of Joints–IRC method–Rigidpavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

TEXTBOOKS:

Khanna S.K., Justo C.E.G and Veeraragavan A,Nem Chand Bros., Roorkee, Highway Engineering,

Kadiyali L, Traffic Engineering and Transportation Planning,. R,Khanna Publishers, New Delhi.

REFERENCES:

Kadiyali L, Principles of Highway Engineering, R,Khanna Publishers, NewDelhi

Partha Chakraborty and Animesh Das, Principles of Transportation Engineering, PHI Learning Private Limited, Delhi

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III Year-II Semester

L	T	P	C
3	0	0	3

ENVIRONMENTAL ENGINEERING

Course Learning Objectives:

The objective of this course is to:

1. Outline planning and the design of water supply systems for a community/town/city
2. Provide knowledge of water quality requirement for domestic usage and knowledge on design of water distribution network
3. Selection of valves and fixture in water distribution systems
4. Outline the planning and design of Sewerage System for a community/town/city
5. To impart knowledge on waste water treatment and disposal

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Understand water supply planning, demand estimation, population forecasting, and source selection for urban and rural areas.	**L2**
CO2	Analyze water quality parameters and apply national and international standards in the design of water distribution systems.	**L4**
CO3	Explain and design water treatment processes such as sedimentation, filtration, disinfection, and advanced treatments like RO and ion exchange.	**L2**
CO4	Plan and design sewerage systems, estimate sanitary and storm flows, and apply principles of primary sewage treatment including septic and sedimentation units.	**L3**
CO5	Apply secondary treatment methods (e.g., ASP, UASB, MBR), evaluate disposal and reuse options for treated sewage, and understand self-purification processes in natural water bodies.	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	1	1	1	1	1	1	1	3	1	-
CO2	3	3	3	1	2	1	1	1	1	1	1	1	3	1	-
CO3	3	3	3	1	2	1	1	1	1	1	1	1	3	1	-
CO4	3	3	3	1	2	1	1	1	1	1	1	1	3	1	-
CO5	3	3	3	1	2	1	1	1	1	1	1	1	3	1	-

UNIT–I

Introduction: Importance and Necessity of Protected Water Supply systems. Water borne diseases. Planning of public water supply systems. Per capita demand and factors influencing it, types of water demands and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.

Sources of Water: Various surface and subsurface sources considered for water supply and their comparison- Capacity of storage reservoirs, Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes and Pipe joints.

UNIT-II

Quality and Analysis of Water: Physical, Chemical and Biological characteristics of water. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines.

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods – Appurtenances of water distribution system–Laying and testing of pipe lines.

UNIT-III

Treatment of Water: Typical treatment flow of a municipal water treatment plant, Unit operations of water treatment: Theory and Design of Sedimentation, Coagulation, flocculation, Filtration, Water conditioning and softening, Disinfection, Removal of color and odors – Removal of Iron and manganese – Fluoridation and De-fluoridation –Ion Exchange - Ultra filtration- Reverse Osmosis.

UNIT-IV

Planning and Design of Sewerage System: Characteristics and composition of sewage — population equivalent -Sanitary sewage flow estimation — Sewer materials — Hydraulics of flow in sanitary sewers — Sewer design — Storm drainage-Storm runoff estimation — sewer appurtenances — corrosion in sewers — prevention and control — sewage pumping-drainage in buildings-plumbing systems for drainage

Primary Treatment of Sewage: Objectives — Unit Operations and Processes — Selection of treatment processes — Onsite sanitation — Septic tank- Grey water harvesting — Primary treatment — Principles, functions and design of sewage treatment units — screens — grit chamber-primary sedimentation tanks — Construction, Operation and Maintenance aspects.

UNIT–V

Secondary Treatment of Sewage: Objectives — Selection of Treatment Methods — Principles, Functions, — Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor (SBR) — Membrane Bioreactor — UASB — Waste Stabilization Ponds — Other treatment methods -Reclamation and Reuse of sewage — Recent Advances in Sewage Treatment — Construction, Operation and Maintenance aspects.

Disposal of Sewage: Standards for– Disposal — Methods — dilution — Mass balance principle — Self purification of river - Oxygen sag curve — de-oxygenation and re-aeration — Streeter–Phelps model — Land disposal — Sewage farming — sodium hazards — Soil dispersion system.

TEXT BOOKS

1. **Howard S. Peavy, Donald R. Rowe**, Teorge George Tchobanoglus, Environmental Engineering — McGraw-Hill Book Company, New Delhi, 1985.
2. **Dr. P.N. Modi** ,Water Supply Engineering., Standard Book House, Delhi.

REFERENCES

1. **K.N. Duggal**, Elements of Environmental Engineering, S. Chand & Company Ltd., New Delhi.
2. **Dr. B.C. Punmia, A.K. Jain** ,Water Supply Engineering.– Laxmi Publications (P) Ltd., New Delhi.
3. **G.S. Birdie and J.S. Birdie** -Water Supply and Sanitary Engineering

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III Year II Semester

L	T	P	C
3	0	0	3

GROUND IMPROVEMENT TECHNIQUES

Course Learning Objectives:

The objective of this course is:

1. To make the student appreciate the need for different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

Course Outcomes:

CO	CO STATEMENT	TAXONAMY
CO1	Understand and apply in-situ densification techniques for improving granular and cohesive soils.	**L3**
CO2	Analyze various dewatering techniques and select suitable methods based on soil and site conditions.	**L4**
CO3	Demonstrate knowledge of soil stabilization methods and grouting techniques including their mechanisms and applications.	**L2**
CO4	Design reinforced earth structures and analyze their stability including soil nailing systems.	**L5**
CO5	Classify geo-synthetics and demonstrate their functions and applications in civil engineering practice.	**L2**

CO-PO Mapping:

CO /PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	1	-	-	-	1	3	2	-
CO2	3	3	2	2	2	-	1	-	-	-	1	3	2	-
CO3	3	2	2	-	1	1	2	-	-	-	-	3	3	-
CO4	3	3	3	2	1	-	2	-	-	-	2	3	3	-
CO5	3	2	2	-	2	1	2	-	-	-	1	2	3	-

UNIT-I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – in situ densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT-II

Dewatering–sumps and interceptor ditches –single and multi-stage well points–vacuum well points, horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization–use of industrial wastes like fly- ash and granulated blast furnace slag.

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting–hydraulic fracturing in soils and rocks –post grout tests. Introduction to Liquefaction & its effects & applications.

UNIT-IV

Reinforce earth–principles–components of reinforced earth–design principles of reinforced earth walls – stability checks – soil nailing.

UNIT-V

Geo-synthetics–geotextiles–types–functions, properties and applications – geogrids, geo-membranes and gabions - properties and applications.

TEXT BOOKS:

1. **Dr. P. Purushothama Raj**, 'Ground Improvement Techniques' , Laxmi Publications, New Delhi.
2. **Nihar Ranjan Patro,** 'Ground Improvement Techniques' , Vikas Publishing House(p) limited ,New Delhi.
3. **G.L.Siva Kumar Babu** ,'An introduction to Soil Reinforcement and Geosynthetics', Universities Press.

REFERENC EBOOKS:

1. **MP Moseley** ,'Ground Improvement ', Blackie Academic and Professional, USA.
2. **RM Koerner** ,'Designing with Geosynethetics ', Prentice Hall

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III Year II Semester

L	T	P	C
3	0	0	3

REPAIR AND REHABILITATION OF STRUCTURES

Course Learning Objectives:

The objective of this course is to:

1. Understand material selection for structural repair and rehabilitation, including the use of Admixtures, fibers, and wraps, and learn non-destructive evaluation (NDE) techniques for assessing structural condition.

2. Learn strengthening and stabilization techniques for beams, columns, and structural connections with a focus on design considerations and crack control.

3. Explore bonded installation techniques using FRP and steel plates, and understand debonding Mechanisms in structural reinforcement systems.

4. Examine the design and application of various special concretes such as fiber-reinforced concrete, lightweight concrete, and fly ash concrete for improved durability and performance.

5. Gain knowledge of high-performance concretes**,** including their development, properties, and types such as self-consolidating concrete, for advanced construction applications.

Course Outcomes:

At the end of this course the student will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Recognize the mechanisms of degradation of concrete structures and to design durable Concrete structure	**L2**
CO2	Conduct field monitoring and non-destructive evaluation of concrete structures.	**L3**
CO3	Design and suggest repair strategies for deteriorated concrete structures including Repairing with composites	**L6**
CO4	Understand the methods of strengthening methods for concrete structures	**L2**
CO5	Study the impact of launching small business and understand resource planning for start up	**L2**

CO-PO Mapping:

Co/Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	2	2	1	-	-	2	3	2	2	-	-
CO2	2	3	2	2	2	1	-	-	-	1	2	2	-	2	-
CO3	3	3	3	-	2	2	-	-	1	2	3	2	2	2	-
CO4	3	2	3	-	1	2	-	-	1	2	3	2	2	2	-
CO5	2	1	2	-	-	2	2	1	1	2	3	3	-	2	-

UNIT: I

Materials for repair and rehabilitation-Admixtures-types of admixtures-purposes of using Admixtures-chemical composition-Natural admixtures-Fibers-wraps-Glass and Carbon fiber wraps-Steel Plates-Non-destructive evaluation: Importance-Concrete behaviour under corrosion, disintegrated mechanisms- moisture effects and thermal effects –Visual investigation- Acoustical emission methods-Corrosion activity measurement- chloride content–Depth of carbonation-Impact echo methods-Ultra sound pulse velocity methods- pull out tests.

UNIT–II

Strengthening and stabilization-Techniques-design considerations-Beam shear capacity strengthening- Shear Transfer strengthening-stress reduction techniques- Column strengthening flexural strengthening-Connection stabilization and strengthening, Crack stabilization..

UNIT: III

Bonded installation techniques- Externally bonded FRP-Wet layup sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms- intermediate crack debonding- CDC debonding plate end de bonding-strengthening of floor of structures post grout tests. Introduction to Liquefaction& its effects & applications

UNIT: IV

Fiber reinforced concrete-Properties of constituent materials-Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete-applications of fiber reinforced concretes-Light weight concrete-properties of light weight concrete-No fines concrete-design of light weight concrete-Fly ash concrete-Introduction-classification of fly ash-properties and reaction mechanism of fly ash-Properties of fly ash concrete in fresh state and hardened state-Durability of fly ash concretes

UNIT: V

High performance concretes-Introduction-Development of high-performance concretes- Materials of high-performance concretes-Properties of high-performance concretes-Self Consolidating concrete properties-qualifications.

TEXT BOOKS

1. **P.C. Varghese**, 'Maintenance Repair Rehabilitation & Minor works of Buildings', PHI Publications
2. **P.I. Modi, C.N. Pate**l, 'Repair and Rehabilitation of Concrete Structures', PHI Publications.
3. **B. Vidivelli**, 'Rehabilitation of Concrete Structures, Standard Publishers Distributors
4. **V.K. Raina**, 'Concrete Bridge Practice Construction Maintenance & Rehabilitation', Shroff Publishers and Distributors.

REFERENCES

1**. M.S. Shetty, S Chand**, 'Concrete Technology Theory and Practice'
2. **Peter HEmmons**, 'Concrete Repair and Maintenance'
3. **SantaKumarA.R**, 'Concrete Chemical Theory and Applications', Indian Society for Construction Engineering and Technology, Madras
4. **CPWD,** 'Hand book on Repair and Rehabilitation of RC Building', Delhi

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III Year – II Semester

L	T	P	C
3	0	0	3

VALUATION AND QUANTITY SURVEY

Course Learning Objectives:

The objective of this course is to:

1. Understand and define key terms in estimation, quantity surveying, and contract documents.
2. Utilize CPWD DAR/DSR data effectively to extract relevant information for construction activities
3. Develop accurate Bill of Quantities (BoQ) for diverse construction works such as buildings, earthwork, sanitary, and water supply.
4. Key terms such as depreciation, obsolescence, and appreciation in the context of property valuation.
5. Prepare comprehensive valuation reports based on the selected method for buildings of varying complexities

Course Outcomes:

At the end of this course the student will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Define basic terms related to estimation, quantity surveying and contract document. Interpret the item of work from drawings and explain its general specification and unit of measurement	**L2**
CO2	Make use of given data from CPWDDAR/DSR for calculating the unit rate of different items of work associated with building Construction	**L3**
CO3	Develop detailed measurement (including BBS) and BoQ of a various work like buildings, earth work for road, sanitary and water supply work	**L6**
CO4	Explain various basic terms related to valuation of land and Building	**L2**
CO5	Develop valuation of buildings using different methods of valuation	**L6**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	2	-	-	-	-	1	-	-	2	-	-
CO2	2	2	3	-	3	-	-	-	-	2	-	-	3	1	-
CO3	2	2	3	2	3	-	-	-	-	2	-	-	3	2	-
CO4	2	-	-	-	1	-	-	-	-	1	-	-	1	-	-
CO5	2	2	3	2	2	-	-	-	-	2	-	-	3	2	-

UNIT - I

Introduction- Quantity Surveying- Basic principles, Role/responsibility of Quantity surveyor at various stages of construction. Estimate-Details required, Type of estimate, purposes. Contingencies, Work-charge establishment, Tools and Plant, centage charge, Day work, Prime cost, Provisional sum & provisional Quantity, Overhead charges, Cost index, Contract documents (Brief description only)Bill of Quantity-Typical format-use Item of works-Identifyvariousitemofworkfromthedrawings-unitsofmeasurementofvarious materials and works (focus may give to RCC residential building) General rule & method of measurement with reference to Indian Standard Specifications- IS1200.

UNIT - II

Introduction to the use of CPWD schedule of rates as per latest DSR and Analysis of rate as per latest DAR. Specifications-Generalspecificationofallitemsofaresidentialbuilding.Detailed specification (CPWD specifications) of major item of work like Earth work excavation in foundation, masonry, Reinforced cement concrete, finishing of building work Analysis of rates for Earth work in excavation for foundation, mortars, reinforced cement concrete Works, finishing work, masonry work, stone works, flooring with reference to latest DSR and latest DAR (Data should be given).

UNIT - III

Detailed Estimate- Preparation of detailed measurement using Centre line method & Short wall long wall (separate wall) method for RCC single storied building (Flat roof) including stair cabin- Residential/office/school building. BOQ preparation of a single storied RCC building work. Material quantity calculation of the items of work (Rubble, Brick work, Concrete work, Plastering) in detailed estimate prepared for building work. (Data for unit quantity should be provided from DAR)

UNIT - IV.

Bar Bending Schedule- Preparation of BBS of RCC beams, slabs, Column footings, Retaining wall. Roadestimation-Estimationofearthworkfromlongitudinalsection-metaledroad.Estimation of sanitary and water supply work -Water tank, Septic tank, Manhole *(No Detailed estimate needed-concept of item of work, its general specification and unit of measurement*).(Valuation – purpose, factor affecting, introduction to terms-Value, Cost, Price, kinds of values Income- Gross income, net income, outgoings, annuity, sinking fund, Year's purchase, Depreciation, obsolescence -Free hold and leasehold properties.)

UNIT - V

Methods of calculating depreciation – straight line method – constant percentage method, sinking fund method and quantity survey method.

Methods of valuation–rental method, direct comparison of capital cost, valuation based on profit,

depreciation method. Various method of valuation of land (Brief description only)

Text Books:

1. **B.N.Dutta**, Estimation and costing in civil engineering, UBS publishers
2. **Rangwala**, Estimation Costing and Valuation, Charotar publishing house pvt.ltd
3. **Dr. S. Seetha Raman, M.Chinna swami**, Estimation and quantity surveying, Anuradha publications Chennai.
4. **M Chakraborthy**, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26

References:

1. **BS Patil**, Civil Engineering contracts and estimates, university press
2. **VN Vazirani & S P Chandola**, Civil Engineering Estimation and Costing, Khanna Publishers
3. IS1200-1968; Methods of measurement of building & civil engineering works
4. CPWDDAR 2018 and DSR 2018 or latest
5. CPWD Specifications Vol 1&2 (2019 or latest edition)

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III Year II Semester

L	T	P	C
3	0	0	3

FINITE ELEMENT METHOD

Course Learning Objectives:
The objective of this course is:
1. To introduce the basic principles of the stiffness method and variational approaches for structural analysis.
2. To develop finite element formulations for truss elements using stiffness matrices and approximation techniques.
3. To analyze beam elements under various loading and support conditions using finite element concepts and Galerkin's method.
4. To formulate and solve plane stress, plane strain, and axisymmetric problems using constant strain triangle (CST) and linear strain triangle (LST) elements.
5. To understand isoperimetric formulation, numerical integration, and issues related to element performance such as mesh instabilities and stress computation.

Course Outcomes*:*
Upon the successful completion of this course, the students will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Develop finite element formulations of one degree of freedom problems and solve them	**L6**
CO2	Understand any Finite Elements of ware to perform stress, thermal and modal analysis	**L2**
CO3	Compute the stiffness matrices of different elements and system	**L3**
CO4	Interpret displacements, strains and stress resultants	**L5**
CO5	Analyze planar structural systems using finite element modeling	**L4**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	2	-	-	-
CO2	2	2			3	-	-	-	-	-	-	2	-	-	-
CO3	3	2	2		2	-	-	-	-	-	-	-	-	-	-
CO4	2	3		3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	3	-	-	-	1	1	-	2	-	-	-

UNIT I

Introduction: Review of stiffness method-Principle of Stationary potential energy-Potential energy of anelastic body-Rayleigh-Ritz method of functional approximation-variational approaches- weighted residual methods

UNIT II

Finite Element formulation of truss element: Stiffness matrix-properties of stiffness matrix –Selection of approximate displacement functions-solution of a planetruss-transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports-Galerkin's methodfor1-Dtruss– Computation of stress in a truss element.

UNIT III

Finite element formulation of Beam elements: Beam stiffness-assemble age of beam stiffen matrix- Examples of beam analysis for concentrated and distributed loading-Galerkin's method – 2 Darbitrarily oriented beam element–inclined and skewed supports–rigid plane frame examples

UNIT IV

Finite element formulation for plane stress, plane strain and axi symmetric problems-Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axi-symmetric problems-comparison of CST and LST elements– convergence of solution-interpretation of stresses

UNIT V

Iso-parametric Formulation: Iso-parametric bar element- plane bilinear Iso-parametric element – quadratic plane element-shape functions, evaluation of stiffness matrix, consistent modalload vector- Gauss quadrature-appropriate order of quadrature–element and mesh instabilities– spurious zero energy modes, stress computation-patch test.

TEXTBOOKS

1. **Daryl L.Logan,** 'A first course in the Finite Element Method', Thomson Publications.
2. **Robert D.Cook, David S. Malkus, Michael E. Plesha and Robert J. Witt**, 'Concepts and applications of Finite Element Analysis', John Wiley & Sons Publications.

REFERENCES:

1. **Tirupati R. Chandrupatla and Ashok D. Belegundu,** 'Introduction to Finite Elements in Engineering', PHI publications.
2. **Wail N. AI-Rifaie and Ashok K. Govil,** 'Finite Element Methods (For Structural Engineers)', New Age International(P)Limited

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III Year – II Semester

L	T	P	C
3	0	0	3

BRIDGE ENGINEERING

Course Learning Objectives:

The objective of this course is to:

1. Familiarize students with different types of Bridges and IRC standards
2. Equip student with the concepts and design of Slab Bridges, T Beam Bridges, Box Culverts
3. Understand concepts of design of Plate Girder Bridges
4. Familiarize with different methods of inspection of bridges and their maintenance

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

CO	CO STATEMENT	TAXONAMY
CO1	Explain different types of Bridges with diagrams and Loading standards.	**L2**
CO2	Carryout analysis and design of Slab bridges and suggest structural detailing	**L4**
CO3	Carryout analysis and design of T Beam bridges and suggest structural detailing	**L4**
CO4	Carryout analysis and design of Plate girder bridges and suggest structural detailing	**L4**
CO5	Organize for attending inspections and maintenance of bridges and prepare reports.	**L5**

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
CO5	3	3	3	2	2	2	2	-	2	3	2	3	3	3	-

UNIT-I

General Introduction to types of Bridges- (Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, pre stressed concrete bridges, Truss Bridges, Culverts) - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open,

Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs-dispersion length-Design of interior panel of slab-Guyon's–Massonet Method– Hendry-Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III

T-Beam bridges- Analysis and design of various elements of bridge–Design of deck slab, longitudinal girders, Secondary beams- Reinforcement detailing

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Box Culverts: Loading–Analysis and Design-Reinforcement detailing.
Inspection and Maintenance of Bridges: Procedures and methods for inspection–Testing of bridges- Maintenance of Sub Structures and Super structures-Maintenance of bearings- Maintenance Schedules.

TEXTBOOK

1. **Johnson Victor D** , 'Essentials of Bridge Engineering '
2. **T.R. Jagadeesh**, M.A. Jayaram, PHI , 'Design of Bridge Structures'
3. **B. C.Punmai**, Jain & Jain, Lakshmi Publications , 'Design of RC Structures'

REFERENCES:

1. **Aswini, Vazirani, Ratwani** , 'Design of Concrete Bridges'
2. **B.C.Punmai, Jain & Jain**, 'Design of Steel Structures', Lakshmi Publications.
3. **Krishna Raju**, 'Design of Bridges'

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III Year II Semester

L	T	P	C
3	0	0	3

WATER RESOURCES ENGINEERING

Course Learning Objectives:

The objective of this course is to:

1. Learn the types of irrigation systems.
2. Understand the concepts of planning and design of irrigation systems.
3. Study the relationships among soil, water and plant and their significance in planning an irrigation system.
4. Understand design principles of erodible and non-erodible canals.
5. Know the principles of design of weirs on permeable foundations.
6. Know the concepts for analysis and design of storage head works.
7. Learn design principles of canal structures.

Course Outcomes:

At the end of this course the student will be able to

CO	CO STATEMENT	TAXONAMY
CO1	Estimate irrigation water requirements.	**L4**
CO2	Design irrigation canals	**L6**
CO3	Design irrigation canal structures	**L6**
CO4	Plan and design diversion head works	**L6**
CO5	Analyze stability of gravity and earth dams & Design hydraulic ogee spillways	**L5 & L6**

CO-PO Mapping:

Co/ Po	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO2	3	2	-	-	1	-	-	-	-	3	2	-	2	-	-
CO3	2	-	2	-	2	3	2	-	-	2	2	2	2	2	-
CO4	1	-	2	-	2	3	2	-	-	2	2	2	2	2	-
CO5	2	-	2	1	3	2	2	-	-	2	2	2	2	3	-

UNIT-I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT-II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT- III

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.(Description only)

Regulators: Head and cross regulators, design principles (Description only)

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage. (Description only)

Outlets: Types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

UNIT-IV

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-V

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates.

Text Books:

1.**Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009),** 'Irrigation and Waterpower Engineering',Laxmi Publications Pvt. Ltd., New Delhi

2.AsawaG L (2013), 'Irrigation and Water Resources Engineering', New Age International Publishers

3.Raghunath H.M (2012), 'Irrigation Engineering' Wiley India.

4.Modi P N (2011), 'Irrigation Water Resources and Waterpower Engineering', Standard Book House, New Delhi

Reference Books:

1. **Mays L.W (2013**),'Water Resources Engineering' Wiley India Pvt. Ltd, New Delhi.
2. **Sharma R.K. and Sharma, T. K (2012) ,S. Chand,** 'Irrigation Engineering'
3. **Satyanarayana Murthy Challa (2008),** 'Water Resources Engineering' New Age International Publishers.

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L	T	P	C
3	0	0	3

III YEAR –II Semester

DISASTER MANAGEMENT

Course Learning Objectives:

The objective of this course is to:

1. Develop an understanding of why and how the modern disaster manager is involved with pre- disaster and post-disaster activities.
2. Develop an awareness of the chronological phases of natural disaster response and refugee relief operations. Understand how the phases of each are parallel and how they differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Affirm the usefulness of integrating management principles in disaster mitigation work	**L2**
CO2	Distinguish between the different approaches needed to manage pre- during and post-disaster periods	**L2**
CO3	Explain the process of risk management	**L2**
CO4	Relate to risk transfer	**L3**
CO5	Explain the process of multi-sectional issues, education and community preparedness	**L2**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	3	3	2	-	2	-	2	2	-	-
CO2	2	3	2	-	-	3	3	2	-	2	-	2	2	-	-
CO3	3	3	3	2	-	3	2	2	-	2	-	3	3	-	-
CO4	2	3	2	-	-	2	2	2	-	-	-	3	2	-	-
CO5	2	2	2	-	-	3	3	3	3	3	2	3	3	2	-

UNIT-I

Natural Hazards and Disaster Management: Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.

UNIT-II

Man Made Disaster and Their Management Along With Case Study Methods Of The Following: Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.

UNIT-III

Risk and Vulnerability: Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses.

UNIT-IV

Role of Technology in Disaster Managements: Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS.

UNIT-V

Multi-sectional Issues, Education and Community Preparedness: Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction- Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. **S.Vaidyanathan** , An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards – CBS Publishers & Distributors Pvt.Ltd.
2. **RB Singh** ,Natural Hazards & Disaster Management, Vulnerability and Mitigation - Rawat Publications
3. **Tushar Bhattacharya**, 'Disaster Science & Management', Tata McGraw Hill Education Pvt. Ltd., NewDelhi.
4. **Jagbir Singh**, 'Disaster Management – Future Challenges and Opportunities', I K International Publishing House Pvt.Ltd.

REFERENCE BOOKS:

1. **H K Gupta**, 'Disaster Management' edited, Universities press.
2. **Rajib shah & R R Krishnamurthy**, 'Disaster Management – Global Challenges and Local Solutions', Universities press.

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III Year I Semester

L	T	P	C
3	0	0	3

SUSTAINABILITY IN ENGINEERING PRACTICES

Course Learning Objectives:

The objective of this course is:

1. Understand the Principles of Sustainable Development
2. Identify and Analyze Local and Global Environmental Issues
3. Learn and Apply Tools for Environmental Assessment and Management
4. Understand Sustainable Built Environments and Urban Systems
5. Explore Renewable Energy Resources and Green Technologies

Course Outcomes*:*

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

CO	CO STATEMENT	TAXONAMY
CO1	Explain sustainable development and different environmental agreements and protocols	**L2**
CO2	Discuss real time activities causing environmental issues and different methods to use renewable energy resources	**L2**
CO3	Explain local and global environmental issues	**L2**
CO4	Differentiate between carbon emissions for regular and sustainable cities and explain different practices to move industries towards sustainability	**L2**
CO5	Discuss different renewable energy resources and explain methods to implement green technology	**L2**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	2	3	3	-	1	-	1	-	-	-
CO2	3	3	2	-	-	2	3	2	-	-	-	2	-	-	-
CO3	3	2	2	3	3	-	3	-	-	-	-	2	-	-	-
CO4	3	2	3	2	2	3	3	-	2	2	2	2	-	-	-
CO5	3	2	2	-	2	-	3	2	-	-	2	2	-	-	-

UNIT-I

Introduction to Sustainable Engineering- Sustainable development, concepts of sustainable development: three pillar model, egg of sustainability model, Atkisson's pyramid model, prism model, principles of sustainable development, sustainable engineering, threats for sustainability.

Environmental Ethics and Legislations – Environmental ethics and education, multilateral environmental agreements and protocols, enforcement of environmental laws in India – The Water Act, The Air Act, The Environment Act.

UNIT-II

Local Environmental Issues- Solid waste, impact of solid waste on natural resources, zero waste concept and three R concept, waste to energy technology :thermo-chemical conversion, biochemical conversion.

Global Environmental Issues- Resource degradation: deterioration of water resources, land degradation, air pollution, climate change and global warming, ozone layer depletion, carbon footprint, carbon trading.

UNIT-III

Tools for Sustainability - Environmental management System (EMS), concept of ISO14000, life cycle assessment (LCA): basic components, advantages, disadvantages, case study. Environmental impact assessment (EIA), environmental auditing, bio mimicking, case studies.

UNIT-IV

Sustainable Habitat - Concept of green building, green building materials, green building certification and rating : green rating for integrated habitat assessment(GRIHA), leadership in energy and environmental design (LEED) rating, energy efficient buildings, sustainable cities, sustainable transport, sustainable pavements, case studies in sustainability engineering: Green building, sustainable city, sustainable transport system.

Sustainable Industrialization and Urbanization – Sustainable urbanization, industrialization, material selection, pollution prevention, industrial ecology, industrial symbiosis, poverty reduction.

UNIT-V

Renewable energy resources- Conventional and non- conventional forms of energy, solar energy, fuel cells, wind energy, small hydro plants, bio-gas systems, biofuels, energy from ocean, geo-thermal energy, conservation of energy**.**

Green technology and Green Business: Sustainable business, green technology, green energy, green construction, green transportation, green chemistry, green computing

TEXTBOOKS:

1. **Dr. K.R. Arora,**'Soil Mechanics and Foundation Engineering, Standard Publishers and Distributors, New Delhi.
2. **Gopal Ranjan and A.S.R.Rao**,' Basic and Applied Soil Mechanics', New Age International Publishers.
3. **V.N.S.Murthy,** 'Soil Mechanics and Foundation Engineering', CBS publishers
4. **C. Venkataramaiah**, 'Geotechnical Engineering', New Age International Publishers

REFERENCES:

1. **D.W.Taylor**., Wiley, 'Fundamentals of Soil Mechanics'
2. **Holtz and Kovacs**,' An introduction to Geotechnical Engineering',Prentice Hall
3. **B raja M.Das**, 'Principles of Geotechnical Engineering', Cengage Learing.

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III Year I Semester

L	T	P	C
3	0	0	3

WATER SUPPLY SYSTEMS

Course Learning Objectives:

The objective of this course is:

1. Understand the Role of Water in Human and Environmental Systems
2. Identify and Classify Different Sources of Water
3. Interpret the Concepts of Dual Water Supply and Related Health Implications
4. Analyze Water Distribution Methods
5. Evaluate Water Requirements and Wastewater Characteristics in Industry

Course Outcomes*:*

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

CO	CO STATEMENT	TAXONAMY
CO1	Outline of the various facets of water usage in daily life	**L1**
CO2	Explain the origin of Natural waters and also to synthesize it for regular use	**L2**
CO3	Discuss the utilization of non-potable water	**L2**
CO4	Describe water supply system from a reservoir	**L2**
CO5	Explain the characteristics of wastewater	**L2**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	2	3	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-		3	-	-	-	-	2	-	2	-
CO3	2	-	-	-	-	2	3	-	-	-	-	2	-	2	-
CO4	2	2	3	-	2	-	-	-	1	1	-	-	-	2	-
CO5	3	-	-	2	2	-	3	-	-	-	-	2	-	2	-

UNIT-I

Water and life: Necessity of water – Domestic demand – Public demand – Irrigation – Transportation – Sanitation – Dilution of waste waters – Dust palliative – Recreation – Fire protection.

UNIT-II

Sources of water: Surface sources – Ground sources – Water from atmosphere – Desalination – Recycling of waste water – Recharging of aquifers.

UNIT-III

Dual supply of water: Potable and non-potable water – Protected water – Grey water – Black water – Water borne diseases – water related diseases – Sewage Irrigation.

UNIT-IV

Distribution of water: Based on topography – Gravity distribution – Direct pumping – Combined pumping and gravity flow. Service Reservoirs – Continuous supply – Intermittent supply – Networks of distribution– Emergency water supply as in case of fire accidents – Valves, hydrants and meters.

UNIT-V

Industrial water: Location of Industry with reference to surface sources of water – Quality of water required for industrial operations – characteristics of waste water produced – Standards for letting industrial effluents into sources of water.

TEXT BOOKS:

1. **K.N. Duggal**, 'Elements of Environmental Engineering', 7th Edition, S. Chand Publishers, 2010.
2. **Hammer and Hammer**, 'Water and wastewater Technology', 4th Edition, Prentice hall of India, 2003.
3. **Howard S. Peavy, Donand P. Rowe and George Technobanoglous,** 'Environmental Engineering', 1st Edition Mc Graw –Hill Publications, Civil Engineering Series, 1985.

REFERENCES:

1. **B.C.Punmia,** 'Water Supply Engineering', Vol. 1, 'Waste water Engineering Vol. II', 2nd Edition, Ashok Jain &Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi, 2008.
2. **Fair, Geyer and Okun,** 'Water and Waste Water Engineering', 3rd Edition, Wiley, 2010.
3. **Metcalf and Eddy,** 'Waste Water Engineering', 3rd Edition, Tata Mc Graw Hill, 2008.

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III Year-II Semester

L	T	P	C
0	0	3	1.5

ENVIRONMENTAL ENGINEERING LAB

Course Learning Objectives:

The objective of this course is to:

1. Estimation of some important characteristics of water and wastewater in the laboratory
2. It also gives the significance of the characteristics of the water and wastewater

Course Outcomes:

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

CO	CO STATEMENT	TAXONAMY
CO1	Estimate some important characteristics of water and wastewater in the laboratory	**L3**
CO2	Draw some conclusion and decide whether the water is suitable for construction or not,drinking or not; ultimate disposal as per effluent standards or not.	**L4**
CO3	Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments	**L4**
CO4	Estimate and study the strength of the raw and treated effluents in terms of BOD, COD, pH,TDS	**L3**
CO5	Chloride of the neutralization tank treating effluents from Chemistry lab or Environmental Engineering Laboratory	**L3**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	3	2	-	-	-	-	2	3	-	-
CO2	3	3	3	-	-	3	3	-	-	-	-	3	3	-	-
CO3	3	3	2	-	-	3	2	-	-	-	-	2	3	-	-
CO4	3	3	3	-	-	3	3	-	-	-	-	3	3	-	-
CO5	3	3	2	-	-	3	2	-	-	-	-	2	3	-	-

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of Total Solids, Organic Solids and Inorganic Solids and Settleable Solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter &Wrinklers Method and B.O.D.

8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.
14. Visit a Water Treatment Plant and give a technical report.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipments

1) pH meter
2) Turbidity meter
3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter
7) U–V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus

TEXTBOOKS:

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. **KVSG Murali Krishna** ,Chemical Analysis of Water and Soil by Reem Publications, New Delhi

REFERENCE:

1. Relevant IS Codes.
2. **Sawyer and Mc**. Carty ,Chemistry for Environmental Engineering. BV

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III Year II Semester

L	T	P	C
0	0	3	1.5

HIGHWAY ENGINEERING LAB

Course Learning Objectives:

The objectives of this course are:

1. To test crushing value, impact resistance, specific gravity and water absorption, attrition value, abrasion value, flakiness index and elongation index for the given road aggregates.
2. To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
3. To test the stability for the given bituminous mix
4. To carry out surveys for traffic volume, speed and parking.

Course outcomes:

At the end of the course, the student will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Test aggregates and judge the suitability of materials for the road construction	**L5**
CO2	Test the given bitumen samples and judge their suitability for the road construction	**L5**
CO3	Obtain the optimum bitumen content for Bituminous Concrete	**L4**
CO4	Determine the traffic volume, speed and parking characteristics	**L3**
CO5	Draw highway cross sections and intersections	**L6**

CO-PO Mapping:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	3	2	-	-	-	-	2	3	-	-
CO2	3	3	2	-	-	3	2	-	-	-	-	2	3	-	-
CO3	3	3	3	-	-	3	3	-	-	-	-	3	3	-	-
CO4	3	3	2	-	2	3	2	-	-	-	-	2	3	-	-
CO5	3	3	3	-	3	3	3	-	-	-	-	3	3	-	-

List of Experiments:

I. ROAD AGGREGATES:

1. Aggregate Crushing value Test
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption Test
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

V. DESIGN & DRAWING

1. Earthwork calculations for road works
2. Drawing of road cross sections
3. Rotary intersection design

LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Elongation and thickness gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus

10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

TEXTBOOKS:

1. S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers 'Highway Material Testing Manual' New Chand Publications, New Delhi.

REFERENCE BOOKS:

1. IRC Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

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III Year II Semester

L	T	P	C
0	1	2	2

CAD LAB

Course Objectives: The objectives of the course are to

1. **Learn** the usage of any fundamental software for design
2. **Create** geometries using pre-processor
3. **Analyze** and Interpret the results using post processor
4. **Design** the structural elements

Course Outcomes:

CO	CO STATEMENT	TAXONAMY
CO1	Model and represent the geometry of structural elements and systems using design software tools.	L3
CO2	Perform structural analysis on different types of structural systems using analysis software.	L3
CO3	Interpret and validate analysis results using post-processing tools for design decisions.	L4
CO4	Design structural elements and systems as per IS Codes using software and spreadsheets	L5

CO-PO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PSO1	PSO2	PSO3
CO1	3	2	3	-	3	-	-	-	-	-	2	3	3	-
CO2	3	3	3	2	3	-	-	-	-	-	2	3	3	-
CO3	2	3	3	2	3	1	-	-	-	-	2	3	3	-
CO4	3	3	3	2	3	2	-	-	-	-	3	3	3	-

LIST OF EXPERIMENTS

1. Analysis & Design determinate structures using a software
2. Analysis &Design of fixed &continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL, LL,WL,EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam

8. Developing a design program for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

Note: Drafting of all the exercises is to be carried out using commercially available designing software's.

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III Year II Semester

L	T	P	C
2	0	0	0

TECHNICAL PAPER WRITING & IPR

Course Learning Objectives:

The objective of this course is:

1. Understand the essentials of technical writing, including sentence structure, transitions, and tense usage in reports

2. Develop skills to plan, format, and structure technical documents for specific audiences

3. Learn drafting and design techniques using graphics and illustrations to enhance clarity

4. Gain practical skills in editing, proofreading, summarizing, and presenting technical content.

5. Gain skills in advanced MS Word tools like table of contents, macros, comments, footnotes, and version tracking

6. Understand types, processes, and global aspects of IPRs, including patents, copyrights, and trademarks.

Course Outcomes:

At the end of this course the student will be able to:

CO	CO STATEMENT	TAXONAMY
CO1	Apply principles of technical writing to construct clear, concise, and purposeful sentences.	**L3**
CO2	Plan, format, and structure technical reports for different readers and contexts.	**L4**
CO3	Create and refine technical content using proper illustrations and editing practices.	**L6**
CO4	Summarize technical content effectively and demonstrate presentation skills.	**L3**
	Utilize word processing tools for document design, citation, revision tracking, and security.	**L3**
CO5	Explain and apply the basics of Intellectual Property Rights and their relevance globally.	**L2**

CO-PO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO2	3	2	-	-	1	-	-	-	-	3	2	-	2	-	-
CO3	2	-	2	-	2	3	2	-	-	2	2	2	2	2	-
CO4	1	-	2	-	2	3	2	-	-	2	2	2	2	2	-
CO5	2	-	2	1	3	2	2	-	-	2	2	2	2	3	-

Unit I:

Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.

Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

Unit II:

Drafting report and design issues: The use of drafts, Illustrations and graphics.

Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

Unit III:

Proofreading and summaries: Proofreading, summaries, Activities on summaries. **Presenting final reports:** Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Unit IV:

Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

Unit V:

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
3. Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
5. Day R, how to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:

1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/