BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

123 Pages

DEPARTMENT OF CIVIL ENGINEERING

Course Structure – BR23 Regulations

For UG – B.Tech: Civil Engineering

III Year Course Structure

I Semester							
S.No	**Category**	**Course Code**	**Title**	**L**	**T**	**P**	**Credits**
1	PCC	23CE5T07	Design and Drawing of Reinforced Concrete Structures	3	0	0	3
2	PCC	23CE5T08	Engineering Hydrology	3	0	0	3
3	PCC	23CE5T09	Geotechnical Engineering -I	3	0	0	3
4	PEC-I		Professional Elective Course -I	3	0	0	3
5	OEC-I		Open Elective Course -I	3	0	0	3
6	PCC	23CE5L06	Geotechnical Engineering Lab	0	0	3	1.5
7	PCC	23CE5L07	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
8	SEC	23CE5S03	Estimation, Specifications & Contracts	0	1	2	2
9	ESC	23ES5L07	Tinkering Lab	0	0	2	1
10	PROJ	23BS5P01	Evaluation of Community Service Project	-	-	-	2
			Total	**15**	**1**	**10**	**23**

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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For UG – B.Tech: Civil Engineering

III Year Course Structure

II Semester							
S.No	**Category**	**Course Code**	**Title**	**L**	**T**	**P**	**Credits**
1	PCC	23CE6T10	Design and Drawing of Steel Structures	3	0	0	3
2	PCC	23CE6T11	Highway Engineering	3	0	0	3
3	PCC	23CE6T12	Environmental Engineering	3	0	0	3
4	PEC-II		Professional Elective Course -II	3	0	0	3
5	PEC-III		Professional Elective Course -III	3	0	0	3
6	OEC-II		Open Elective Course -II	3	0	0	3
7	PCC	23CE6L08	Environmental Engineering lab	0	0	3	1.5
8	PCC	23CE6L09	High Way Engineering lab	0	0	3	1.5
9	SEC	23CE6S04	CAD Lab	0	1	2	2
			Total	**18**	**1**	**08**	**23**
10	AC	23AC6T03	Technical paper writing & IPR	2	0	0	-

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III Year Course Structure

LIST OF PROFESSIONAL ELECTIVE COURSES

Professional Elective Course (PEC)-I		
S. No.	**Code**	**Course Title**
1	23CE5D01	Advanced structural analysis
2	23CE5D02	Architecture and town planning
3	23CE5D03	Construction Technology and Management
Professional Elective Course (PEC) -II		
S. No.	**Code**	**Course Title**
1	23CE6D04	Ground Improvement Techniques
2	23CE6D05	Repair and Rehabilitation of Structures
3	23CE6D06	Valuation and Quantity Survey
Professional Elective Course (PEC) –III		
S. No.	**Code**	**Course Title**
1	23CE6D07	Finite element method
2	23CE6D08	Bridge Engineering
3	23CE6D09	Water Resource Engineering

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For UG – B.Tech: Civil Engineering

III Year Course Structure

LIST OF OPEN ELECTIVE COURSES OFFERED BY CIVIL

Open Elective Course-I - Civil Engineering Department		
S. No.	**Code**	**Course Title**
1.	23CE5E01	Green Buildings
2.	23CE5E02	Construction technology and management
3.	23CE5E03	Climate Change impact on Eco system

Open Elective Course-II - Civil Engineering Department		
S. No.	**Code**	**Course Title**
1.	23CE6E04	Disaster management
2.	23CE6E05	Sustainability in Engineering practices
3.	23CE6E06	Water Supply Systems

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Course Structure – BR23 Regulations
For UG – B.Tech: Civil Engineering
III Year Course Structure

LIST OF OPEN ELECTIVE COURSES OFFRED BY OTHER DEPARTMENTS

Open Elective Course -I			
S. No.	**Code**	**Course title**	**Offered By**
1	23EE5E01	Renewable Energy Sources	EEE
2	23EE5E02	Concepts of Energy Auditing & Mangement	EEE
3	23ME5E01	Sustainable Energy Technologies	ME
4	23ME5E02	Applied Operations Research	ME
5	23ME5E03	Nano Technology	ME
6	23ME5E04	Thermal Management of Electronic Systems	ME
7	23HM5E01	Entrepreneurship & Venture Creation	ME
8	23EC5E01	Electronic Devices and Circuits	ECE
9	23EC5E02	Signals and Systems	ECE
10	23EC5E03	Probability Theory and Random Variables	ECE
11	23EC5E04	Network Analysis	ECE
12	23CS5E01	Principles of Operating Systems	CSE,CAD,AIM,CSM,IT
13	23CS5E02	Computer Organization and Architecture	CSE,AIM,CSM,IT
14	23AD5E01	OOPS Through JAVA	CAD
15		MOOCs_OE-I	

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Open Elective Course -II			
S. No.	**Code**	**Course title**	**Offered By**
1	23EE6E03	Fundamentals of Electric Vehicles	EEE
2	23EE6E04	Electrical Wiring Estimation and Costing	EEE
3	23ME6E06	Introduction to Industrial Robotics	ME
4	23ME6E07	Industrial Management	ME
5	23ME6E08	Additive Manufacturing	ME
6	23ME6E09	Vehicle Technology	ME
7	23ME6E10	Industrial Safety	ME
8	23EC6E05	Linear and Digital IC Applications	ECE
9	23EC6E06	Principles of Communications	ECE
10	23EC6E07	Principles of Signal Processing	ECE
11	23EC6E08	Microprocessors & Microcontrollers	ECE
12	23CS6E03	Principles of Database Management Systems	CSE,CAD,AIM,CSM,IT
13	23AM6E01	Artificial Neural Netwoeks and Fuzzy Logic	AIM
14		MOOCs_OE-II	

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Regulation	BR23				
III Year I Semester	Course Code: 23CE5T07	L	T	P	C
		3	0	0	3
Course Title:	DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES				

Course Learning Objectives:

The objective of this course is:

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:

1. The student will understand the fundamentals of working stress and limit state design methods, load standards, and the design of reinforced concrete beams.
2. The student will learn how to analyze and design singly and doubly reinforced beams and flanged sections for bending using limit state theory.
3. The student will be able to design concrete members for shear, torsion, and bond, and ensure serviceability with respect to deflection and cracking.
4. The student will gain the ability to design short and long columns under various loading conditions and also design different types of isolated footings.
5. The student will understand the classification and design of one-way, two-way, and continuous slabs, including waist-slab staircases using standard design procedures.

SYLLABUS:

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

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	Cerd online	online			

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.

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

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30 + 10 + 5
15 + 10

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.

mid exam pattern: 30 marks for descriptive only

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 in design out of which three are to be answered. Weightage for Part – A is 40% and Part- B is 60%.

TEXTBOOKS:

1. Punmia, B. C., Ashok Kr Jain, Ashok Kumar Jain, Arun Kumar Jain, and Arun Kr Jain. Limit state design of reinforced concrete. Firewall Media, 2007.
2. 'Reinforced Concrete Structures' by S. Unnikrishnan Pillai &Devdas Menon, Tata Mc.Graw Hill, New Delhi, 2022.

REFERENCES:

1. Krishna, Raju N. Reinforced Concrete Design: Principles And Practice. New Age International, 2007.
2. Park, Robert, and Thomas Paulay. Reinforced concrete structures. John Wiley & Sons, 1991.

IS Codes:

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

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5T08	L	T	P	C
		3	0	0	3
Course Title:	ENGINEERING HYDROLOGY				

Course Learning Objectives:

The course is designed to make the students,

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:

1. The student will understand the hydrologic cycle, types and measurement of precipitation, and the use of rainfall data for hydrological design.
2. The student will learn about various water loss processes like evaporation, evapotranspiration, and infiltration, along with methods to estimate and reduce them.
3. The student will be able to analyze runoff and hydrographs, understand stream gauging techniques, and apply unit hydrograph methods for flood prediction.
4. The student will understand the causes and effects of floods, apply frequency analysis, and learn flood routing techniques for reservoirs and channels.
5. The student will learn about groundwater movement, aquifer properties, well hydraulics, and estimation of yield using Darcy's law and Dupuit's assumptions.

SYLLABUS:

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,

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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.

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TEXTBOOKS:

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. 'Applied hydrology' by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. 'Engineering Hydrology' by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).

REFERENCES:

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

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5T09	L	T	P	C
		3	0	0	3
Course Title:	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 successful completion of this course, student will be able to

1: Understand soil formation, its index properties and classification.

2: Understand soil moisture and flow of water through soils and its effects.

3: Understand stress distribution in soils.

4: Understand Compressibility characteristics under partially saturated and fully saturated conditions.

5: Understand shear strength of soil at different loading & drainage conditions for different soils.

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DEPARTMENT OF CIVIL ENGINEERING

SYLLABUS:

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– Newmark'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 - Over consolidated and normally consolidated clays – Determination of coefficient of consolidation (c_v) , Pre-consolidation Pressure.

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UNIT - V

Shear Strength of Soils: Basic mechanism of shear strength – Mohr-Coulomb Failure theories – total and effective shear strength parameters — Determination of 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. 'Soil Mechanics and Foundation Engineering by K.R. Arora, Standard Publishers and Distributors, New Delhi, 2020.
2. Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers, 2011.
3. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy, CBS publishers, 1989.
4. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers, 1995.

REFERENCES:

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley, 1948.
2. An introduction to geotechnical engineering. Holtz, Robert D., William D. Kovacs, and Thomas C. Sheahan. Vol. 733. Englewood Cliffs, NJ: Prentice-hall, 1981.
3. Das, B. M. "Principles of geotechnical engineering/Braja M." Das, Cengage Learning, Stamford, CT 2011.

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23	L	T	P	C
III Year I Semester	Course Code: 23CE5D01	3	0	0	3
Course Title:	ADVANCED STRUCTURAL ANALYSIS				

Course objectives

1. To help students understand and apply energy methods like Castigliano's theorems to find deflections in beams and analyze indeterminate trusses.
2. To introduce the analysis of three-hinged and two-hinged arches using elastic theory and teach how to calculate internal forces and temperature effects.
3. To provide knowledge of approximate methods for analyzing building frames under gravity and lateral loads using portal, cantilever, and substitute frame methods.
4. To explain the behavior and analysis of cable structures and suspension bridges under different loading conditions, including temperature and stiffening effects.
5. To teach various methods like Moment Distribution, Slope Deflection, and Kani's Method for analyzing indeterminate beams and frames, including sway and support settlement.

Course Outcomes:

1. The student will understand strain energy concepts and apply Castigliano's theorems to calculate deflections in beams and indeterminate trusses.
2. The student will learn to analyze three-hinged and two-hinged arches, compute support reactions, internal forces, and account for temperature effects.
3. The student will apply approximate analysis methods like portal, cantilever, and substitute frame methods to analyze multi-storey building frames under loads.
4. The student will be able to analyze cable structures and suspension bridges under various loading conditions and understand their behavior.
5. The student will learn to analyze indeterminate structures using Moment Distribution, Slope Deflection, and Kani's methods including sway and support settlements.

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Syllabus:

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 Moment Distribution Method: Analysis of Portal frames – including Sway-Substitute frame analysis by two cycle. Sloped eflection method: Analysis of Portal frames – including Sway. Analysis of inclined frames. Shear force and bending moment diagrams - Elastic curve.

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.

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UNIT-V Introduction to matrix methods:

Flexibility methods: Introduction, application to continuous beams (maximum of two unknowns) including support settlements

Stiffness method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements

Text Books:

1 Structural Analysis by R.C. Hibbeler, Pearson, New Delhi. 2006.
2 "Analysis of Structures (Vol. I and II)." Vazirani, V. N., M. M. Ratwani, and Dr SK Duggal. Khanna Publishers, New Delhi. (1991).

References:

1. Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd. 2015.
2. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd. 2010.
3. Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt Ltd. 2008.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5D02	L	T	P	C
		3	0	0	3
Course Title:	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:

1. The student will understand the evolution of architecture through various historical periods including Egyptian, Greek, Roman, Buddhist, Hindu, and Islamic styles.
2. The student will learn the basic principles of residential planning and gain knowledge of post-classic architectural contributions by renowned architects.
3. The student will explore the historical development of town planning in India and ancient cities around the world.
4. The student will understand modern town planning concepts such as zoning, housing, traffic, public utilities, and the importance of planning standards and laws.
5. The student will learn about landscaping and different types of town expansions like garden cities, satellite towns, floating towns, and skyscrapers.

Syllabus:

UNIT–I

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

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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. 'The great ages of World Architecture 'by G.K.Hiraskar. Dhanpat Rai; 1991.
2. 'Planning & Designing Of Residential Buildings by Y. N. Raja Rao (Author), Y. Subrahmanyam (Author), Standard Publishers Distributors (7 December 2020).

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3. 'Indian Architecture–Vol.I&II'byPercy Brown, Taraporevala Publications, Bombay.1942
4. 'Fundamentals of Town Planning' by G.K.Haraskar. Dhanpat Rai Publication, 2018.

REFERENCES:

1. 'Drafting and Design for Architecture'by Dana J. Hepler/Paul Ross Wallach/Donald Hepler, ISBN: 9781285242637, 2013
2. 'Architect's Portable Hand book' by John Patten Guthrie–McGraw Hill International Publications. 2012.
3. 'Modern Ideal Homes for India'by R.S.Deshpande. digitallibrary India; JaiGyan, 1939.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard. Published by Melbourne University Press Melbourne 1959,

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5D03	L	T	P	C
		3	0	0	3
Course Title:	CONSTRUCTION TECHNOLOGY AND 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:

1. Appreciate the importance of construction planning
2. Understand the functioning of various earth moving equipment
3. Know the methods of production of aggregate products and concreting
4. Understand the Concreting equipment operations and types and mixing and placing of concrete
5. Apply the gained knowledge to project management and construction techniques

Syllabus:

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–

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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. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder, Shapira, Tata McGraw hill. 2010.
2. 'Construction Project Management Theory and Practice' by Kumar NeerajJha Pearson Education India; 2nd edition (1 January 2015); Pearson India.
3. 'Construction Technology' by S K.Sarkar and S Sarasvati, Oxford University press, 2008.

REFERENCES:

1. 'Construction Project Management-An Integrated Approach'by Peter Fewings,Taylor and Francis, 2019.
2. 'Construction Management Emerging Trends and Technologies' by TreforWilliams , Cengage learning, 2009.

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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.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5E01	L	T	P	C
		3	0	0	3
Course Title:	GREEN BUILDINGS				

Objectives:

1. To understand what green buildings are and why they are important.
2. To learn about green building rules and rating systems used in India.
3. To study how to design buildings that save energy and use natural energy sources.
4. To know about energy-saving air conditioning and lighting systems.
5. To learn how to use eco-friendly materials and keep indoor air clean and healthy.

Outcomes:

1. Students will explain what green buildings are and how they help the environment.
2. Students will name and describe Indian green building rating systems like IGBC and LEED.
3. Students will describe how to design buildings that use less energy and more renewable energy.
4. Students will understand energy-saving systems like HVAC and lighting in green buildings.
5. Students will suggest ways to reduce waste, use eco-friendly materials, and improve air quality inside buildings.

Syllabus:

UNIT – I:

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,

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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UNIT – II:

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-III:

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. Eco friendly captive power generation for factory, Building requirement,

UNIT- IV

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.

UNIT –V

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.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5E02	L	T	P	C
		3	0	0	3
Course Title:	CONSTRUCTION TECHNOLOGY AND 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:

1. Appreciate the importance of construction planning
2. Understand the functioning of various earth moving equipment
3. Know the methods of production of aggregate products and concreting
4. Understand the Concreting equipment operations and types and mixing and placing of concrete
5. Apply the gained knowledge to project management and construction techniques

SYLLABUS:

UNIT-I Introduction to Project Management

Overview of Construction Project Management– qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

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UNIT-II Project Scheduling and Cost Basics

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 – Overview

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-bull dozers–graders–scrapers.

UNIT-IV Concreting Equipment – Basics

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

UNIT-V Construction Methods and Safety

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

TEXTBOOKS:

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder, Shapira, Tata McGraw hill. 2010.
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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5E03	L	T	P	C
		3	0	0	3
Course Title:	CLIMATE CHANGE IMPACT ON ECO SYSTEM				

Objectives:

1. To understand the basic concepts of climate, weather, and how temperature varies in the atmosphere and soil.
2. To learn about the water cycle and how water moves through the Earth's system.
3. To study how climate factors like precipitation, humidity, and winds affect weather and water flow.
4. To understand the types and effects of climate variability like floods, droughts, and heat waves.
5. To learn about climate change, its causes, and how scientists model future climate using global and regional models.

Outcomes:

1. Students will explain the structure of the atmosphere and how temperature changes over time and space.
2. Students will describe the water cycle and use simple models to understand water balance on land.
3. Students will identify different climate factors that affect precipitation and water movement.
4. Students will describe major climate events like floods and droughts, and explain their effects.
5. Students will understand the basics of climate change and how it is predicted using computer models.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Syllabus:

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, Stream flow

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

Text Books:

1. Anil Markandya , Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002
   Heal, G. M., Interpreting Sustainability, in Sustainability: Dynamics and Uncertainty, Kluwer Academic Publ., 1998

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2. Jepma, C.J., and Munasinghe, M., Climate Change Policy – Facts, Issues and Analysis, Cambridge University Press, 1998

References:

1. Munasinghe, M., Sustainable Energy Development: Issues and Policy in Energy, Environment and Economy: Asian Perspective, Kleindorfor P. R. et al (ed.), Edward Elgar, 1996
2. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5L06	L	T	P	C
		0	0	3	1.5
Course Title:	GEOTECHINICAL 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 behavior from relevant lab tests; to determine permeability of soils.
6. To teach how to determines hear parameters of soil through different laboratory tests.

Outcomes:

1. Upon successful completion of this course, student will be able to
2. Determine index properties of soil and classify them.
3. Determine permeability of soils.
4. Determine Compaction, Consolidation and shear strength characteristics.

SYLLABUS:

LISTOFEXPERIMENTS

1. Specific gravity, G, Differential frees well (DFS), Grain size analysis by Wet/Dry sieving and hydrometer analysis
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Permeability of soil-Constant and Variable head tests

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5. Compaction test
6. Consolidation test (to be demonstrated)
7. Direct Shear test
8. Triaxial Compression test
9. Unconfined Compression test
10. Vane Shear test
11. Field Plate Load Test demo
12. Field CBR demo

At least **TEN** experiments shall be conducted.

LIST OF EQUIPMENT:

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

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13. Box shear test apparatus
14. Laboratory vanesh ear apparatus.
15. Hot air ovens (rangeoftemperature50^0-150^0C)
16. Field plate load Test equipment
17. Field CBR test equipment

References:

1. Engineering Properties of Soils and their Measurement · by Joseph Bowles | 31 March 1992 | 4th Edition.
2. IS Code2720 –relevant parts.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23CE5L07	L	T	P	C
		0	0	3	1.5
Course Title:	FLUID MECHANICS & HYDRAULIC MACHINES LAB				

Course Objective:

To experimentally study and validate fundamental principles of fluid mechanics and evaluate flow behavior through various hydraulic devices and pipelines.

Course Outcomes (COs): Students will be able

1. To verify Bernoulli's theorem and understand energy conservation in fluid flow.
2. To calibrate flow measuring devices like Venturimeter, orificemeter, and notches.
3. Determine flow coefficients for orifices and mouthpieces under different flow conditions.
4. Evaluate various types of head losses in pipelines due to friction, sudden expansions/contractions.

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 dead loss due to a sudden expansion/ contraction in a pipeline.
10. Determination of head loss coefficient due to a bend in pipeline.

References

1. **R.K. Bansal** "A Textbook of Fluid Mechanics and Hydraulic Machines" Laxmi Publications, Latest Edition.
2. **P.N. Modi and S.M. Seth** "Hydraulics and Fluid Mechanics Including Hydraulic Machines" Standard Book House, New Delhi, Latest Edition.

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Regulation	BR23				
III Year I Semester	Course Code: 23CE5S03	L	T	P	C
		0	1	2	2
Course Title:	ESTIMATION, SPECIFICATION & 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:

1. The student will understand different types of contracts, contract documents, and standard specifications, including the basics of e-procurement and reverse auctions.
2. The student will learn the types of building works and how to calculate quantities using detailed, abstract, and approximate estimation methods.
3. The student will be able to perform rate analysis for various items of work and prepare bar bending schedules and earthwork calculations.
4. The student will gain skills to prepare detailed estimates of buildings using the individual wall method.
5. The student will learn to estimate buildings using the center line method and get introduced to software tools like building estimators.

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.

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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. 'Estimating and Costing' by B.N.Dutta,UBS publishers, 2000.
2. 'Civil Engineering Contracts and Estimates' by B.S.Patil, Universities Press (India) Pvt. Ltd., Hyd. 2015.
3. 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi. 2014.
4. 'Estimating and Costing'by G.S. Birdie. Dhanpat Rai Publishing Company Private Limited-New Delhi; Sixth edition (1 January 2014)

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. 'Estimation, Costing and Specifications' by M.Chakraborthi; Laxmi publications.
4. National Building Code

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU

DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year I Semester	Course Code: 23ES5L07	L	T	P	C
		0	0	2	1
Course Title:	TINKERING LAB				

Objective: 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

1. **Encourage Innovation and Creativity**
2. **Provide Hands-on Learning**
3. **Impart Skill Development**
4. **Foster Collaboration and Teamwork**
5. **Enable Interdisciplinary Learning**
6. **Impart Problem-Solving mind-set**
7. **Prepare for Industry and Entrepreneurship**

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.

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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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Regulation	BR23				
III Year I Semester	Course Code: 23BS5P01	L	T	P	C
		-	-	-	2
Course Title:	EVALUATION OF COMMUNITY SERVICE INTERNSHIP				

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
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III YEAR, II SEMESTER

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Regulation	BR23				
III Year II Semester	Course Code: 23CE6T10	L	T	P	C
		3	0	0	3
Course Title:	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:

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

1. Analyze and design steel structural members with relevant IS codes
2. Carryout analysis and design of flexural members and detailing
3. Design compression members of different types with connection detailing
4. Design Plate Girder and Gantry Girder with connection detailing
5. Produce the drawings pertaining to different components of steel structures

SYLLABUS:

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.

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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.

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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. 'Steel Structures Design and Practice' by N.Subramanian, Oxford University Press. 2010.
2. 'Design of Steel Structures' by Ramachandra, Vol – 1, Universities Press. STANDARD BOOK HOUSE SINCE 1960; 18TH edition (1 January 2016)
3. 'Design of steel structures' by S.K. Duggal, Tata Mcgraw Hill, and New Delhi. 2017.

REFERENCES

1. 'Structural Design in Steel' by SarwarAlamRaz, New Age International Publishers, New Delhi, 2012
2. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers, 2012.
3. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill, 2009.
4. 'Structural Design and Drawing' by N. Krishna Raju; University Press, 2009.

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Regulation	BR23				
III Year II Semester	Course Code: 23CE6T11	L	T	P	C
		3	0	0	3
Course Title:	HIGHWAY ENGINEERING				

Course Learning Objectives:

1. The objectives of this course are:
2. To impart different concepts in the field of Highway Engineering.
3. To acquire design principles of Highway Geometrics and Pavements
4. To acquire design principles of Intersections

Course Outcomes:

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

1. Plan high way network for a given area.
2. Determine High way alignment and design high way geometrics.
3. Design Intersections and prepare traffic management plans.
4. Understand the properties of high way materials
5. Judge suitability of pavement materials and design flexible and rigid pavements

UNITI

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.

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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:

1. Highway Engineering, Khanna S.K., Justo C.E.G and Veeraragavan A,Nem Chand Bros., Roorkee. 2013
2. Traffic Engineering and Transportation Planning, KadiyaliL. R,Khanna Publishers, New Delhi. 1999

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REFERENCES:

1. Principles of Highway Engineering, KadiyaliL .R,Khanna Publishers, NewDelhi, 2019
2. Principles of Transportation Engineering, Partha Chakraborty and Animesh Das,PHI Learning Private Limited, Delhi, 2011

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6T12	L	T	P	C
		3	0	0	3
Course Title:	ENVIRONMENTAL ENGINEERING				

Course Learning Objectives:

The course will address the following:

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:

1. Plan and design the water and distribution networks and sewerage systems
2. Able to identify the appropriate source of water based on quality and quality requirements
3. Select a suitable treatment for raw water treatment as well as sewage treatment
4. Plan and design the sewer systems
5. Decide the manner of disposal of wastewater

SYLLABUS:

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

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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.

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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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. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – McGraw-Hill Book Company, New Delhi, 1985.
2. Water Supply Engineering. Dr. P.N. Modi, Standard Book House, Delhi. 2018.

REFERENCES

1. Elements of Environmental Engineering – K.N. Duggal, S. Chand & Company Ltd., New Delhi. 1996.
2. Water Supply Engineering.– Dr. B.C. Punmia, A.K. Jain and A.K. Jain. Laxmi Publications (P) Ltd., New Delhi. 2016.
3. Water Supply and Sanitary Engineering – G.S. Birdie and J.S. Birdie, 2010.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6D04	L	T	P	C
		3	0	0	3
Course Title:	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 adoptedforimprovingthepropertiesofremoldedandin-situsoilsbyadoptingdifferent 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:

1. The student will understand and apply different in-situ densification methods to improve the strength and stability of granular and cohesive soils.
2. The student will learn various dewatering techniques and drainage systems used to remove groundwater for soil stabilization.
3. The student will understand soil stabilization methods using mechanical, chemical, and industrial waste materials, along with grouting techniques and their applications.
4. The student will gain knowledge about reinforced earth structures, their components, and design principles for earth retention systems.
5. The student will be able to identify types, properties, and uses of geosynthetics like geotextiles, geogrids, and geomembranes in ground improvement.

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 – insitudensification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

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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 a shand 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 grouttests. 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

Geosynthetics–geotextiles–types–functions, properties and applications – geogrids, geomembranes and gabions - properties and applications.

TEXT BOOKS:

1. 'Ground Improvement Techniques' by Purus Hotham Raj, Laxmi Publications, New Delhi. 1999.
2. 'Ground Improvement Techniques' by Nihar Ranjan Patro,Vikas Publishing House(p) limited ,New Delhi. 2012.
3. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu, Universities Press. 2005.

REFERENC EBOOKS:

1. 'Ground Improvement 'by MP Moseley, Blackie Academic and Professional, USA. 2000.
2. 'Designing with Geosynethetics 'by RM Koerner, Prentice Hall, 1999.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
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Regulation	BR23				
III Year II Semester	Course Code: 23CE6D05	L	T	P	C
		3	0	0	3
Course Title:	REPAIR AND REHABILITATION OF STRUCTURES				

Course Objectives:

1. To make students aware of modern materials and techniques used for concrete repair and rehabilitation.
2. To introduce non-destructive testing (NDT) methods used to assess structural damage and deterioration.
3. To explain different methods of strengthening and stabilization of concrete elements like beams, columns, and joints.
4. To provide knowledge on advanced concretes like fiber reinforced concrete, light weight concrete, and fly ash concrete.
5. To help students understand high performance concretes and their behavior, properties, and materials.

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

1. Students will be able to identify and evaluate materials and techniques used for inspecting and repairing deteriorated concrete structures using non-destructive methods.
2. Students will understand and apply suitable strengthening and stabilization techniques for improving the performance of damaged structural elements.
3. Students will gain knowledge of bonded FRP installation methods and assess their effectiveness in structural strengthening.
4. Students will be able to design and apply fiber-reinforced and sustainable concretes like lightweight and fly ash concrete for various applications.
5. Students will understand the composition, properties, and applications of high-performance concretes, including self-compacting concrete, in modern construction.

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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-Nondestructive evaluation :Importance-Concrete behavior 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-Wetlay upsheet, 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.

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TEXT BOOKS

1. Maintenance Repair Rehabilitation & Minor works of Buildings -P.C.Varghese, PHI Publications, 2023.
2. Repair and Rehabilitation of Concrete Structures–P.I.Modi,C.N.Patel,PHI Publications, 2016.
3. Rehabilitation of Concrete Structures-B.Vidivelli,Standard Publishers Distributors, 2009.
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation-V.K.Raina, Shroff Publishers and Distributors. 2019.

REFERENCE:

1. Concrete Technology Theory and Practice-M.S.Shetty,SChandand Company, 2006.
2. Concrete Repair and Maintenance illustrated-PeterHEmmons, Galgotia Publications Pvt Ltd (22 February 2001)
3. Hand book on Repair and Rehabilitation of RC Buildings published by CPWD, Delhi, 2002.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU

DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6D06	L	T	P	C
		3	0	0	3
Course Title:	VALUATION AND QUANTITY SURVEY				

Course Learning Objectives:

The objective of this course is to:

1. Understand the principles of quantity surveying, estimation types, and measurement standards as per IS 1200.
2. Learn CPWD specifications, schedule of rates, and rate analysis for common building works.
3. Understand the detailed estimates and BOQ using Centre Line and Long Wall–Short Wall methods.
4. Develop bar bending schedules and basic estimations for roads, sanitary, and water supply works along with basic valuation concepts.
5. Understand methods of calculating depreciation and valuation techniques for buildings and land.

Course Outcomes:

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

1. Explain quantity surveying roles and prepare estimates following IS measurement standards.
2. Analyze building works using latest CPWD specifications and rate analysis tools.
3. Prepare detailed building estimates and BOQs with quantity calculations for major works.
4. Generate BBS for RCC components and estimate infrastructure works and basic valuation terms.
5. Apply depreciation and valuation methods for assessment of buildings and land.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
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DEPARTMENT OF CIVIL ENGINEERING

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-

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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, 2024.
2. Rangwala, Estimation Costing and Valuation, Charotar publishing house pvt.ltd, 2023.
3. S. Seetha Raman, M.Chinna swami, Estimation and quantity surveying, Anuradha publications Chennai. 2015.
4. M Chakraborthy, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26, 2006.

References:

1. BS Patil, Civil Engineering contracts and estimates, university press, 2006.
2. VNVazirani & SPChandola, Civil Engineering Estimation and Costing, Khanna Publishers, 1968.
3. IS1200-1968; Methods of measurement of building & civil engineering works
4. CPWDDAR2018andDSR2018orlatest
5. CPWDSpecificationsVol1&2(2019orlatestedition)

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6D07	L	T	P	C
		3	0	0	3
Course Title:	FINITE ELEMENT METHOD				

Course Learning Objectives:

The objective of this course is to:

1. Understand variational and weighted residual methods used in finite element analysis.
2. Learn stiffness matrix formulation for truss elements and compute stresses in truss structures.
3. Understand finite element formulation for beams and analyze various loading and support conditions.
4. Derive stiffness matrices for plane stress, plane strain, and axisymmetric problems using CST and LST elements.
5. Study iso-parametric elements, shape functions, Gauss quadrature, and element stability issues.

Course Outcomes:

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

1. Apply variational and weighted residual methods for deriving finite element equations.
2. Formulate and solve 1D and 3D truss problems using stiffness and transformation matrices.
3. Analyze beams and rigid frames using finite element methods under various loads.
4. Solve 2D plane stress, plane strain, and axisymmetric problems using CST and LST elements.
5. Use iso-parametric formulations and numerical integration for accurate stress analysis and stability checks.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
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DEPARTMENT OF CIVIL ENGINEERING

Syllabus:

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. A first course in the Finite Element Method–Daryl L.Logan, Thomson Publications. 2012.
2. Concepts and applications of Finite Element Analysis–Robert D.Cook, Michael EPlesha, JohnWiley & Sons Publications, 2001.

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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REFERENCES:

1. Introduction to Finite Elements in Engineering-Tirupati R.Chandrupatla, Ashok D. Belgunda, PHI publications. 2009.
2. Finite Element Methods (For Structural Engineers)Wail N Rifaie, Ashok K Govil, New Age International(P)Limited, 2008.

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr. V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr. A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6D08	L	T	P	C
		3	0	0	3
Course Title:	BRIDGE ENGINEERING				

Course Learning Objectives:

The objective of this course is to:

1. Understand the types of bridges, site selection, components, foundation types, bearings, and loading standards.
2. Learn load distribution and design methods for slab bridges using various analytical approaches.
3. Study the analysis and design of T-beam bridge components with proper reinforcement detailing.
4. Understand the design principles and detailing of plate girder bridge components.
5. Learn the design of box culverts and procedures for bridge inspection, testing, and maintenance.

Course Outcomes:

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

1. Identify suitable bridge types, components, and foundation systems based on site and loading conditions.
2. Analyze and design slab bridges using appropriate methods and calculate effective load dispersion.
3. Design T-beam bridges, including deck slabs and girders, with reinforcement detailing.
4. Design the components of plate girder bridges and ensure structural detailing.
5. Design box culverts and apply proper inspection and maintenance techniques for bridge structures.

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SYLLABUS:

UNIT-I

General Introduction to types of Bridges- (Slab bridges, TBeam, 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. 'Essentials of Bridge Engineering 'by Johnson Victor D, Oxford; 6th edition (1 January 2019)
2. 'Design of Bridge Structures' by T.R. Jagadeesh, M.A. Jayaram, PHI (1 December 2009)

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3. 'Design of RC Structures' by B. C.Punmai, Jain & Jain, Lakshmi Publications, 2006.

REFERENCES:

1. 'Design of Concrete Bridges' by Aswini, Vazirani,Ratwani, Khanna Publishers (1 January 1995)
2. 'Design of Steel Structures' by B.C.Punmai, Jain & Jain, Lakshmi Publications, 2015.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A).
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23	L	T	P	C
III Year II Semester	Course Code: 23CE6D09	3	0	0	3
Course Title:	WATER RESOURCES ENGINEERING				

Course Learning Objectives:

The course is designed to make the students,

1. Understand irrigation needs, crop-water relationships, methods, efficiencies, and water management.
2. Learn the classification, design principles, and economics of non-erodible and erodible canals.
3. Familiarize the various types, functions, and design principles of falls, regulators, outlets, and cross drainage works.
4. Understand the components, failures, and design theories of diversion headworks and subsurface flow.
5. Understand the reservoir planning, dam types, stability, failure causes, spillway design, and seepage control.

Course Outcomes

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

1. Explain irrigation concepts, crop requirements, and factors influencing water use and efficiency.
2. Design canals using Kennedy's and Lacey's theories and analyze canal lining effectiveness.
3. Identify and describe the functions of various canal structures and river training works.
4. Explain diversion headworks and apply Bligh's and Khosla's theories for safe design.
5. Evaluate dam safety, reservoir capacity, and spillway design for effective water storage and control.

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SYLLABUS:

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

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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.

TEXTBOOKS:

1. 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi, 2021.
2. 'Irrigation and Water Resources Engineering' by Asawa G L (2013),. New Age International Publishers
3. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.2011.
4. 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi, 1960.

REFERENCES:

1. 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi. 2011.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T. K (2012), S. Chand & Co Publishers. 2002.
3. 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6E04	L	T	P	C
		3	0	0	3
Course Title:	DISASTER MANAGEMENT				

Course Learning Objectives:

The objective of this course is:

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:

At the end of the course, the students will be able to

1. Explain the nature of disaster management, the disaster management cycle, and evaluate the impacts of various natural disaster
2. Identify different types of man-made disasters and analyze their causes, effects, and management strategies through relevant case studies.
3. Assess risk and vulnerability using building codes, land use planning, and economic tools, and propose sustainable development and financial strategies.
4. Demonstrate the role of technologies and indigenous knowledge in disaster assessment, infrastructure mitigation, and drought monitoring.
5. Discuss the role of education, community preparedness, and multi-sectoral collaboration in disaster risk reduction.

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SYLLABUS:

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

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resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action.

TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S.Vaidyanathan: CBS Punblishers& Distributors Pvt.Ltd. 1905
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications, 2006.
3. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., NewDelhi. 2017.
4. 'Disaster Management – Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt.Ltd.

REFERENCE BOOKS:

1. 'Disaster Management' edited by H K Gupta (2003), Universitiespress.
2. 'Disaster Management – Global Challenges and Local Solutions' by Rajib shah & R R Krishnamurthy (2009), Universitiespress.R. Nishith, Singh AK,
3. "Disaster Management in India: Perspectives, Issues and strategies" New Royal BookCompany. 2021.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A)
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6E05	L	T	P	C
		3	0	0	3
Course Title:	SUSTAINABILITY IN ENGINEERING PRACTICES				

The objectives of this course are: to familiarize students with

1. Understand the concept of sustainable development and various environmental agreements, protocols and laws.
2. Develop an understanding of role of local and global environmental issues in sustainable development.
3. Familiarize students with various tools available for sustainable engineering
4. Understand the concept of carbon emissions for regular and sustainable cities and different practices to move industries towards sustainability.
   Understand the concept of renewable energy resources and various methods to implement green technology.

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

1: Explain sustainable development and different environmental agreements and protocols
2: Discuss real time activities causing environmental issues and different methods to use renewable energy resources
3: Explain local and global environmental issues
4: Differentiate between carbon emissions for regular and sustainable cities and explain different practices to move industries towards sustainability
5: Discuss different renewable energy resources and explain methods to implement green technology

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

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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),leader ship 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 hydroplants, biogas systems, biofuels, energy from ocean, geothermal energy, conservation of energy.

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

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Text Book:

1. R.L. Ragand Lekshmi Dinachandran Remesh. Introduction to Sustainable Engineering. 2nd Edition, PHI Learning Pvt. Ltd., 2016.
2. Committee on Sustainability, 2004, June. Sustainable engineering practice: An introduction. American Society of Civil Engineers.

References:

1. D.T.AllenandD.R.Shonnard.SustainabilityEngineering:Concepts, Design and Case Studies, 1st Edition, Prentice Hall, 2011.mmmm
2. A.S.Bradley,A.O.Adebayo,P.Maria. Engineering applications in sustainable design and development, 1st Edition, Cengage learning, 2016.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A), ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6E06	L	T	P	C
		3	0	0	3
Course Title:	WATER SUPPLY SYSTEMS				

Course Learning Objectives:

The objectives of this course is:

1. Understand the essential roles and diverse applications of water in human life.
2. Explain the various water sources including advanced methods.
3. Understand the difference between potable and non-potable water, understand water-related diseases, and examine wastewater reuse in irrigation.
4. Explain the various methods of water distribution based on topography and demand.
5. Understand the industrial water requirements, wastewater characteristics, and environmental standards for effluent discharge.

Course Outcomes:

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

1. Explain the necessity of water and its multiple applications in daily life, agriculture, industry, sanitation, and emergency services.
2. Identify and assess various water sources, including traditional and modern methods like desalination and aquifer recharge for sustainable water supply.
3. Differentiate between potable and non-potable water and analyze the effects of waterborne and water-related diseases, including wastewater reuse practices.
4. Explain the water distribution systems based on topography and population needs, and ensure functionality during emergencies.
5. Explain the water usage, wastewater characteristics, to minimize environmental impact.

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.

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UNIT-III

DUAL SUPPLY OF WATER:

Potable and non-potable water – Protected water – Grey water – Black water – Water bornediseases – 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", 7thEdition, 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, George Technobanoglous, "Environmental Engineering", 1stEdition 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", 3rdEdition, Wiley, 2010.
3. Metcalf and Eddy, "Waste Water Engineering", 3rd Edition, Tata Mc Graw Hill, 2008.

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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A).
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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6L08	L	T	P	C
		0	0	3	1.5
Course Title:	ENVIRONMENTAL ENGINEERING LAB				

Learning Objectives:

The course will address the following:

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

Outcomes:

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

1. Estimate some important characteristics of water and wastewater in the laboratory
2. 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.
3. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
4. Estimate and study the strength of the raw and treated effluents in terms of BOD, COD, pH, TDS and chloride of the neutralization tank treating effluents from Chemistry lab or Environmental Engineering Laboratory

SYLLABUS:

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.

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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, 1992.
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi, 2012.

Reference

1. Chemistry for Environmental Engineering by Sawyer and Mc. Carty, 1994.

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Regulation	BR23				
III Year II Semester	Course Code: 23CE6L09	L	T	P	C
		0	0	3	1.5
Course Title:	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

1. Test aggregates and judge the suitability of materials for the road construction
2. Test the given bitumen samples and judge their suitability for the road construction.
3. Obtain the optimum bitumen content for Bituminous Concrete
4. Determine the traffic volume, speed and parking characteristics.
5. Draw highway cross sections and intersections.

SYLLABUS:

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.

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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

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TEXTBOOKS:

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.2013.

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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BONAM VENKATA CHALAMAYYA ENGINEERING COLLEGE (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23CE6S04	L	T	P	C
		0	1	2	2
Course Title:	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

After the completion of the course student should be able to

1. Model the geometry of real-world structure Represent the physical model of structural element/structure
2. Perform analysis
3. Interpret from the Post processing results
4. Design the structural elements and a system as per ISCodes

LISTOFEXPERIMENTS

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

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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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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
III Year II Semester	Course Code: 23AC6T03	L	T	P	C
		2	0	0	-
Course Title:	TECHNICAL PAPER WRITING & IPR				

Course objectives:

1) To understand the structure of the technical paper and its components.
2) To review the literature and acquire the skills to write a technical paper for first submission.
3) To understand the process and development of IPR.
4) To create awareness about the scope of patent rights.
5) To analyze the new developments in IPR include latest software

Course outcomes: Upon completion of course, students will be able to:

1: Understand the structure of the technical paper and its components.
2: Review the literature and acquire the skills to write a technical paper for first submission.
3: Understand the process and development of IPR.
4: Create awareness about the scope of patent rights.
5: Analyze the new developments in IPR include latest software.

UNIT-I: Planning and preparation

Planning and Preparation, Word Order, breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness. Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

UNIT-II: Literature review

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check. Key skills needed when writing a Title, Abstract, Introduction, a Review of the Literature, the Methods, the Results, the Discussion, and the Conclusions. Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

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UNIT-III: Process and Development
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. Procedure for grants of patents, patenting under PCT.

UNIT-IV: Patent Rights
Scope of Patent Rights. Licensing and transfer of technology, Patent information and databases, Geographical Indications.

UNIT-V: New Developments In IPR
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies.

Text Books:
1. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press.
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd, 2007.

References:
1) Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2) Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
3) Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
4) Mayall, "Industrial Design", McGraw Hill, 1992.
5) Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age" 2016.
6) T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

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BONAM VENKATA CHALAMAYYA ENGINEERING (A).
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

Course Structure – BR23 Regulations

For UG – B.Tech: Civil Engineering

Honor Degree in Advanced Civil Engineering and Disaster-Resilient Infrastructure

S No	Category	Course Code	Title	L	T	P	Credits
1	PCC	23CEHT01	Introduction to Earthquake Engineering	3	0	0	3
2	PCC	23CEHT02	Structural Dynamics	3	0	0	3
3	PCC	23CEHT03	Traffic Engineering and Management	3	0	0	3
4	PCC	23CEHT04	Advanced Hydrology	3	0	0	3
5	PCC	23CEHT05	Geosynthetics Engineering: In Theory and Practice	3	0	0	3
6	PCC	23CEHT06	Environmental Geotechnics	3	0	0	3
7	PCC	23CEHT07	Seismic Analysis of Structures	3	0	0	3
8	PCC	23CEHT08	Environmental Air Pollution	3	0	0	3
9	PCC	23CEHT09	Soil Dynamics	3	0	0	3
10	PCC	23CEHT10	Advanced Transportation Engineering	3	0	0	3

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BONAM VENKATA CHALAMAYYA ENGINEERING (A),
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DEPARTMENT OF CIVIL ENGINEERING

OFFERED BY DEPARTMENT OF CIVIL ENGINEERING

Course Structure – BR23 Regulations

For UG – B.Tech:

Minor Degree in Construction Engineering and Sustainable Infrastructure

S No	Category	Course Code	Title	L	T	P	Credits
1	PCC	23CEMT01	Introduction to Surveying	3	0	0	3
2	PCC	23CEMT02	Mechanics of Solids	3	0	0	3
3	PCC	23CEMT03	Soil Mechanics	3	0	0	3
4	PCC	23CEMT04	Mechanics of Fluids	3	0	0	3
5	PCC	23CEMT05	Building Materials and Techniques	3	0	0	3
6	PCC	23CEMT06	Building Planning and Drafting	3	0	0	3
7	PCC	23CEMT07	Estimation and Costing	3	0	0	3
8	PCC	23CEMT08	Sustainable Materials and Green Building	3	0	0	3
9	PCC	23CEMT09	Safety in Construction	3	0	0	3
10	PCC	23CEMT10	Construction Planning and Management	3	0	0	3

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	BR23				
Honors Degree courses	Course Code: 23CEHT01	L	T	P	C
		3	0	0	3
Course Title:	INTRODUCTION TO EARTHQUAKE ENGINEERING				

Course Learning Objectives:

1. To understand the behaviour of civil engineering structures during earthquakes.
2. To explain the procedures for seismic analysis of framed and masonry structures.
3. To introduce the principles and importance of ductile detailing in structural design.
4. To develop the ability to analyze structures for seismic loads using static and dynamic methods.
5. To understand seismic design philosophies, methodologies, and relevant building codes and standards

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

1. Demonstrate fundamental knowledge of engineering seismology and seismic hazards.
2. Generate response spectra from earthquake records and apply them to estimate structural response.
3. Identify and classify the causes and types of earthquake-induced damages in civil engineering structures.
4. Analyze multi-storied buildings as shear frames and compute lateral forces using IS 1893 code provisions.
5. Understand planning, design, and detailing aspects of earthquake-resistant RCC and masonry structures as per IS 13920 and other relevant codes.

UNIT-I

Introduction to seismology: Engineering seismology– rebound theory – plate tectonics – seismic waves- earthquake size and various scales – local site effects – Indian seismicity – seismic zones of India – theory of vibrations – near ground and far ground rotation and their effects.

UNIT-II

Seismic design concepts: EQ load on simple building –load path–floor and roof diaphragms –seismicresistantbuildingarchitecture–planconfiguration–verticalconfiguration– pounding effects – mass and stiffness irregularities – torsion in structural system- Provision of seismic

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code (IS 1893 & 13920) – Building system – frames – shear wall – braced frames – layout design of Moment Resisting Frames(MRF) – ductility of MRF – Infill wall – Non- structural elements.

UNIT-III

Calculation of loads: EQ load – 3D modeling of building systems and analysis (theory only) Design and ductile detailing of Beams and columns of frames Concept of strong column weak beams, Design and ductile detailing of shear walls.

UNIT-IV

Earthquake loads: Cyclic loading behavior of RC, steel and pre- stressed concrete elements - modern concepts-Base isolation – Adaptive systems – case studies.

UNIT-V

Concept of damages: Retrofitting and restoration of buildings subjected to damage due to earthquakes- effects of earthquakes – factors related to building damages due to earthquake- methods of seismic retrofitting- restoration of buildings

TEXTBOOKS:

1. Agrawal, P., & Shrikhande, M. (2006). Earthquake Resistant Design of Structures. New Delhi: Prentice Hall of India.
2. Chopra, A. K. (2007). Dynamics of Structures: Theory and Application to Earthquake Engineering (2nd ed.). New Delhi: Prentice Hall of India.
3. Bullen, K. E. (1996). Introduction to the Theory of Seismology. Cambridge: Cambridge University Press.

REFERENCES:

1. Chowdhary, I., & Dasgupta, S. P. (2009). Dynamics of Structure and Foundation – A Unified Approach: Volume 2, Applications. CRC Press, Balkema.
2. Clough, R. W., & Penzien, J. (1993). Dynamics of Structures. New York: McGraw Hill.
3. Datta, T. K. (2010). Seismic Analysis of Structures. Singapore: John Wiley & Sons (Asia) Pte Ltd.
4. Hart, G. C., & Wong, K. (2000). Structural Dynamics for Structural Engineers. New York: John Wiley & Sons, Inc.

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Regulation	BR23				
Honors Degree courses	Course Code: 23CEHT02	L	T	P	C
		3	0	0	3
Course Title:	STRUCTURAL DYNAMICS				

Course Learning Objectives:

1. To understand various dynamic forces acting on structures and their corresponding responses.
2. To gain knowledge about structural failure modes and their remedial measures under dynamic loads.
3. To learn analytical procedures for evaluating structural responses to different types of dynamic excitation.
4. To study linear and nonlinear behavior of structures subjected to dynamic loading.
5. To explore the dynamic characteristics of structural systems, including single, multi-degree of freedom, and continuous systems.

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

1. Distinguish between static and dynamic behavior of structures and their physical properties.
2. Model and analyze single-degree-of-freedom (SDOF) systems under various dynamic loads.
3. Evaluate responses of single-storied buildings to harmonic, periodic, and impulsive loads.
4. Analyze multi-degree-of-freedom (MDOF) systems and compute dynamic responses of multi-storied buildings.
5. Assess beam dynamics and apply appropriate techniques to describe system nonlinearity.

UNIT-I

Introduction to Structural Dynamics: Fundamental objective of Dynamic analysis – Types of prescribed loadings – methods of Discretization – Formulation of the Equations of Motion.

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UNIT-II

Theory of Vibrations: Introduction – Elements of a Vibratory system – Degrees of Freedom of continuous systems - Oscillatory motion – Simple Harmonic Motion – Free Vibrations of Single Degree of Freedom (SDOF) systems – Undamped and Damped – Critical damping – Logarithmic decrement – Forced vibrations of SDOF systems – Harmonic excitation – Dynamic magnification factor – Band width.

UNIT-III

Single Degree of Freedom System: Formulation and Solution of the equation of Motion – Free vibration response – Response to Harmonic, Periodic, Impulsive and general dynamic loadings – Duhamel integral.

UNIT-IV

Multi Degree of Freedom System: Selection of the Degrees of Freedom – Evaluation of Structural Property Matrices – Formulation of the MDOF equations of motion - Undamped free vibrations – Solution of Eigen value problem for natural frequencies and mode shapes – Analysis of dynamic response - Normal coordinates.

UNIT-V

Continuous Systems: Introduction – Flexural vibrations of beams – Elementary case – Equation of motion – Analysis of undammed free vibration of beams in flexure – Natural frequencies and mode shapes of simple beams with different end conditions.

TEXTBOOKS:

1. Paz, M., & Leigh, W. (2010). Structural Dynamics: Theory and Computation. Springer.
2. Chopra, A. K. (2017). Dynamics of Structures: Theory and Applications to Earthquake Engineering (5th ed.). Pearson.
3. Clough, R. W., & Penzien, J. (2015). Dynamics of Structures. New Delhi: CBS Publishers and Distributors.

REFERENCES:

1. Damodarasamy, S. R. (2012). Basics of Structural Dynamics and Aseismic Design. Dhanpat Rai Publishing Company.
2. Mukhopadhyay, M. (2008). Structural Dynamics: Vibrations and Systems. New Delhi: Ane Books Pvt. Ltd.

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	**BR23**				
Honors Degree courses	**Course Code: 23CEHT03**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**TRAFFIC ENGINEERING AND MANAGEMENT**				

Course Learning Objectives:

1. To understand the components and characteristics of traffic systems, including human, vehicle, and environmental aspects.
2. To study traffic control devices and the principles of highway safety and traffic regulations.
3. To evaluate the environmental impacts of road traffic and identify control measures.
4. To learn concepts of highway capacity, level of service (LOS), and their influencing factors.
5. To explore Intelligent Vehicle Highway Systems (IVHS) and their role in traffic management.

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

1. Identify the key components and characteristics of traffic systems.
2. Explain traffic flow characteristics at microscopic and macroscopic levels.
3. Apply traffic control devices and methods to enhance highway safety.
4. Assess environmental impacts of traffic and propose control measures.
5. Summarize Intelligent Transportation Systems and highway capacity concepts

UNIT-I

Components of the Traffic System: Human-Vehicle–Environment System; characteristics of Road users, Vehicles, Highways and their classification; Traffic Studies: Inventories; Volume studies; Speed, Travel time and Delay studies; Intersection studies; Pedestrian studies; Parking studies; Accident studies.

UNIT-II

Traffic Characteristics: Basic characteristics of Traffic- Volume, Speed, and Density- Microscopic and macroscopic flow characteristics: Time headways; Temporal, spatial, and model flow patterns; Interrupted and Uninterrupted traffic. Microscopic and macroscopic speed characteristics: Vehicular speed Trajectories; Speed characteristics – Mathematical distribution; Speed and travel time variations; Travel time and delay studies. Microscopic and Macroscopic density characteristics: Distance headway characteristics; Car-following theories; Density measurement techniques; Density contour maps.

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UNIT-III

Traffic Control Devices & Highway Safety: Importance of Traffic Control and Regulation, signs & Markings, Signal Warrants, Signal Phasing and Development of Phase Plans, Fixed and Vehicle-Activated Signals, Webster Method, ARRB Method, Drew's Method, IRC Method, Signal Coordination, Area Traffic Control. Accident characteristics – Road – Driver – Vehicle; Accident recording and Analysis; Highway Safety Improvement Program; Safety Audit

UNIT-IV

Environmental Impact: Air pollution: Kinds of pollutants; Air pollution standards; Measures of air quality; modelling and control. Noise pollution: Measurement of sound levels; Acceptable limits, Prediction of noise levels, Traffic noise control

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UNIT-V

Highway Capacity and Intelligent Vehicle – Highway Systems: Factors affecting Capacity and LOS; Capacity of Rural Highways, Capacity of Urban Roads; HCM and IRC standards-Traffic surveillance and monitoring; IVHS programs, Role of IVHS, IVHS categories, Benefits and Costs of IVHS.

TextBooks:

1. Kadiyali, L. R. (2016). Traffic Engineering and Transport Planning (10th ed.). New Delhi: Khanna Publishers.
2. Roess, R. P., Prassas, E. S., & McShane, W. R. (2020). Traffic Engineering (5th ed.). Pearson Education.

Reference Books:

1. Sonarkar, V. (2019). Traffic engineering (1st ed.). Nirali Prakashan.
2. Hobbs, F. D. (2016). Traffic planning and engineering: Pergamon international library of science, technology, engineering and social studies (2nd ed.). Elsevier.

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Regulation	**BR23**				
Honors Degree courses	**Course Code: 23CEHT04**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
CourseTitle:	**ADVANCED HYDROLOGY**				

Course Objectives:

1. Explain the fundamentals of advanced hydrology, including the hydrologic cycle and its components.
2. Understand rainfall-runoff processes and conduct hydrograph analysis.
3. Apply hydrologic principles to the design and evaluation of hydraulic and water resources systems.
4. Differentiate between stochastic and deterministic methods in hydrologic modeling.
5. Model hydrologic systems for flood forecasting, reservoir planning, and watershed management.

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

1. Identify and describe components of the hydrologic cycle and their measurement techniques.
2. Apply statistical methods for rainfall data analysis and frequency estimation.
3. Analyze hydrographs and estimate runoff using empirical and rational approaches.
4. Apply unit hydrograph and synthetic hydrograph concepts to assess catchment response.
5. Evaluate flood routing methods, estimate reservoir capacities, and design watershed management strategies.

UNIT – I:

Fundamentals of Hydrology and Hydrologic Processes: Covers the hydrologic cycle, water budget equation, global water distribution, and residence time. Introduces system concepts, transfer function operators, and hydrologic model classification. Also includes Reynolds transport theorem, continuity, momentum, and energyequations, along with discrete time continuity.

UNIT – II:

Atmospheric Hydrology and Precipitation Analysis: Focuses on atmospheric circulation, water vapor, rainfall formation, and types of precipitation. Discusses monsoon characteristics in Nepal, rainfall measurement techniques, gauge adequacy, and discharge measurement.

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Includes thunderstorm analysis, cell model, IDF relationships, spatial averaging, and moving average methods.

UNIT – III:

Evaporation and Subsurface Hydrology: Explains factors affecting evaporation and estimation methods like energy balance, Penman, Blaney–Criddle, Thornthwaite, and radiation methods. Covers subsurface topics such as soil moisture, porosity, saturated and unsaturated flow, infiltration models (Horton's, Philip's, Green-Ampt), and ponding time.

UNIT – IV:

Surface Water Hydrology and Unit Hydrograph: Covers catchment storage, overland and channel flow, hydrographs, and base-flow separation. Discusses abstraction methods (Phi-index, ERH, DRH), SCS method, time-area concepts, and stream networks. Introduces unit hydrograph theory, convolution, storm-based UH derivation, and synthetic UH methods like S-curve, IUH, and Clerk model.

UNIT – V:

Hydrologic Statistics and Frequency Analysis: Covers probability concepts, distributions (Normal, Binomial, PDFs, CDFs), and statistical parameters. Includes fitting methods (moments, maximum likelihood), Chi-square test, and frequency analysis involving return period, extreme value distributions, Log-Pearson distribution, and confidence limits.

Text Books:

1. Subramanya, K. (2024). Engineering hydrology (6th ed.). McGraw Hill Education
2. Ragunath, H. M. (2022). Hydrology: Principles, analysis, design (4th ed.). New Age International (P) Ltd

Reference Books:

1. Chow, V. T., Maidment, D. R., & Mays, L. W. (1988). Applied hydrology. McGraw-Hill.
2. Maidment, D. R. (Ed.). (1993). Handbook of hydrology. McGraw-Hill.
3. Linsley, R. K., Kohler, M. A., & Paulhus, J. L. H. (1980). Applied hydrology. Tata McGraw-Hill Publishing.
4. Chow, V. T. (Ed.). (1964). Handbook of applied hydrology: A compendium of water-resources technology. McGraw-Hill.

Dr. K. Hanumanthu HOD &BOS Chair, Department of Civil Engineering, BVCEC Odalarevu.	Dr.V. Lakshmi, Professor, Department of Civil Engineering UCEK,JNTU Kakinada. (University Nominee)	Dr.A. Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi	Dr. B. Raghuram Kadali Assistant Professor Department of Civil Engineering NIT Warangal.	Dr. Y. Amarnath, Sr. Engineer Ananya Engineers, Anantapur.	Mr. P. Chakradhar Prasad Asst. Professor Department of Civil Engineering DNR College of Engineering Technology
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Honors Degree courses	Course Code: 23CEHT05	L	T	P	C
		3	0	0	3
Course Title:	GEOSYNTHETICS ENGINEERING: IN THEORY AND PRACTICE				

Course Learning Objectives:

1. Understand the emerging trends and importance of geosynthetics in geotechnical engineering.
2. Evaluate the properties and testing methods of various geosynthetic materials.
3. Analyze the functional behavior and mechanisms of geosynthetics in soil interaction.
4. Design geotechnical structures using geosynthetics based on application-specific requirements.
5. Identify civil engineering applications where geosynthetics enhance performance and sustainability.

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

1. Identify types of geosynthetics and their roles in geotechnical applications.
2. Explain manufacturing processes and mechanisms of various geosynthetic products.
3. Analyze and evaluate the physical and engineering properties of geosynthetics.
4. Describe the core functions of geosynthetics including reinforcement, filtration, and separation.
5. Demonstrate knowledge of geosynthetics applications in structures such as pavements, slopes, landfills, and environmental protection systems.

UNIT I: Functional Principles and Roles of Geosynthetics

Core Functions: Reinforcement, Separation, Filtration, Drainage, Hydraulic Barrier, and Confinement. Engineering Principles Behind Each Function. Interaction Mechanisms between Geosynthetics and Soil. Design Considerations for Multi-functional Systems, Performance Criteria in Varying Geotechnical Applications

UNIT II: Materials, Manufacturing Processes, and Properties

Materials Used: Polyamide, Polyester, Polyethylene, Polypropylene, **Manufacturing Methods**: Woven and Non-Woven Types, Monofilament, Multifilament, Slit-Film Techniques, **Geosynthetic Properties.**

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UNIT III: Geosynthetics Types and System Integration

Classification and Types: Geotextiles, Geogrids, Geonets, Geomembranes: Geocomposites, Recent Innovations: Geocells, Geopipes, Smart Geosynthetics, Integration Strategies in Geotechnical Systems, Compatibility with Natural and Modified Soils

UNIT IV: Engineering Design and Analytical Models

Design Approaches for Reinforced Slopes, Embankments, and Retaining Walls, Analytical Models for Load Transfer, Stress Distribution, and Settlement Reduction, Hydraulic Design: Filtration, Drainage, and Flow Control Systems, Geosynthetics in Pavement Design (AASHTO, FHWA Guidelines), Use of Limit Equilibrium and Finite Element Methods (FEM) in Design.

UNIT V: Advanced Applications and Sustainability

Geosynthetics in Pavement Reinforcement, Base/Subgrade Stabilization, Reinforced Soil Walls, Bridge Abutments, Steep Slopes, Landfills: Liner Systems, Leachate Collection, Cover Systems, Environmental Applications: Canal Linings, Reservoirs, Erosion Control, Mining, Ground Improvement Techniques: Geo-drains, Preloading, Vacuum Consolidation, Life Cycle Cost Analysis and Sustainability Considerations in Geosynthetics.

Text Books:

1. Sivakumar Babu, G. L. (2005). *An introduction to soil reinforcement and geosynthetics* (1st ed.). Universities Press.
2. Ranjan, G., & Rao, A. S. R. (2017). *Reinforced soil and its engineering applications* (3rd ed.). IK International Publishing House.

Reference Books:

1. Sarsby, R. W. (2006). *Geosynthetics in civil engineering* (1st ed.). CRC Press.
2. Koerner, R. M. (2012). *Design with geosynthetics* (6th ed., Vols. 1 & 2). Xlibris Publications.

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Regulation	**BR23**	**L**	**T**	**P**	**C**
Honors Degree courses	**Course Code: 23CEHT06**	**3**	**0**	**0**	**3**
Course Title:	**ENVIRONMENTAL GEOTECHNICS**				

Course Learning Objectives:

1. Understand the interdisciplinary principles of environmental and geotechnical engineering.
2. Apply risk assessment and management approaches in geoenvironmental contexts.
3. Analyze environmental challenges related to soil and groundwater contamination, waste management, and infrastructure.
4. Investigate, design, and develop engineering solutions for geoenvironmental problems.
5. Understand the design of waste containment systems, site remediation techniques, and sustainable geo-infrastructure.

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

1. Describe the scope and importance of geoenvironmental engineering in practice.
2. Explain soil–water–contaminant interactions and their significance in environmental problems.
3. Evaluate waste containment practices and the role of soil in containment systems.
4. Apply site remediation techniques for contaminated soil and groundwater.
5. Analyze contaminant effects on soil and water and understand advanced characterization techniques such as geotechnical centrifuge modelling.

UNIT-I:

FUNDAMENTALS OF GEO-ENVIRONMENTAL ENGINEERING Scope of Geo-Environmental Engineering –
Multiphase behaviour of soil – role of soil in Geo-Environmental applications – importance of soil physics,
soil chemistry, hydrogeology, biological process – sources and type of ground contamination – impact of ground contamination on geoenvironment – case histories on geoenvironmental problems.

UNIT-II:

SOIL-WATER-CONTAMINANT INTERACTION Soil-water interaction and concepts of Double layer – forces of interaction between soil particles. Concepts of unsaturated soil – importance of

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unsaturated soil in geo-environmental problems – measurement of soil suction – water retention curves –
Soil-water contaminant interactions and their implications.

UNIT-III :
WASTE CONTAINMENT SYSTEM Evolution of waste containment facilities and disposal practices – Site
selectionbased on environmental impact assessment – different role of soil in waste containment – different
components of waste containment system and its stability issues – property evaluation for checking soil suitability for
waste containment – design of waste containment facilities.

UNIT-IV:
CONTAMINANT SITE REMEDIATION Site characterization – risk assessment of contaminated site – remediation methods for soil and groundwater – selection and planning of remediation methods – some examples of in-situ remediation.

UNIT-V:
ADVANCED SOIL CHARACTERIZATION Contaminant analysis – water content and permeability measurements – electrical and thermal property evaluation – use of GPR for site evaluation – introduction to geotechnical centrifuge modeling.

TEXT BOOKS:

1. Fredlund, D. G., & Rahardjo, H. (1993). *Soil mechanics for unsaturated soils* (2nd ed.). Wiley-Interscience.
2. Rowe, R. K. (2000). *Geotechnical and geoenvironmental engineering handbook* (5th ed.). Kluwer Academic Publishers.
3. Sharma, H. D., & Reddy, K. R. (2004). *Geoenvironmental engineering: Site remediation, waste containment, and emerging waste management technologies* (3rd ed.). John Wiley & Sons.

REFERENCES:

1. Alvarez-Benedi, J., & Munoz-Carpena, R. (2005). *Soil-water-solute process characterization: An integrated approach* (2nd ed.). CRC Press.
2. Bagchi, A. (2004). *Design of landfills and integrated solid waste management* (1st ed.). John Wiley & Sons.
3. Berkowitz, B., Dror, I., & Yaron, B. (2008). *Contaminant geochemistry* (3rd ed.). Springer.

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Regulation	**BR23**				
Honors Degree courses	**Course Code: 23CEHT07**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**SEISMIC ANALYSIS OF STRUCTURES**				

Course Learning Objectives: By the end of this course, students will be able to:

1. Apply structural dynamics principles to model earthquake-resistant structures.
2. Understand and compare various methods of earthquake measurement.
3. Analyze structures using the Equivalent Static Method and related IS code provisions.
4. Interpret and evaluate vertical irregularities in building configurations.
5. Apply ductile detailing and seismic design provisions to beams, columns, and shear walls.

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

1. Formulate and solve undamped free vibration problems for SDOF and 2DOF systems.
2. Explain the concepts of engineering seismology, including earthquake causes, wave types, and measurement.
3. Analyze multistoried structures using the Equivalent Static Method and Response Spectrum Method.
4. Assess and categorize plan and vertical irregularities in buildings as per IS 1893.
5. Apply IS 13920 and IS 4326 provisions for ductile design and detailing of structural components.

UNIT-I

STRUCTURAL DYNAMICS: Introduction – Physical and Mathematical Modelling – Discrete and continuum Modelling. Laws of Equilibrium – Newton's Law of Motion – D'Alembert's Principle and Principle of virtual displacement. - Types of Dynamic Loading. Single Degree of Freedom System (SDOF) – Undamped Free Vibrations – Damped Free Vibrations (concept only). Two Degree of Freedom System (2DOF) – Undamped Free Vibrations – Determination of Natural frequencies and Mode shapes.

UNIT-II

ENGINEERING SEISMOLOGY: Introduction- Internal structure of earth – Chemical properties – Physical properties – Continental drift theory – Plate tectonics – Movement of plate Boundaries – Movement of Indian plate – Faults – Types of faults – Elastic Rebound theory. Earthquakes – Earthquake terminology – Classification of Earthquakes – Causes and

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effects of Earthquakes –Earthquake waves – Quantification of Earthquakes – Intensity and Magnitude – Recording Earthquakes.

UNIT-III

EARTHQUAKE RESISTANT DESIGN: Reviews of latest I.S : 1893 (Part 1) provisions for buildings - General principles and design criteria – Assumptions – Design Acceleration spectrum – Horizontal seismic coefficient – Design acceleration – Seismic zones of India – Importance factor – Response reduction factor – Design lateral force – Design imposed loads for Earthquake force calculation –Seismic weight – Analysis by Equivalent Static Method and Dynamic Method (Response Spectrum Method) – Storey drift limitation.

UNIT-IV

BUILDING CONFIGURATIONS: Introduction – Regular and Irregular Buildings. Plan Irregularities – Torsion Irregularity – Re-entrant corners - Floor slabs having excessive cut-outs or openings- Out of plane offsets in Vertical Elements – Non-parallel Lateral Force system. Vertical Irregularities – Stiffness Irregularity (soft storey) – Mass Irregularity – Vertical Geometric Irregularity – In-plane discontinuity in Vertical Elements resisting lateral force – strength Irregularity (weak storey) – Floating or stub columns – Irregular Modes of Oscillation in two Principle Plan Directions.

UNIT-V

DUCTILE DESIGN AND DETAILING: Review of Latest IS: 13920 provisions General specifications – Beams – Columns – Shear walls. Special confining reinforcement. Review of Latest IS: 4326 provisions - General principles – Special Construction features relating to separations of structures (above ground only).

TEXT BOOKS:

1. Jain, A. K. (2016). *Dynamics of structures with Mat Lab applications*. Pearson India Education Series Pvt. Ltd.
2. Agarwal, P., & Shrikhande, M. (2011). *Earthquake resistant design of structures* (5th ed.). Prentice Hall of India.
3. Duggal, S. K. (2012). *Earthquake resistant design of structures* (1st ed.). Oxford University Press.

REFERENCES:

1. Chopra, A. K. (2007). *Dynamics of structures* (5th ed.). Pearson Education.
2. Paz, M. (2005). *Structural dynamics - Theory and computations* (6th ed.). Pearson Education.
3. Bureau of Indian Standards. (2000). *IS 456: Indian standard plain and reinforced concrete – Code of practice*.
4. Bureau of Indian Standards. (2016). *IS 1893 (Part 1): Criteria for earthquake resistant design of structures. Part 1: General provisions and buildings*.

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	BR23				
Honors Degree courses	**Course Code: 23CEHT08**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**ENVIRONMENTAL AIR POLLUTION**				

Course Learning Objectives:

1. To introduce the fundamental concepts and sources of air pollution.
2. To provide a comprehensive understanding of the types and causes of environmental pollution, with a focus on air quality.
3. To impart knowledge about the major causes and contributing factors of air pollution.
4. To examine the health impacts and environmental consequences of air pollutants.
5. To develop analytical and technical skills necessary for monitoring, managing, and controlling air pollution.

Course Outcomes:

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

1. Understand the fundamental concepts and various sources of air pollution
2. Classify the explain the different types of environmental pollution with emphasis on air quality issues
3. Identify and describe the major causes and contributing factors of air pollution
4. Analyze the health impacts and environmental consequences of air pollutants
5. Apply analytical and technical skills for monitoring,controlling,and managing air pollution

UNIT—I:

Introduction: History of Air pollution and episodes, Sources of air pollution and types, Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile, Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise.

UNIT—II:

Transport of Pollution in the Atmosphere: Plume behavior under different atmospheric conditions, Mathematical models of dispersion of air pollutants, Plume behavior in valley and terrains. Plume behavior under different meteorological conditions, Concept ofisoplates.

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UNIT—III:

Effects of Air Pollution: Effects of Air Pollution on human beings, plants, animals, and Properties. Global Effects-Greenhouse effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog, Future engines and fuels.

UNIT—IV:

Air Pollution control: Air Pollution control at source equipment for control of air pollution for Particulate matter, settling chambers, fabric filters, scrubbers, cyclones, and Electrostatic precipitators. For Gaseous pollutants, control by absorption, adsorption, scrubbers, and secondary combustion after burners. Working principles, advantages, disadvantages, design, and examples.

UNIT—V:

Air Quality Sampling and Monitoring: Stack sampling, instrumentation and methods of analysis of SO2, CO etc, legislation for control of air pollution and automobile pollution.

TEXTBOOKS:

1. Peavy, H. S., Row, D. R., & Tchobanoglous, G. (1985). *Environmental engineering*. McGraw-Hill International Edition.
2. Perkins, H. C. (1974). *Air pollution*. McGraw-Hill Publications.
3. Crawford, M. (1976). *Air pollution control theory*. Tata McGraw-Hill Publishing.
4. Rao, M. N., & Rao, H. V. N. (1989). *Air pollution*. Tata McGraw-Hill Publishing Co.
5. Rao, C. S. (2024). *Environmental pollution control engineering* (4th ed.). New Age International Publishers.

REFERENCES:

1. De Nevers, N. (1999). *Air pollution control engineering* (2nd ed.). McGraw-Hill Education.
2. Krishna, K. V. S. G. M. (1995). *Air pollution and control*. Kaushal & Co.
3. Pandey, G. N., & Carney, G. C. (1989). *Environmental engineering*. Tata McGraw-Hill.
4. Rao, T. D. G., & Andal, M. (2018). *Air pollution and control – Fundamentals and applications* (1st ed.). Cambridge University Press.

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Regulation	**BR23**				
Honors Degree courses	**Course Code: 23CEHT09**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**SOIL DYNAMICS**				

Course Learning Objectives: By the end of this course, students will be able to:

1. Explain the significance of dynamic loads in machine foundation analysis.
2. Apply the theory of vibrations under different field conditions.
3. Describe the design principles of machine foundations for reciprocating and impact machines.
4. Explain the concepts and methods of foundation isolation.
5. Understand the behavior of foundations under dynamic loads, including liquefaction effects.

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

1. Understand the influence of dynamic loads in machine foundation analysis and design.
2. Apply vibration theory in soil dynamics and interpret soil behavior accordingly.
3. Estimate dynamic soil properties using laboratory and field tests.
4. Design machine foundations for reciprocating and impact machines, including considerations for liquefaction.
5. Explain foundation isolation methods and their significance in machine foundation design.

UNIT-I
THEORY OF VIBRATIONS: Basic definitions- Free and Forced vibrations with and without damping for Single degree freedom system- Resonance and its effect – Magnification – Logarithmic decrement – Transmissibility, Natural frequency of foundation soil system - Barkan's and IS methods – Pressure bulb concept

UNIT-II
WAVE PROPAGATION AND DYNAMIC SOIL PROPERTIES: Elastic waves in Rods – Waves in elastic Half space, Field and Laboratory methods of determination – Uphole, Down hole and Cross hole methods – Cyclic plate load test – Block vibration test.

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UNIT-III

MACHINE FOUNDATIONS: Design criteria, Permissible amplitudes and Bearing pressure, Degrees of freedom - Analysis under different modes of vibration of block foundation.

UNIT-IV

DESIGN OF FOUNDATIONS FOR RECIPROCATING AND IMPACT MACHINES: Analysis of Two Degree freedom systems under free and forced vibrations -Principles of Design of Foundations for reciprocating and impact machines as per IS code.

UNIT-V (10 Lectures) VIBRATION ISOLATION: Types and methods – Isolating materials and their properties.

TEXT BOOKS:

1. Barkan, D. D. (1970). Dynamics of Bases and Foundations (2nd ed.). McGraw-Hill.
2. Prakash, S. (2000). Soil Dynamics (3rd ed.). John Wiley.

REFRENCE BOOK:

1. Prakash, S. (1981). Soil dynamics. McGraw-Hill.
2. Sreenivasulu, P., & Varadarajan, C. (2007). Handbook of machine foundations. Tata McGraw-Hill.
3. Bureau of Indian Standards. (1987). IS 2974 (Part 1): Code of practice for design and construction of machine foundations: Foundations for reciprocating type machines.
4. Bureau of Indian Standards. (1992). IS 5249: Determination of dynamic properties of soil - Method of test.

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Regulation	**BR23**				
Honors Degree courses	**Course Code: 23CEHT10**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**ADVANCED TRANSPORTATION ENGINEERING**				

Course Learning Objectives:

1. To introduce students to the core concepts and elements of transportation engineering.
2. To provide foundational knowledge in geometric design of highways, railways, and airfields.
3. To develop understanding of pavement types, design procedures, and construction methods.
4. To impart knowledge of traffic engineering, traffic flow theories, and traffic control techniques.
5. To build competence in transportation planning and travel demand forecasting techniques.

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

1. Explain principles of transportation planning, travel demand modeling, and network design.
2. Analyze and design intersections, interchanges, and traffic flow using traffic engineering principles.
3. Assess and propose sustainable transportation systems including public and non-motorized transport.
4. Conduct technical research on transportation challenges and evaluate new technologies.
5. Apply economic analysis including cost-benefit techniques for transportation project evaluation.

UNIT – 1

Introduction to Transportation Engineering -3 Elements of Transportation Engineering (e.g.: vehicle, driver, way, terminal, and control), Transportation modes, Development and transportation, various aspects of transportation engineering (e.g., pavement design, traffic engineering, transport planning, public transportation, etc.)

UNIT-2

Layout, Orientation, and Geometric Design -Geometric Design of highways and railways (e.g., horizontal alignment, vertical alignment, etc.), Geometry of hill roads, Orientation of runways, and geometry of taxiways, Curve layout

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UNIT-3

Pavements and Rail Tracks-Types of pavements, Analysis and design of flexible pavements, Pavement drainage, Construction and maintenance of flexible pavements, Introduction to design of rail tracks

UNIT-4

Traffic Engineering -Characterizing traffic flow (e.g. density, speed, flow), Data collection techniques for traffic parameters and delay studies, Introduction to traffic flow theory (including description of speed- density, speed-flow, and flow density relations), Introductions to concept of capacity and level of service

UNIT-5

Travel Demand Analysis and Transportation Planning -The planning process, Sequential demand analysis, Models of trip generation, distribution, traffic assignment, and modal split.

TEXT BOOKS:

1. Khanna, S. K., & Justo, C. E. G. (2000). *Highway engineering* (7th ed.). Nem Chand & Bros.
2. Kadiyali, L. R., & Lal, N. B. (2003). *Principles and practices of highway engineering*. Khanna Publishers.

REFERENCE BOOKS:

1. Yoder, E. J., & Witczak, M. W. (1975). Principles of pavement design (2nd ed.). John Wiley & Sons.
2. IRC (2001). *IRC: 37-2001 – Guidelines for the Design of Flexible Pavements*.
3. IRC (2002). *IRC: 58-2002 – Guidelines for the Design of Rigid Pavements*

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT01**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**INTRODUCTION TO SURVEYING**				

Course Objectives:

1. To understand the principles and methods of surveying for measuring horizontal and vertical distances and angles.
2. Identify sources of errors in surveying and apply rectification techniques.
3. To apply surveying principles for the calculation of areas and volumes.
4. Use modern surveying equipment to set out curves and achieve accurate results.
5. To understand the basics of Photogrammetry and its applications in surveying.

Course Outcomes:

The course will enable the student to:

1. Apply principles and methods to measure horizontal and vertical distances and angles.
2. Identify and correct errors in surveying data.
3. Determine areas and volumes using appropriate surveying techniques.
4. Set out curves using modern surveying instruments.
5. Understand and use modern surveying methods such as GPS, Drone, and LiDAR.

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories.

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – systems and W.C.B and Q.B systems of locating bearings.

UNIT - II

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas & Volumes- Determination of areas consisting of irregular boundary and regular boundary. Determination of volume of earth work in cutting and embankments for level section.

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UNIT - III

Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical leveling when base is accessible and inaccessible.

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric Surveying.

Unit-V

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and Li DAR Survey (Light Detection And Ranging).

Textbooks:

1. Punmia, B. C., Jain, A. K., & Jain, A. K. (2024). *Surveying* (Vol. 1, 18th ed.). Laxmi Publications Pvt. Ltd.
2. Duggal, S. K. (2019). *Surveying* (Vols. 1 & 2, 5th ed.). Tata McGraw Hill Publishing Co. Ltd.
3. Venkatramaiah, C. (2011). *Textbook of Surveying* (1st ed.). Universities Press.

Reference Books:

1. Chandra, A. M. (2015). *Plane Surveying and Higher Surveying* (3rd ed.). New Age International Pvt. Ltd. Publishers.
2. Basak, N. (2014). *Surveying and Levelling* (4th ed.). Tata McGraw Hill Publishing Co. Ltd.
3. Arora, K. R. (2015). *Surveying* (Vols. 1, 2 & 3, 12th ed.). Standard Book Hous.

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT02**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**MECHANICS OF SOLIDS**				

Course Learning Objectives:

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

1. To introduce the concepts of stress, strain, elastic constants, and their relationships.
2. To impart knowledge on the concepts of principal stresses and principal strains.
3. To familiarize students with shear force, bending moment, bending stresses, and shear stresses developed in different sections of beams and shafts.
4. To impart various methods to find slope and deflection of beams.
5. To familiarize students with the analysis of stresses in thin and thick cylinders.

Course Outcomes:

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

1. Understand the behavior of materials under different external loading and support conditions.
2. Draw diagrams showing variations in axial forces, bending moments, and shear forces in structural members.
3. Acquire knowledge of bending concepts, calculate section modulus, and determine stresses developed in beams.
4. Analyze the deflection of beams under various loading conditions.
5. Assess stresses across sections in thin and thick cylinders and determine optimal sections to withstand internal pressure using Lame's equation.

UNIT –I

Simple Stresses &Strains : Elasticity and plasticity- Types of stresses & strains- Hooke's law, stress - strain diagram for mild steel - Working stress -Poisson's ratio & volumetric strain - Bars of varying section - composite bars - Temperature stresses- Relation between elastic constants, Strain energy - Resilience - Gradual, sudden, impact and shock loadings. Complex Stresses: Stresses on an inclined plane under different uniaxial and biaxial stress conditions - Principal planes and principal stresses – Mohr's circle – theories of failure

UNIT –II

Shear Force And Bending Moment: Definition of beam - Types of beams - Concept of shear force and bending moment - S.F and B.M diagrams for cantilever, simply supported

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and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads - Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT–III

Flexural Stresses : Theory of simple bending - Assumptions - Derivation of bending equation: M/ I = f/y= E/R Neutral axis – Determination of bending stresses - section module rectangular, circular sections (Solid and Hollow), I, T, Angle and Channel sections - Design of simple beam sections.

Shear Stresses: Derivation of formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT –IV

Deflection of Beams: Bending into a circular arc - slope, deflection and radius of curvature - Differential equation for the elastic line of a beam - Double integration and Macaulay's methods

- Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, uniformly distributed load, uniformly varying load. Mohr's theorems – application to simple cases including overhanging beams

UNIT –V

Thin Cylinders: Thin seamless cylindrical shells - Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and volumetric strains - changes in diameter, and volume of thin cylinders - Riveted boiler shells - Thin spherical shells.

Thick Cylinders: -Lame's equation - cylinders subjected to inside & outside pressures - compound cylinders

Text Books:

1. Bansal, R. K. (2018). Strength of Materials (6th ed.). Laxmi Publications.
2. Bhavikatti, S. S. (2021). Strength of Materials (5th ed.). Vikas Publishing House Pvt. Ltd.
3. Prakash Rao, D. S. (1999). Strength of Materials: A Practical Approach, Volume 1 (1st ed.). University Press India Pvt. Ltd.

Reference Books:

1. Popov, E. P. (2015). Engineering Mechanics of Solids (2nd ed.). Pearson Publishers.
2. Shah, H. J., & Junnarkar, S. B. (2012). Mechanics of Structures Vol. 1 (SoM) (30th ed.). Charotar Publishing House Pvt. Ltd.

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT03**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**SOIL MECHANICS**				

Course Learning Objectives

1. To enable the student to determine the index properties of soils and classify them accordingly.
2. To impart the concept of seepage through soils and determine water discharge characteristics.
3. To impart the principles of compaction and consolidation and evaluate settlement magnitude and rate.
4. To enable the student to understand shear strength concepts and determine shear parameters for sands and clays.
5. To introduce stress distribution in soils and its relevance to geotechnical design applications

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

1. Outline the formation of soils, identify index properties, and classify soils accurately.
2. Explain water flow behavior through soils and its impact on engineering properties.
3. Analyze stress distribution under various loading using classical and empirical methods.
4. Interpret compressibility characteristics and evaluate consolidation in different saturation conditions.
5. Evaluate shear strength parameters under different loading and drainage conditions for various soil types.

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 –

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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– Newmark'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. Arora, K. R. (2019). *Soil mechanics and foundation engineering* (7th reprint). Standard Publishers and Distributors.
2. Ranjan, G., & Rao, A. S. R. (2023). *Basic and applied soil mechanics* (5th ed.). New Age International Publishers.

REFERENCES:

1. Taylor, D. W. (1948). Fundamentals of soil mechanics. John Wiley & Sons.
2. Holtz, R. D., Kovacs, W. D., & Sheahan, T. C. (2023). An introduction to geotechnical engineering (3rd ed.). Pearson.
3. Das, B. M. (2022). Principles of geotechnical engineering (10th ed.). Cengage.

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT04**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**MECHANICS OF FLUIDS**				

Course Objectives:

1. To explain the basics of statics, kinematics, and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2. To impart the ability to solve engineering problems in fluid mechanics
3. To enable the students to measure quantities of fluid flowing in pipes, tanks, and channels
4. To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities, and forces.
5. To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

Course Outcomes:

On completion of the course, the students will be able to

1. Understand principles of fluid statics, kinematics, and dynamics
2. Apply the laws of fluid statics and concepts of buoyancy
3. Understand the fundamentals of fluid kinematics and differentiate types of fluid flow
4. Apply the principle of conservation of energy for flow measurement
5. Analyze the losses in pipes and discharge through the pipe network

UNIT-I

Basic concepts and definitions: Distinction between a fluid and a solid; Density, pecific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton's law of viscosity; Vapor pressure, Boiling point, Surfactantension, Capillarity, Bulk modulus of elasticity, Compressibility

UNIT–II

Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density, and altitude.Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Pressure gauges, Hydrostatic pressure and force: horizontal, vertical, and inclined surfaces. Buoyancy and stability of floating bodies

UNIT-III

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Fluid kinematics: Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, twoand three - Dimensional continuity equations in Cartesian coordinates.

UNIT-IV

FluidDynamics: Surfaceandbodyforces;Equationsofmotion-Euler'sequation;Bernoulli'sequation – Derivation; Energy Principle; Practical applications of Bernoulli's equation :Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

UNIT-V

Analysis Of Pipe Flow: Energy losses in pipelines; Darcy–Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length–Pipes in Parallel and Series.

Textbooks:

1. Bansal, R. K. (2024). A Text of Fluid Mechanics and Hydraulic Machines (11th ed.). Laxmi Publications Pvt. Ltd.
2. Sinha, S. S. (2024). Fundamentals of Fluid Mechanics. Ane Books Pvt. Ltd.
3. Modi, P. M., & Seth, S. M. (2022). *Hydraulics and Fluid Mechanics* (23rd ed.). Standard Book House.
4. Subrahmanya, K. (2018). *Theory and Applications of Fluid Mechanics* (2nd ed.). Tata McGraw Hill.

Reference Books:

1. Bansal, R. K. (2024). A Text of Fluid Mechanics and Hydraulic Machines (11th ed.). Laxmi Publications Pvt. Ltd.
2. Pillai, N. N. (2009). Principles of Fluid Mechanics and Fluid Machines (3rd ed.). Universities Press Pvt. Ltd.
3. White, F. M., & Xue, H. (2022). Fluid Mechanics (9th ed.). Tata McGraw Hill.
4. Ojha, C. S. P., Berndtsson, R., & Chandramouli, P. N. (2010). Fluid Mechanics and Machinery. Oxford University Press.

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT05**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**3**
Course Title:	**BUILDING MATERIALS AND TECHNIQUES**				

Course Learning Objectives:

1. To introduce various building materials.
2. To describe the properties and types of masonry.
3. To explain the types, importance, and properties of cement and lime.
4. To explain the structural and functional roles of building components.
5. To describe the various types of surface finishing techniques

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

1. Know various engineering properties of building materials and suggest their suitability.
2. Identify the functional role and types of masonry in building construction.
3. Acquire and apply basic knowledge about cement, lime, and supplementary materials.
4. Understand and identify major components of buildings such as floors, roofs, and stairs.
5. Recognize different types of finishing techniques such as plastering, painting, and damp proofing.

UNIT –I
STONES, BRICKS, TILES, WOODANDPAINTS
Stones: Classification of Stones–Properties of stones in structural requirements.
Bricks: Composition of good brick earth, various methods of manufacturing of bricks.
Tiles: Characteristics of good tile–Manufacturing methods, Types of tiles.

Wood: Structure– Properties–Seasoning of timber–Classification of various types of woods used in buildings – Defects in timber Paints: White washing and distempering, Constituents of paint – Types of paints – Painting of new and old wood – Varnish.

UNIT-II
MASONRY- Typesof masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.
WOOD: Structure – Properties- Seasoning of timber-Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiver

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– Reinforced Plastics, Steel, aluminum.

UNIT-III

LIMEANDCEMENTSUPPLEMENTATIONARYMATERIALS

Lime: Various ingredients of lime – Constituents of lime stone – classification of lime – various methods of manufacture of lime. Cement Supplementary materials like Silica fume, Fly ash, GGBS, Rice husk ash used and properties.

UNIT-IV

BUILDINGCOMPONENTS- Lintels, arches, vaults, staircases – types. Different types of floors – Concrete, Mosaic, and Terrazzo floors, Pitched, flat roofs, Lean-to roof, Coupled Roofs.Trussedroofs–King and Queen post Trusses, R.C.CRoofs, Madras Terrace and Pre-fabricated Roofs.

UNIT-V

FINISHINGS

Damp Proofing and waterproofing materials and uses – Plastering, Pointing, white washing, and distempering – Paints: Constituents of paint – Types of paints – Painting of new/old wood-Varnish. Form Works and Scaffoldings.

TEXTBOOKS:

1. Bhavikatti, S. S. (2012). *Building materials* (1st ed.). Vikas Publishing House
2. Punmia, B. C., Jain, A. K., & Jain, A. K. (2023). *Building materials*. Laxmi Publications.

REFERENCES:

1. Duggal, S. K. (2025). *Building materials* (6th ed.). New Age International Publishers
2. Varghese, P. C. (2017). *Building construction* (2nd ed.). PHI Learning.
3. Gambhir, M. L. (2017). *Building materials: Products, properties and systems* (1st ed.). McGraw Hill Education.

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT06**	**L**	**T**	**P**	**C**
		0	**1**	**2**	**2**
Course Title:	**BUILDING PLANNING AND DRAFTING**				

Course Objectives:

1. To introduce students to different building bye-laws and regulations.
2. To impart planning principles for residential and public buildings.
3. To provide hands-on training in drawing various architectural symbols and brick bonds.
4. To provide training in sketching different building components.
5. To develop the skills required to plan and represent various buildings graphically.

Course Outcomes:

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

1. Plan various types of buildings in accordance with standard building bye-laws.
2. Interpret the relationship between plan, elevation, and section and analyze building form and function.
3. Draw architectural symbols, signs, and brick bonds effectively.
4. Prepare drawings for different building units such as doors, windows, and roofs.
5. Acquire the skill to draw and plan buildings based on functional and user requirements.

Syllabus:

1. Detailing Drawing of Sign Conventions.
2. Detailing Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators & Roofs.
7. Drawing of a Line Diagram of Residential Buildings by using Building Bye-Laws.
8. Drawing of Plan, Elevation & Section from a lined diagram for a single-story building.
9. Drawing of Plan, Elevation, and Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

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Text Books:

1. Singh, G., & Singh, J. (1992). Building planning, designing, and scheduling. Standard Publishers Distributors.
2. Chakraborti, M. (2019). Building planning and drawing (9th ed.). Charotar Publishing House Pvt. Ltd.
3. Shah, M. G., Kale, C. M., & Patki, S. Y. (2017). Building drawing with an integrated approach to built environment. McGraw Hill Education.

Reference Books:

1. Verma, B. P. (2023). Civil engineering drawing and house planning (13th ed.). Khanna Publishers.
2. Singh, S. (2014). Civil engineering building practice. CBS Publishers & Distributors
3. Saha, G. C., & Jena, J. G. (2015). Building materials and construction (1st ed.). McGraw Hill Education (India) Pvt. Ltd

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Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT07**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**ESTIMATION AND COSTING**				

Course Learning Objectives:

1. To teach quantity surveying principles for preparing preliminary and detailed estimates.
2. To enable cost analysis of building components using standard rate analysis techniques.
3. To provide knowledge on computing areas and volumes in roads, canals, and earthworks.
4. To familiarize with contracts, valuation methods, and standard specifications in construction.
5. To inculcate systematic practices for record-keeping and estimation data management.

Course Outcomes:

1. Determine quantities of various components in a building.
2. Estimate the cost of construction components using rate analysis.
3. Compute areas and volumes in earthwork, road, and canal works.
4. Understand the basics of contracts, valuations, and standard specifications.
5. Prepare detailed estimates using both the Individual Wall and Centre Line methods.

SYLLABUS:

UNIT-I:
General items of work in buildings – Standard units – Principles of working out quantities for detailed and abstract estimates – Approximate methods of estimating.

UNIT-II
Rate analysis – Working out data for various items of work – Overhead and contingent charges – Reinforcement bar bending and bar requirement schedules.

UNIT-III
Computation of Areas and Volumes: Area from field notes, computation along irregular and regular boundaries. Embankments and cutting for level and two-level sections (with and without transverse slopes), volume of barrow pits, earthwork for roads and canals. Contracts:

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		online	online		

Types of contracts, contract documents, conditions of contract. Valuation: Valuation of buildings. Specifications: Standard specifications for different items of building construction.

UNIT-IV

Detailed estimation of buildings using the Individual Wall Method.

UNIT-V

Detailed estimation of buildings using Centre Line Method.

TEXTBOOKS:

1. Dutta, B. N. (2020). Estimating and Costing (28th ed.). UBS Publishers.
2. Patil, B. S. (2015). Civil Engineering Contracts and Estimates (4th ed.). Universities Press (India) Pvt. Ltd.
3. Gupta, R. (2014). Construction Planning and Technology (2nd ed.). CBS Publishers & Distributors Pvt. Ltd.

REFERENCES:

1. Public Works Department. (2022). Standard Schedule of Rates and Standard Data Book (Vols. 1 & 2).
2. Bureau of Indian Standards. (1974). IS 1200: Method of Measurement of Building and Civil Engineering Works (Parts I to XXV). B.I.S.
3. Chakraborthi, M. (2006). Estimation, Costing and Specifications (29th ed.). Laxmi Publications.
4. Kohli, R. C. (2013). Estimation and Costing (13th ed.). S. Chand Publications.
5. Rethaliya, R. P. (2018). Estimating, Costing and Valuation (1st ed.). Atul Prakashan.

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BONAM VENKATA CHALAMAYYA ENGINEERING (A),
ODALAREVU
DEPARTMENT OF CIVIL ENGINEERING

Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT08**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**SUSTAINABLE MATERIALS AND GREEN BUILDING**				

Course Learning Objectives

1. To understand sustainability concepts in construction materials and ecological systems.
2. To explore eco-friendly alternatives to traditional building materials.
3. To study recycled aggregate processing and sustainable brick-making techniques.
4. To examine health, environmental, and radiation impacts of building materials.
5. To gain knowledge of ECBC codes, green rating systems, and sustainable construction.

Course Outcomes:

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

1. Explain ecological footprint, bio-capacity, global hectare, and Earth's natural systems.
2. Discuss conventional and low-carbon construction materials like concrete and bricks.
3. Illustrate properties and classification of recycled aggregates.
4. Identify radiation-related hazards in conventional building materials.
5. Appraise ECBC 2007, OTTV methodology, and sustainable energy solutions in construction.

SYLLABUS:

UNIT–I:

Basics of Material Sustainability: Ecological footprint, bio-capacity, global hectare, planet equivalent, earth natural system, CO_2 emissions, basics of the carbon cycle, factors affecting the carbon cycle, urban environment, fundamentals of sustainability, life cycle assessment, role of materials and primary energy, secondary energy, embodied energy, energy analysis, factors affecting material sustainability, ecological footprint and bio-capacity calculation, equivalent factor, yield factor, role of cement in sustainability, and chemical exergy calculation.

UNIT–II:

Sustainability in Cement Usage: Fuel required for cement production, cementitious/supplementary cementitious materials and their characterization, strength of concrete, types of composite cements, alternative fuel for cement, life cycle embodied energy

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and concrete sustainability, use of admixtures, curing methods, and use of wastewater for mixing and curing.

UNIT–III:

Recycled Aggregates and Clay Bricks: Processing and classification of recycled aggregates, crushing and grinding of aggregates, Bond's law, operational energy, thermal conductivity models, thermal diffusivity, types of clay bricks, and comparison of various types of brick kilns.

UNIT–IV:

Ill-effects of Building Materials and Radiation: Carbon balance, paints, adhesives, sealants, health hazards of building materials, emission models and testing, energy-efficient design of buildings, design optimization, urban heat island effect, radiation concepts, and evapotranspiration theory and models.

UNIT–V:

Energy Conservation and Formwork Basics: Energy Conservation Building Code (ECBC 2007), ECBC-compliant methodology, OTTV methodology, solar energy and solar PV cells, solar water heating, green design strategies, green building rating systems, Autoclaved Aerated Concrete (AAC), insulated precast systems and forms, insulated concrete form, tunnel form, and modular construction.

TEXTBOOKS

1. Newman, J., & Choo, B. S. (2003). Advanced Concrete Technology – Processes (1st ed.). Elsevier.
2. Kubba, S. (2010). LEED Practices, Certification, and Accreditation Handbook (1st ed.). Elsevier.
3. Indian Building Congress. (2008). Practical Handbook on Energy Conservation in Buildings (1st ed.). Nabhi Publications.

REFERENCES

1. Venkatarama Reddy, B. V., & Jagadish, K. S. (2003). Embodied energy of common and alternative building materials. *Energy and Buildings*, 35, 129–137.
2. Bureau of Energy Efficiency. (2018). *Energy Conservation Building Code – Revised Version*. Ministry of Power, Government of India.

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BONAM VENKATA CHALAMAYYA ENGINEERING (A),
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DEPARTMENT OF CIVIL ENGINEERING

Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT09**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**SAFETY IN CONSTRUCTION**				

Course Learning Objectives

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

1. To introduce the fundamentals of safety in the construction industry.
2. To explain safety practices across various construction operations.
3. To familiarize with safety standards for material handling and equipment usage.
4. To provide knowledge on applicable construction safety laws and codes.
5. To build awareness of worker welfare and legal safety provisions in construction.

Course Outcomes

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

1. Understand safety issues and human factors influencing construction sites.
2. Apply safety measures for excavation, demolition, tunneling, and confined spaces.
3. Explain safety protocols in material handling and storage.
4. Apply safe practices for using construction equipment and power systems.
5. Describe relevant labor laws, safety regulations, and legal codes in construction.

UNIT–I:

Introduction to the Construction Industry and Safety Management:

Introduction to the construction industry – Safety issues in construction – Human factors in construction safety – Roles of various groups in ensuring safety – Framing contract conditions related to safety – Relevance of ergonomics in construction safety.

UNIT–II:

Safety in Construction Operations and Standards: Safety in excavation, underwater works, underpinning, and shoring – Ladders and scaffolds – Tunneling – Blasting – Demolition – Pneumatic caissons – Confined spaces – Temporary structures – Indian Standards and National Building Code provisions on construction safety.

UNIT–III:

Safety in Material Handling and Storage:

Safety practices in handling construction materials – Safety in storage and stacking of materials at construction sites.

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UNIT – IV

Safety in Construction Equipment Usage:

Safe use of vehicles, cranes, tower cranes, lifting gears, hoists, lifts, wire ropes, pulley blocks, mixers, conveyors – Pneumatic and hydraulic tools – Safety in temporary power supply.

UNIT – V

Construction Labor Laws and Welfare Regulations:

Contract Labor (Regulation & Abolition) Act and Central Rules – Definitions – Registration of establishments – Licensing of contractors – Health and welfare provisions – Penalties and wagerules.Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and Central Rules, 1998 – Applicability – Administration – Welfare Board and Fund – Worker training – General safety, health, and welfare provisions – Penalties.

Text Books:

1. Bureau of Indian Standards. (2016). National Building Code of India 2016 (SP-7; Vols. 1 & 2).
2. Verma, B. P. (2023). Civil engineering drawing and house planning (13th ed.). Khanna Publishers.
3. Saha, G. C., & Jena, J. G. (2015). Building materials and construction (1st ed.). McGraw Hill Education (India) Pvt. Ltd

Reference Books:

1. Government of India. (1971). Contract Labor (Regulation & Abolition) Act, 1970 with Central Rules, 1971.
2. Government of India. (1998). Building and Other Construction Workers (RE&CS) Act, 1996 and Central Rules, 1998.
3. Reese, C. D., & Eidson, J. V. (1999). Handbook of OSHA construction safety and health. Taylor & Francis.
4. MacCollum, D. V. (1995). Construction safety planning. John Wiley & Sons.

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DEPARTMENT OF CIVIL ENGINEERING

Regulation	**BR23**				
Minor Degree	**Course Code: 23CEMT10**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
Course Title:	**CONSTRUCTION PLANNING AND MANAGEMENT**				

Course Learning Objectives

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

1. To introduce the fundamentals of construction project management, including planning, scheduling, and monitoring techniques.
2. To familiarize with project evaluation methods, cost/resource optimization, and software tools like Primavera.
3. To impart knowledge on earthwork, hoisting, hauling, and material handling equipment.
4. To explain the processes and machinery for concrete production, placement, and finishing.
5. To build an understanding of modern construction methods, safety practices, and BIM applications.

Course Outcomes

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

1. Understand construction planning, scheduling, coordination, and monitoring techniques.
2. Apply PERT, CPM, crashing, and resource optimization using project management tools.
3. Analyze operation and economics of earthmoving and material handling equipment.
4. Explain the working of concreting equipment and concrete placement techniques.
5. Understand construction methods, safety measures, and the role of BIM in modern construction.

UNIT–I:

Construction Project Management: Construction project management and its importance – Qualities of a good project manager – Project planning, coordination, scheduling, and monitoring – Bar charts – Milestone charts – Critical Path Method (CPM).

UNIT–II:

Project Evaluation and Resource Management: Project Evaluation and Review Technique (PERT) – Cost analysis – Project crashing for optimum cost and resources – Resource allocation – Introduction to project management software – Application of PRIMAVERA or equivalent tools.

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UNIT–III:

Earthmoving and Material Handling Equipment: Construction equipment and economic considerations – Earthwork equipment – Trucks and handling equipment – Rear dump trucks – Capacity and productivity calculations – Compaction equipment – Rollers and types – Hoisting and earthwork equipment: hoists, cranes, tractors, bulldozers, graders, scrapers, draglines, clam shell buckets.

UNIT–IV:

Concreting Equipment and Techniques: Concrete production: Batching plants, mobile units (e.g., AJAX), mixers – Mixing, placing, consolidating, and finishing of concrete – Equipment used in concreting operations.

UNIT–V:

Construction Methods and Safety: Construction methods: Earthwork, piling, concrete placement, formwork, fabrication and erection – Quality control – Safety engineering – Introduction to BIM (Building Information Modelling) for civil engineering applications

Text Books:

1. Peurifoy, R. L., Schexnayder, C. J., & Shapira, A. (n.d.). Construction planning, equipment, and methods. Tata McGraw Hill. 2009.
2. Jha, K. N. (2011). Construction project management: Theory and practice. Pearson Education.
3. Sarkar, S. K., & Sarasvati, S. (n.d.). Construction technology. Oxford University Press. 2012.

Reference Books:

1. Fewings, P. (2019). Construction project management: An integrated approach (3rd ed.). Routledge.
2. Williams, T. (2009). Construction management: Emerging trends & technologies. Delmar Cengage Learning.

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