



**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY &  
SCIENCE(AUTONOMOUS)  
DEPARTMENT OF CIVIL ENGINEERING**

B. Tech III Year I Semester

**B. TECH CIVIL ENGINEERING BR23- III YEAR COURSE STRUCTURE**

S.no	Category	Course Code	Title	L	T	P	Credits
1	PCC	23CE5T01	Design and Drawing of Reinforced Concrete Structures	3	0	0	3
2	PCC	23CE5T02	Engineering Hydrology	3	0	0	3
3	PCC	23CE5T03	Geotechnical Engineering -I	3	0	0	3
4	PE-1	23CE5D01	1.Advanced structural analysis	3	0	0	3
		23CE5D02	2.Architecture and town planning	3	0	0	3
		23CE5D03	3.Construction Technology and Management	3	0	0	3
		23CE5D04	4. MOOCs (NPTEL/ Swayam) Course (12 Week duration)	3	0	0	3
		23HM5E01	OR 1.Entrepreneurship Development & Venture Creation	3	0	0	3
5	OE-1	23CE5E01	2.Green Buildings	3	0	0	3
		23CE5E02	3.Construction technology and management	3	0	0	3
		23CE5E03	4.Climate Change impact on Eco system	3	0	0	3
		23CE5L01	Geotechnical Engineering Lab	0	0	3	1.5
6	PCC	23CE5L02	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	1.5
7	PCC	23SC5L01	Estimation, Specifications & Contracts	0	1	2	2
8	SEC	23ES5L01	Tinkering Lab	0	0	2	1
9	ES	23CE5I01	Evaluation of Community Service Internship	-	-	-	2
Total				15	1	10	23
11	MC	23CSMT02	Minor Course (Student may select from the same specialized minors pool)	3	0	3	4.5
12	MC	23CSML01	Minor Course through SWAYAM / NPTEL (Minimum 12 Week, 3 credit course)	3	0	0	3

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**B. TECH CIVIL ENGINEERING BR23- III YEAR COURSE STRUCTURE**

**B. Tech III Year II Semester**

S.no	Category	Course Code	Title	L	T	P	Credits
1	PC	23CE6T01	Design and Drawing of Steel Structures	3	0	0	3
2	PC	23CE6T02	Highway Engineering	3	0	0	3
3	PC	23CE6T03	Environmental Engineering	3	0	0	3
4	PE-II	23CE6D01	1.Ground Improvement Techniques	3	0	0	3
		23CE6D02	2. Repair and Rehabilitation of Structures	3	0	0	3
		23CE6D03	3.Valuation and Quantity Survey	3	0	0	3
		23CE6D04	4. MOOCs (NPTEL/ Swayam) Course (12 Week duration)	3	0	0	3
5	PE-III	23CE6D05	1.Finite element method	3	0	0	3
		23CE6D06	2.Bridge Engineering	3	0	0	3
		23CE6D07	3.Water Resource Engineering	3	0	0	3
		23CE6D08	4.MOOCs (NPTEL/ Swayam) Course (12 Week duration)	3	0	0	3
6	OE-II	23CE6E01	1.Disaster management	3	0	0	3
		23CE6E02	2.Sustainability in Engineering practices	3	0	0	3
		23CE6E03	3.Water Supply Systems	3	0	0	3
7	PC	23CE6L01	Environmental Engineering lab	0	0	3	1.5
8	PC	23CE6L02	Highway Engineering lab	0	0	3	1.5
9	SEC	23SC6L01	CAD Lab	0	1	2	2
Total				18	1	08	23
10	AC	23NC6T01	Technical paper writing & IPR	2	0	0	-
Mandatory Industry Internship of 08 weeks duration during summer vacation							
11	MC	23CSMT03	Student may select from the same minors pool	3	0	3	4.5
12	MC	23CSML02	Minor Course (Student may select from the same specialized minors pool)	3	0	0	3

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**OPEN ELECTIVES**

S.NO	Category	Titles
1	Open Elective -1	1.Green Buildings 2.Construction technology and management 3. Climate Change impact on Eco system
2	Open Elective-2	1.Disaster management 2.Sustainability in Engineering practices 3.Water Supply Systems
3	Open Elective-3	1.Building technology for engineers 2.Environmental impact assessment
4	Open Elective-4	1.Geo-Spatial Technologies 2. Solid waste management

**Minors Degree**

1. Surveying
2. Mechanics of solids
3. Soil Mechanics
4. Fluid Mechanics
5. Civil Engineering- Building Materials and Construction
6. Building Planning and drawing
7. Estimation and Costing
8. Sustainable Materials and Green building
9. Safety in Construction
10. Construction planning and Management

Web link for NPTEL courses: <https://nptel.ac.in/courses>

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<b>REGULATION</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23CE5T01</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>	<b>Course Title: DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES</b>				

**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:**

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

- a. Work on different types of design philosophies
- b. Carryout analysis and design of flexural members and detailing
- c. Design structures subjected to shear, bond, and torsion.
- d. Design different type of compression members and footings.

**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 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.

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<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES</b>				

**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 every week and the Following plates should be prepared by the students.

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

**FINAL EXAMINATION PATTERN:**

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

**TEXTBOOKS:**

1. 'Limit State Design' by A. K. Jain, 8<sup>th</sup> Edition 2024.
2. 'Reinforced Concrete Structures' by S. UnniKrishna Pillai & Devdas Menon, Tata Mc. Graw Hill, New Delhi, 4<sup>th</sup> Edition 2021.

**REFERENCES:**

1. 'Design of concrete structures' by N. Krishna Raju ,4<sup>th</sup> Edition 2016
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons, 1<sup>st</sup> Edition 1995.

**IS Codes:**

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

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REGULATION	BR23	L	T	P	C
III B. TECH	Course Code: 23CE5T02	3	0	0	3
I SEMESTER	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 hydraulics.

**Course Outcomes:**

At the end of the course the students are expected to

- a. Have a thorough understanding of the theories and principles governing the hydrologic processes.
- b. Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
- c. Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
- d. Develop design storms and conduct frequency analysis.
- e. Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.
- f. Develop unit hydrograph and synthetic hydrograph.
- g. Estimate flood magnitude and conduct flood routing.
- h. Determine aquifer parameters and yield of wells.

**SYLLABUS:**

**UNIT - I**

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

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

**UNIT-II**

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

IC S MADAN DD & BOS, tment of Civil gineering, S Batlapalem	Dr G Yesuratnam Professor of Civil Engineering JNTU Kakinada (University Nomine)	Dr A Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi.	Dr B Raghuram kadali, Asst Assistant Professor, Department of civil Engineering, NIT Warangal.	Mr P Rajesh Sr Engineer(P)SDVVL Survey &Constructions, Kakinada (Industrial Expert)	Mr Chakradhar Prasad Assistant Professor, Department of civil DNR College of Engineering Technology Bhimavaram. (Alumni Member)





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<b>III B. TECH</b>	<b>Course Code: 23CE5T02</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>ENGINEERING HYDROLOGY</b>				

**UNIT-III.**

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

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

**UNIT-IV**

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

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

**UNIT-V**

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

**TEXTBOOKS:**

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, 6<sup>th</sup> Edition 2024.
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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<b>III B. TECH</b>	<b>Course Code: 23CE5T03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>GEOTECHNICAL ENGINEERING -I</b>				

**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. Import 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 the shear strength of soil at different loading & drainage conditions for different soils.

**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

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<b>III B. TECH</b>	<b>Course Code: 23CE5T03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>GEOTECHNICAL ENGINEERING -I</b>				

**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. 'Soil Mechanics and Foundation Engineering by K.R. Arora, Standard Publishers and Distributors, New Delhi, standard edition 2020
2. Soil Mechanics and Foundation Engineering' by V.N.S. Murthy, CBS publishers, 3<sup>rd</sup> Edition 2017
3. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers, 5<sup>th</sup> Edition 2017
4. 'Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R. Rao, New Age International Publishers, 3<sup>rd</sup> Edition 2016

**REFERENCES:**

1. 'Fundamentals of Soil Mechanics' by D.W. Taylor., Wiley, 20 July 2013
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall, 2<sup>nd</sup> 2013
3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learning 2<sup>nd</sup> edition 2022

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REGULATION	BR23	L	T	P	C
III B. TECH	Course Code: 23CE5D01	3	0	0	3
ISEMESTER					
Course Title:	ADVANCED STRUCTURAL ANALYSIS				

**Course Outcomes:**

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

1. Differentiate Determinate and Indeterminate Structures
2. Carry out lateral Load analysis of structures.
3. Analyze Cable and Suspension Bridge structures.
4. Analyze structures using Moment Distribution, Kani's Method
5. Analyze structures using the Matrix method.

**UNIT-I**

**Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem- Deflections of simple beams and pin jointed plane trusses.

**INDETERMINATE TRUSSES:** Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies – Castigliano's second theorem.

**UNIT-II**

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

**UNIT – IV 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 – V Moment Distribution Method:** Analysis of Portal frames – including Sway- Substitute frame analysis by two cycles. Sloped deflection method: Analysis of Portal frames – including Sway. Analysis of inclined frames. Shear force and bending moment diagrams - Elastic curve.

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ISEMESTER					
Course Title:	ADVANCED STRUCTURAL ANALYSIS				

**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.

**Text Books:**

1. Structural Analysis by R.C. Hibbeler, Pearson, New Delhi, 10<sup>th</sup> Edition 2017.
2. Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi, 5<sup>th</sup> Edition 1994.

**References:**

1. Mechanics of Structures Vol – II by H.J. Shah and S.B. Junnarkar, Charotar Publishing House Pvt. Ltd, 24<sup>th</sup> Edition 2015.
2. Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd, 1<sup>st</sup> Edition 2020.
3. Structural Analysis: A Matrix Approach, G.S. Pandit and S.P. Gupta, Mc Graw Hill Pvt Ltd, 2<sup>nd</sup> Edition 2002.

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DEPARTMENT OF CIVIL ENGINEERING

<b>REGULATION</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23CE5D02</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ISEMESTER</b>					
<b>Course Title:</b>	<b>ARCHITECTURE AND TOWN PLANNING</b>				

**Course Learning Objectives:**

The objectives of this course are:

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

**Course Outcomes:**

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

- a. Distinguish architectural styles of eastern and western world.
- b. Understand the importance of Orders of architecture.
- c. Composed spaces of buildings using design concepts, planning principles.
- d. Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities.

**UNIT-I**

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

**Temples of Religions:** Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhubaneshwar, Mount Abu. Indo Arsenic (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.

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<b>III B. TECH</b>	<b>Course Code: 23CE5D02</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>ISEMESTER</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Title:</b>	<b>ARCHITECTURE AND TOWN PLANNING</b>				

### UNIT-III

**Historical Background 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 , 2<sup>nd</sup> Edition 2023.
2. 'Planning and Design of Buildings by Section of Architecture' by Y.S. Sane, 2<sup>nd</sup> Edition 2022.
3. 'Professional Practice'by G.K. Krishnamurthy, S.V.Ravindra, PHI Learning, New Delhi, 2020.
4. 'Indian Architecture–Vol.I&II'byPercy Brown, Taraporevala Publications, Bombay,2018.
5. 'Fundamentals of Town Planning' by G.K.Haraskar,2017.

### REFERENCES:

1. 'Drafting and Design for Architecture'by Hepler, Cengage Learning,5<sup>th</sup> edition 1986.
2. 'Architect's Portable Handbook' by John Patten Guthrie–McGraw Hill International Publications,2012.
3. 'Modern Ideal Homes for India'by R.S.Deshpande,1939
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard,1990.
5. 'Town Design'by Federik Glbbard, Architectural press, London,2000.

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IIT Tirupathi.

Dr B Raghuram  
kadali, Asst  
Assistant Professor,  
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civil Engineering,  
NIT Warangal.

Mr P Rajesh Sr  
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&Constructions,  
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(Industrial Expert)

Mr Chakradhar Prasad  
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Engineering Technology  
Bhimavaram.  
(Alumni Member)

*[Handwritten signatures of the above faculty members]*



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<b>III B. TECH</b>	<b>Course Code: 23CE5D03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>ISEMESTER</b>	<b>CONSTRUCTION TECHNOLOGY &amp; MANAGEMENT</b>				
<b>Course Title:</b>					

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

1. I 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 concrete.
4. Apply the gained knowledge to project management and construction techniques.

**UNIT-I**

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

**UNIT-II**

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

**UNIT-III**

Construction equipment – economic 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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REGULATION	BR23	L	T	P	C
III B. TECH ISEMESTER	Course Code: 23CE5D03	3	0	0	3
Course Title:	CONSTRUCTION TECHNOLOGY & MANAGEMENT				

### 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)

### TEXT BOOKS:

1. 'Construction Technology' by Subir K. Sarkar and Subhajit Sarasvati, Oxford University press, 2<sup>nd</sup> Edition 2018.
2. 'Construction Project Management Theory and Practice' by Kumar Neeraj Jha (2011), Pearson, 2<sup>nd</sup> Edition.
3. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder, Shapira, Tata McGraw hill, 7<sup>th</sup> Edition 2010.

### REFERENCES:

1. 'Construction Project Management-An Integrated Approach' by Peter Fewings, Taylor, and Francis, 2<sup>nd</sup> Edition 2013.
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams, Cengage learning, 1<sup>st</sup> Edition 2019.

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<b>REGULATION</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23CE5E01</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>GREENBUILDINGS</b>				

**UNIT - 1:**

**Introduction**

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

**UNIT - 2:**

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

**UNIT-3:**

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

**UNIT- 4:**

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

**UNIT -5:**

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

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REGULATION	BR23				
III B. TECH	Course Code: 23CE5E01	L	T	P	C
I SEMESTER		3	0	0	3
Course Title:	GREENBUILDINGS				

**Text Books:**

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

**References:**

1. Complete Guide to Green Buildings by Trish riley ,2007.
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009.

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<b>REGULATION</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23CE5E02</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b>				

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

1. I 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. 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–crashing for optimum resources–allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent.

**UNIT-III**

Construction equipment – economic 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–draglines clam shell buck

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<b>III B. TECH</b>	<b>Course Code: 23CE5E02</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>CONSTRUCTION TECHNOLOGY AND MANAGEMENT</b>				

**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)

**TEXT BOOKS:**

1. 'Construction Technology' by Subir K. Sarkar and Subhajit Sarasvati, Oxford University press, 2<sup>nd</sup> Edition 2018.
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<b>III B. TECH</b>	<b>Course Code: 23CE5E03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>CLIMATE CHANGE IMPACT ON ECO-SYSTEM</b>				

**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.Climate Change Impact on Ecosystem by J. Sundaresan, S. Sreekesh, A.L. Ramanathan, Lenand Sonnenschen & R. Boojh, Scientific Publishers.
- 2.Climate Change Impacts on Freshwater Ecosystems 1st Edition, Kindle Edition by Martin Kernan (Editor), Richard W. Battarbee (Editor), Brian R. Moss (Editor) Format: Kindle Edition, ASIN: B005C64YTK Publisher: Wiley-Blackwell; 1st edition (9 June 2011)
- 3.Climate Change Impacts on Natural Resources, Ecosystems and Agricultural Systems Book © 2023, Editors: Chaitanya B. Pande, Kanak N. Moharir, Sudhir Kumar Singh, Quoc Bao Pham, Ahmed Elbeltagi, Part of the book series: Springer Climate (SPCL)

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**REFERENCES:**

1.Environment, Energy and Climate Change Author: Nawnheet Vibhaw ISBN: 9789389991208 EDITION: 1st NO. OF VOLUMES: 1 COPYRIGHT YEAR: 2020

2.Climate and ecosystems by Schimel, David Steven, Princeton: Princeton University Press, [2013]

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<b>REGULATION</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23CE51.01</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>GEOTECHNICAL ENGINEERING LAB</b>				

**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 determine parameters of soil through different laboratory tests.

**Outcomes:**

- a) Upon successful completion of this course, student will be able to
- b) Determine index properties of soil and classify them.
- c) Determine permeability of soils.
- d) Determine Compaction, Consolidation, and shear strength characteristics.

**SYLLABUS:**

**LIST OF EXPERIMENTS**

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Permeability of soil-Constant and Variable head tests
6. Compaction test
7. Consolidation test (to be demonstrated)
8. Direct Shear test
9. Triaxial Compression test
10. Unconfined Compression test
11. Vane Shear test
12. Differential free swell (DFS)
13. Field Plate Load Test Demo
14. Field CBR demo

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REGULATION	BR23	L	T	P	C
III B. TECH I SEMESTER	Course Code: 23CE5L01	0	0	3	1.5
Course Title:	GEOTECHNICAL ENGINEERING LAB				

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

**LIST OF EQUIPMENT:**

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrink age limits.
3. Field density apparatus for
  - a) Core cutter method.
  - b) Sand replacement method.
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for
  - a) Constant head test
  - b) Variable head test
7. Universal auto compactor 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 consolidation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38mm Dia specimens.
13. Box shear test apparatus.
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 50<sup>0</sup>-150<sup>0</sup>C)
16. Field plate load Test equipment
17. Field CBR test equipment

**References:**

1. 'Determination of Soil Properties 'by J.E. Bowles.
2. IS Code 2720 –relevant parts.

Dr M C S MADAN HOD & BOS, Department of Civil Engineering, BVCITS Batlapalem	Dr G Yesuratnam Professor of Civil Engineering JNTU Kakinada  (University Nomine)	Dr A Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi.	Dr B Raghuram kadali, Asst Assistant Professor, Department of civil Engineering, NIT Warangal.	Mr P Rajesh Sr Engineer(P)SDVVL Survey &Constructions, Kakinada  (Industrial Expert)	Mr Chakradhar Prasad Assistant Professor, Department of civil DNR College of Engineering Technology Bhimavaram. (Alumni Member)



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REGULATION	BR23	L	T	P	C
III B. TECH I SEMESTER	Course Code: 23CE51.02	0	0	3	15
Course Title: .	FLUID MECHANICS AND HYDRAULIC MACHINES LAB				

1. Verification of Bernoulli's equation.
2. Calibration of Venturi meter.
3. Calibration of orifice meter.
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 pipe line.

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<b>Regulation</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23SC51.01</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>ESTIMATION, SPECIFICATION AND CONTRACTS</b>				

**Course Learning Objectives:**

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

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

**Course Outcomes:**

Upon successful completion of this course:

- a. The student should be able to determine the quantities of different components of buildings.
- b. The student should be in a position of find the cost of various building components.
- c. The student should be capable of finalizing the value of structures.

**UNIT-I**

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

**UNIT-II**

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

**UNIT-III**

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

**UNIT-IV**

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

**UNIT-V**

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

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Regulation	BR23	L	T	P	C
III B. TECH I SEMESTER	Course Code: 23SC5L01	0	1	2	2
Course Title:	ESTIMATION, SPECIFICATION AND CONTRACTS				

**TEXTBOOKS:**

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.
3. 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4. 'Estimating and Costing' by G.S. Birdie.

**REFERENCES:**

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

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<b>Regulation</b>	<b>BR23</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>III B. TECH</b>	<b>Course Code: 23ES5L01</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>I SEMESTER</b>					
<b>Course Title:</b>	<b>TINKERING LAB</b>				

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.
- 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

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<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>



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Regulation	BR23	L	T	P	C
III B. TECH I SEMESTER	Course Code:23ES5L01	0	0	2	1
Course Title:	TINKERING LAB				

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	L	T	P	C
III B. TECH I SEMESTER	Course Code: 23CE5I01	-	-	-	2
Course Title:	EVALUATION OF COMMUNITY SERVICE INTERNSHIP				

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REGULATION	BR23	L	T	P	C
III B. TECH		3	0	0	3
II SEMESTER	Course Code: 23CE6T01				
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

- a. Analyze and design steel structural members with relevant IS codes
- b. Carryout analysis and design of flexural members and detailing
- c. Design compression members of different types with connection detailing
- d. Design Plate Girder and Gantry Girder with connection detailing
- e. 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.

**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

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<b>REGULATION</b>	<b>BR23</b>				
<b>III B. TECH</b>	<b>Course Code: 23CE6T01</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>II SEMESTER</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Title:</b>	<b>DESIGN AND DRAWING OF STEEL STRUCTURES</b>				

**UNIT – IV**

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

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

**UNIT – V**

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

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

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

Plate 1 Detailing of simple beams

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

Plate 3 Detailing of Column including lacing and battens.

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

Plate 5 Detailing of steel roof trusses including joint details.

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

Plate 7 Detailing of gantry girder.

**FINAL EXAMINATION PATTERN:**

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

**TEXTBOOKS**

1. 'Design of steel structures' by S.K. Duggal, Tata McGraw Hill, and New Delhi ,3rd Edition 1 July 2017.
2. 'Design of Steel Structures' by Ramachandra, Vol – 1, Universities Press, 18th Edition 1 January 2016.
3. Steel Structures Design and Practice' by N. Subramanian, Oxford University Press, 27 August 2010.

**REFERENCES**

1. 'Structural Design in Steel' by SarwarAlamRaz, New Age International Publishers, New Delhi, 3<sup>rd</sup> Edition 2020.
2. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers, 1<sup>st</sup> Edition 2012.
3. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill, 3<sup>rd</sup> Edition 2017.
4. 'Structural Design and Drawing' by N. Krishna Raju; University Press.

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REGULATION	BR23				
III B. TECH II SEMESTER	Course Code: 23CE6T02	L	T	P	C
Course Title: HIGHWAY ENGINEERING		3	0	0	3

**Course Learning Objectives:**

The objectives of this course are:

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

**Course Outcomes:**

Upon 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. Judge suitability of pavement materials and design flexible and rigid pavements

**UNIT I**

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

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

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

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<b>REGULATION</b>	<b>BR23</b>				
<b>III B. TECH</b>	<b>Course Code: 23CE6T02</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>II SEMESTER</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Title:</b>	<b>HIGHWAY ENGINEERING</b>				

**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–Rigid pavements 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, 2013th Edition 1 January2013.
- 2.Traffic Engineering and Transportation Planning, KadiyaliL. R, Khanna Publishers, New Delhi, 1 January1999
3. highway engineering by Khanna and Justo,10<sup>th</sup> Edition 2018.

**REFERENCES:**

- 1.Principles of Highway Engineering, KadiyaliL. R, Khanna Publishers, New Delhi, 2019.
- 2.Principles of Transportation Engineering, Partha Chakraborty and Animesh Das, PHI Learning Private Limited, Delhi,2012.

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REGULATION	BR23	L	T	P	C
III B. TECH II SEMESTER	Course Code: 23CE6T03	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 wastewater treatment and disposal

**Course Outcomes:**

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

- a. Plan and design the water and distribution networks and sewerage systems
- b. Able to identify the appropriate source of water based on quality and quantity requirements
- c. Select a suitable treatment for raw water treatment as well as sewage treatment
- d. 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 demand and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.

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

**UNIT-II**

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

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

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<b>III B. TECH</b>	<b>Course Code: 23CE6T03</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>II SEMESTER</b>					
<b>Course Title:</b>	<b>ENVIRONMENTAL ENGINEERING</b>				

### UNIT-III

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

### UNIT-IV

#### Planning and Design of Sewerage System

Characteristics and composition of sewage — population equivalent -Sanitary sewage flow estimation — Sewer materials — Hydraulics of flow in sanitary sewers — Sewer design — Storm drainage-Storm runoff estimation — sewer appurtenances — corrosion in sewers — prevention and control — sewage pumping-drainage in buildings-plumbing systems for drainage **Primary Treatment of Sewage**

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

### UNIT-V

#### Secondary Treatment of Sewage

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

#### Disposal of Sewage

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

### TEXT BOOKS

1. 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.

### REFERENCES

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

Dr M C S MADAN HOD &BOS, Department of Civil Engineering, BVCITS Batlapalem	Dr G Yesuratnam Professor of Civil Engineering JNTU Kakinada (University Nomine)	Dr A Murali Krishna, Professor, Department of Civil Engineering, IIT Tirupathi.	Dr B Raghuram kadali, Asst Assistant Professor, Department of civil Engineering, NIT Warangal.	Mr P Rajesh Sr Engineer(P)SDVVL Survey &Constructions, Kakinada (Industrial Expert)	Mr Chakradhar Prasad Assistant Professor, Department of civil DNR College of Engineering Technology Bhimavaram. (Alumni Member)



**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE**  
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DEPARTMENT OF CIVIL ENGINEERING

REGULATION	BR23	L	T	P	C
III B. TECH II SEMESTER	Course Code: 23CE6D01	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 adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.
2. To make the student understand how the reinforced earth technology and soil nailing can obviate the problems posed by the conventional retaining walls.
3. To enable the students to know how geotextiles and geo synthetics can be used to improve the engineering performance of soils.
4. To make the student learn the concepts, purpose and effects of grouting.

**Course Outcomes:**

- a. By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability for different field situations.
- b. The student should be able to design are in forced earth embankment and check its stability.
- c. The student should know the various functions of Geosynthetics and their applications in Civil Engineering practice.
- d. The student should be able to understand the concepts and applications of grouting.

**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 – insitu densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

**UNIT-II**

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

**UNIT- III**

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

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REGULATION	BR23	L	T	P	C
III B. TECH II SEMESTER	Course Code: 23CE6D01	3	0	0	3
Course Title:	GROUND IMPROVEMENT TECHNIQUES				

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

#### UNIT-IV

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

#### UNIT-V

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

#### TEXT BOOKS:

1. 'Ground Improvement Techniques' by Nihar Ranjan Patro, Vikas Publishing House(p) limited, New Delhi, 1st Edition 2012.
2. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L. Siva Kumar Babu, Universities Press, 22 June 2005.
3. 'Ground Improvement Techniques' by Purus Hotham Raj, Laxmi Publications, New Delhi, 1st Edition 1 January 1999.

#### REFERENC EBOOKS:

1. 'Ground Improvement' by MP Moseley, Blackie Academic and Professional, USA, 3<sup>rd</sup> Edition 1981.
2. 'Designing with Geosynethetics' by RM Koerner, Prentice Hall, 6<sup>th</sup> Edition 2012.

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<b>III B. TECH</b>					
<b>II SEMESTER</b>	<b>Course Code: 23CE6D02</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Course Title:</b>	<b>REPAIR AND REHABILITATION OF STRUCTURES</b>				

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

- Recognize the mechanisms of degradation of concrete structures and to design durable Concrete structures.
- Conduct field monitoring and non-destructive evaluation of concrete structures.
- Design and suggest repair strategies for deteriorated concrete structures including
- Repairing with composites
- Understanding the methods of strengthening methods for concrete structures
- Assessment of the service ability and residual life span of concrete structures by Visual inspection and in situ tests

**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-Wetly up sheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding-CDC debonding-plate end de bonding-strengthening of floor of structures post grout tests. Introduction to Liquefaction & its effects & applications.

**UNIT: IV**

Fiber reinforced concrete-Properties of constituent materials-Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete-applications of fiber reinforced concretes Lightweight 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 concrete

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Regulation	BR23				
III B. TECH	Course Code: 23CE6D02	L	T	P	C
II SEMESTER		3	0	0	3
Course Title:	REPAIR AND REHABILITATION OF STRUCTURES				

**UNIT: IV**

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

**TEXTBOOKS**

- 1.Rehabilitation of Concrete Structures-B. Vidivelli, Standard Publishers Distributors ,1st Edition 2024.
- 2.Concrete Bridge Practice Construction Maintenance & Rehabilitation-V.K. Raina, Shroff Publishers and Distributors,2nd Edition 2024.
- 3.Maintenance Repair Rehabilitation & Minor works of Buildings -P.C. Varghese, PHI Publications, 2021
- 4.Repair and Rehabilitation of Concrete Structures-P.I. Modi, C.N. Patel, PHI Publications

**REFERENCE:**

1. Concrete Technology Theory and Practice-M.S. Shetty, SChandand Company,2006.
2. Concrete Repair and Maintenance illustrated-Peter Emmons,1<sup>st</sup> Edition 2002.
3. Concrete Chemical Theory and Applications-Santa Kumar A.R., Indian Society for Construction Engineering and Technology, Madras,2022.
4. Hand book on Repair and Rehabilitation of RC Buildings published by CPWD, Delhi,2002.

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Regulation	BR23						
III B. TECH	Course Code: 23CE6103			L	T	P	C
II SEMESTER				3	0	0	3
Course Title:	VALUATION AND QUANTITY SURVEY						

**Outcomes**

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

**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- Identify various item of work from the drawings- unit of measurement of various 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- General specification of all items of a residential building. 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)

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III B. TECH	Course Code: 23CE6103	3	0	0	3
II SEMESTER					
Course Title:	VALUATION AND QUANTITY SURVEY				

#### UNIT IV.

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

#### UNIT V

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

Methods of valuation–rental method, direct comparison of capital cost, valuation based on profit, depreciation method. Various methods of valuation of land (Brief description only)

#### Text Books:

1. B.N. Dutta, Estimation and costing in civil engineering, UBS publishers, 28th Edition 2020
2. Rangwala, Estimation Costing and Valuation, Charotar publishing house pvt.ltd, 18th Edition 2023
3. Dr. S. Seetha Raman, M. Chinna swami, Estimation and quantity surveying, Anuradha publications Chennai, 2015.
4. M Chakraborty, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26, 29 Revise & enlarge edition 2010

#### References:

1. BS Patil, Civil Engineering contracts and estimates, university press, 2006.
2. VNVazirani & SPChandola, Civil Engineering Estimation and Costing, Khanna Publishers, 2002.
3. IS1200-1968; Methods of measurement of building & civil engineering works
4. CPWD DAR2018 and DSR2018 or latest
5. CPWD Specifications Vol1&2(2019 or latest edition)

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Regulation	BR23	L	T	P	C
III B. TECH	Course Code: 23CE6D04	3	0	0	3
II SEMESTER					
Course Title:	FINITE ELEMENT METHOD				

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

- Develop finite element formulations of 1 degree of freedom problems and solve Them
- Understand any Finite Elements of ware to perform stress, thermal and modal Analysis
- Compute the stiffness matrices of different elements and system
- Interpret displacements, strains and stress resultants
- Analyze planar structural systems using finite element modeling

### 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 method for 1-D truss-  
 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 modal load vector- Gauss quadrature-appropriate order of quadrature-element and mesh instabilities-spurious zero energy modes, stress computation-patch test

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Regulation	BR23	L	T	P	C
III B. TECH		3	0	0	3
II SEMESTER	Course Code: 23CE6D04				
Course Title:	FINITE ELEMENT METHOD				

**TEXT BOOKS**

1. A first course in the Finite Element Method-Daryl L. Logan, Thomson Publications, 4th Edition 2015.
2. Concepts and applications of Finite Element Analysis-Robert D. Cook, Michael Eplesha, John Wiley & Sons Publications, 4th Edition 2017.

**REFERENCES:**

1. Introduction to Finite Elements in Engineering-Tirupati R. Chandrupatla, Ashok D. Belgunda, PHI publications, 2011.
2. Finite Element Methods (For Structural Engineers) Wail N Rifaie, Ashok K Govil, New Age International(P)Limited, 2008.

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<b>III B. TECH</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>II SEMESTER</b>	<b>Course Code: 23CE6105</b>				
<b>Course Title:</b>	<b>BRIDGE ENGINEERING</b>				

**Course Learning Objectives:**

The objective of this course is to:

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

**Course Outcomes:**

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

- a. Explain different types of Bridges with diagrams and Loading standards
- b. Carry out analysis and design of Slab bridges, T Beam bridges, Box culverts and suggest structural detailing
- c. Carry out analysis and design of Plate girder bridges
- d. Organize for attending inspections and maintenance of bridges and prepare reports.

**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

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III B. TECH II SEMESTER	Course Code: 23CE6D05			L	T
Course Title:	BRIDGE ENGINEERING			P	C
				3	0
				0	3

**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, 2019.
2. 'Design of Bridge Structures' by T.R. Jagadeesh, M.A. Jayaram, PHI, 2<sup>nd</sup> Edition 2019.
3. 'Design of RC Structures' by B. C. Punmai, Jain & Jain, Lakshmi Publications, 10<sup>th</sup> Edition 2015.

**REFERENCES:**

1. 'Design of Concrete Bridges' by Aswini, Vazirani, Ratwani, 1995.
2. 'Design of Steel Structures' by B.C. Punmai, Jain & Jain, Lakshmi Publications, 2015.
3. 'Design of Bridges' by Krishna Raju, 1988.

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<b>III B. TECH</b>	<b>Course Code: 23CE6D06</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>II SEMESTER</b>					
<b>Course Title:</b>	<b>WATER RESOURCES ENGINEERING</b>				

**Course Learning Objectives:**

The course is designed to make the students,

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

**Course Outcomes**

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

- a. Estimate irrigation water requirements.
- b. Design irrigation channels
- c. Design irrigation canal structures
- d. Plan and design diversion head works
- e. Analyze stability of gravity and earth dams.
- f. Design hydraulic ogee spillways

**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)

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Regulation	BR23				
III B. TECH II SEMESTER	Course Code: 23CE6D06	L	T	P	C
Course Title:	WATER RESOURCES ENGINEERING	3	0	0	3

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

**Outlets:** Types, proportionality, sensitivity and flexibility

**River Training:** Objectives and approaches

#### UNIT-IV

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

#### UNIT-V

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

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

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

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

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

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

#### REFERENCES:

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

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**BONAM VENKATA CHALAMAYYA INSTITUTE OF TECHNOLOGY & SCIENCE**  
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**DEPARTMENT OF CIVIL ENGINEERING**

Regulation	BR23	L	T	P	C
III B. TECH	Course Code: 23CE6E01	3	0	0	3
II SEMESTER					
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 they are parallel and how differ.
3. Understand the 'relief system' and the 'disaster victim.'
4. Describe the three planning strategies useful in mitigation.
5. Identify the regulatory controls used in hazard management.
6. Describe public awareness and economic incentive possibilities.
7. Understand the tools of post-disaster management.

**Course Outcomes:**

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

- a. Affirm the usefulness of integrating management principles in disaster mitigation work
- b. Distinguish between the different approaches needed to manage pre- during and post- disaster periods
- c. Explain the process of risk management
- d. Relate to risk transfer

**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

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<b>Regulation</b>	<b>BR23</b>				
<b>III B. TECH II SEMESTER</b>	<b>Course Code: 23CE6E01</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Course Title:</b>	<b>DISASTER MANAGEMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

vulnerability – Macro-economic management and sustainable development, Climate change risk rendition  
– Financial management of disaster – related losses.

#### UNIT-IV

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

#### UNIT-V

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

#### TEXT BOOKS:

1. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazards– S. Vaidyanathan: CBS Punblishers& Distributors Pvt.Ltd.
2. Natural Hazards & Disaster Management, Vulnerability and Mitigation by RB Singh- Rawat Publications
3. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
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), Universities press.
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 Book Company."

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Regulation	BR23	L	T	P	C
III B. TECH		3	0	0	3
II SEMESTER	Course Code: 23CE6E02				
Course Title:	SUSTAINABILITY IN ENGINEERING PRACTICES				

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

**CO1:** Explain sustainable development and different environmental agreements and protocols

**CO2:** Discuss real-time activities causing environmental issues and different methods of using renewable energy resources

**CO3:** Explain local and global environmental issues

**CO4:** Differentiate between carbon emissions for regular and sustainable cities and explain different practices to move industries towards sustainability

**CO5:** 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, and threats for sustainability.

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

### UNIT-II

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

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

### UNIT-III

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

### UNIT-IV

**Sustainable Habitat** - Concept of green building, green building materials, green building certification and rating: green rating for integrated habitat assessment (GRIHA), leader ship

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Regulation	BR23	L	T	P	C
III B. TECH		3	0	0	3
II SEMESTER	Course Code: 23CE6E02				
Course Title:	SUSTAINABILITY IN ENGINEERING PRACTICES				

in energy and environmental design (LEED) rating, energy efficient buildings, sustainable cities, sustainable transport, sustainable pavements, case studies in sustainability engineering: Green building, sustainable city, sustainable transport system.

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

#### UNIT-V

**Renewable energy resources-** Conventional and non- conventional forms of energy, solar energy, fuel cells, wind energy, small hydro plants, 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

#### Text Book:

I.R.L. Ragand Lekshmi Dinachandran Remesh. Introduction to Sustainable Engineering. 2<sup>nd</sup> Edition, PHI Learning Pvt. Ltd., 2016.

#### References:

1. D.T. Allen and D.R. Shonnard. Sustainability Engineering: Concepts, Design and Case Studies, 1<sup>st</sup> Edition, Prentice Hall, 2011.
2. A.S. Bradley, A.O. Adebayo, P. Maria. Engineering applications in sustainable design and development, 1<sup>st</sup> Edition, Cengage learning, 2016.

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Regulation	BR23	L	T	P	C
III B. TECH		3	0	0	3
II SEMESTER	Course Code: 23CE6E03				
Course Title:	WATER SUPPLY SYSTEMS				

**Course Outcomes:**

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

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

**UNIT-I**

**WATER AND LIFE:**

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

**UNIT-II**

**SOURCES OF WATER:**

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

**UNIT-III**

**DUAL SUPPLY OF WATER:**

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

**UNIT-IV**

**DISTRIBUTION OF WATER:**

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

**UNIT-V**

**INDUSTRIAL WATER**

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

**TEXT BOOKS:**

- 1.K.N. Duggal, "Elements of Environmental Engineering", 7<sup>th</sup> Edition, S. Chand Publishers, 2010.
- 2.Hammer and Hammer "Water and wastewater Technology", 4<sup>th</sup> Edition, Prentice Hall of India, 2003.

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Regulation	BR23			
III B. TECH	Course Code: 23CE6E03			
II SEMESTER				
Course Title:	WATER SUPPLY SYSTEMS			
	L	T	P	C
	3	0	0	3

3. Howard S. Peavy, Donand P. Rowe, George Technobanoglous, "Environmental Engineering", 1<sup>st</sup> Edition Mc Graw -Hill Publications, Civil Engineering Series, 1985.

**REFERENCES:**

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

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Regulation	BR23	L	T	P	C
III B. TECH		0	0	3	15
II SEMESTER	Course Code: 23CE6L01				
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 successful completion of this course, the students will be able to:

- a. Estimate some important characteristics of water and wastewater in the laboratory
- b. 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.
- c. Decide whether the water body is polluted or not with reference to the state parameters in the list of experiments
- d. 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.
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.

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Regulation	BR23				
III B. TECH II					
SEMESTER	Course Code: 23CE6L01	L	T	P	C
Course Title:	ENVIRONMENTAL ENGINEERING LAB	0	0	3	15

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

**List of Equipments**

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

**Textbooks**

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

**Reference**

1. Relevant IS Codes.

Chemistry for Environmental Engineering by Sawyer and Mc. Carty

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Regulation	BR23				
III B. TECH II SEMESTER	Course Code: 23CE6L02				
Course Title:	HIGHWAY ENGINEERING LAB				
	L	T	P	C	
	0	0	3	1.5	

**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

- a. Test aggregates and judge the suitability of materials for the road construction
- b. Test the given bitumen samples and judge their suitability for the road construction.
- c. Obtain the optimum bitumen content for Bituminous Concrete
- d. Determine the traffic volume, speed and parking characteristics.
- e. 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.
2. Ductility Test.
3. Softening Point Test.
4. Flash and Fire Point Tests.
5. Stripping Test
6. Viscosity Test.

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III B. TECH II SEMESTER	Course Code: 23CE61.02	0	0	3	1.5
Course Title:	HIGHWAY ENGINEERING LAB				

**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 the aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Elongation and thickness gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

**TEXTBOOKS:**

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

**REFERENCE BOOKS:**

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

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<b>Regulation</b>	BR23				
<b>III B. TECH II SEMESTER</b>	<b>Course Code: 23SC61.01</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Course Title:</b>	<b>CAD LAB</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**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

- a) Model the geometry of real-world structure Represent the physical model of structural element/structure
- b) Perform analysis
- c) Interpret from the Post processing results
- d) Design the structural elements and a system as per IS Codes

**LIST OF EXPERIMENTS**

1. Analysis & Design determinate structures using software
2. Analysis & Design of fixed & continuous beams using software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL, LL, WL, EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built-up steel beam
8. Developing a design program for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

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

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<b>III B. TECH II SEMESTER</b>	<b>Course Code: 23NC6T01</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>-</b>
<b>Course Title:</b>	<b>AUDIT COURSE TECHNICAL PAPER WRITING &amp; IPR</b>				

**Course Objective:**

1. The course will explain the basics related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

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

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

**Unit II: Drafting report and design issues:** The use of drafts, Illustrations and graphics.  
**Final edits:** Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

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

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

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

**Text Books:**

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

**Reference Books:**

1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
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