UG Scheme-2023 (NEP-2020)
B. Tech. Civil Engineering with Multidisciplinary Minor

Course Code	Name of Course	Course Category	Teaching Scheme				Credits	Evaluation Scheme					
								Theory			Practical		Total Marks
			L	T	P	Total Hours		TAE	CAE	ESE	INT	EXT	
SEMESTER-III													
23BTCEL201 / 23BTCEP201	Mechanics of Materials	PCC2	2	1	2	5	4	10	15	50	25	25	125
23BTCEL202 / 23BTCEP202	Soil Mechanics	PCC3	3	-	2	5	4	10	15	50	25	-	100
23BT XXLXXX	Multidisciplinary Minor I	MDM1	2	-	0	2	2	10	15	50	-	-	75
23BTISL2XX	Open Elective -I	OE1	4	-		4	4	10	15	50	-	-	75
23BTSHL20X CE	Humanities Elective	VEC1	2	-	-	2	2	10	15	50	-	-	75
23BTMBL201 CE	Engineering Economics and Industrial Management	EEMC1	2	-	-	2	2	10	15	50	-	-	75
23BTCEP203	Minor Project	CEP	-	-	4	4	2	-	-	-	50	-	50
			15	1	8	24	20	60	90	300	100	25	575

UG Scheme-2023 (NEP-2020)
B. Tech. Civil Engineering with Multidisciplinary Minor
Tracks for Programme Elective Courses

Programme Elective -1 (Credits : 4) (Semester-V)		Programme Elective -2 (Credits : 4) (Semester-VI)		Programme Elective - 3 (Credits : 4) (Semester-VI)		Programme Elective -4 (Credits : 4) (Semester-VII)			
23BTCEL306/ 23BT CEP306	Advance Fluid Mechanics	23BTCEL309/ 23BTCEP309	Air Pollution & Solid Waste Management	23BTCEL312/ 23BTCEP312	Advanced Surveying	23BTCEL407	Waste Water Engineering	23BTCELXXX	Construction Technology and Management
23BTCEL307/ 23BTCEP307	Advanced Highway Material	23BTCEL310/ 23BTCEP310	Foundation Engineering	23BTCEL313/ 23BTCEP313	Green Building	23BTCEL408	Advanced Transportation Engineering	23BTCELXXX	Construction Equipment and Advanced Surveying Application
23BTCEL308/ 23BTCEP308	New Engineering Materials	23BTCEL311/ 23BTCEP311	Advance Concrete Design	23BTCEL314/ 23BTCEP314	Introduction to Structural Dynamics	23BTCEL409	Earthquake Resistance Structure	23BTCELXXX	Sustainability in Construction Projects

UG Scheme-2023 (NEP-2020)
B. Tech. Civil Engineering with Multidisciplinary Minor

B. Tech. Civil Engineering with Multidisciplinary Minor

Multidisciplinary Minor Electives

Multidisciplinary Minor Elective -1 (Credits : 2) (Semester-III)		**Multidisciplinary Minor Elective -2 (Credits : 2) (Semester-IV)**		**Multidisciplinary Minor Elective - 3 (Credits : 4) (Semester-V)**		**Multidisciplinary Minor Elective -4 (Credits : 2) (Semester-VI)**		**Multidisciplinary Minor Elective -5 (Credits : 4) (Semester-VII)**	
23BTCEL208	Disaster Management	23BTCEL209	Environmental Management	23BTCEL315 / 23BTCEP315	New Engineering Material	23BTCEL316	Repair & Rehabilitation of Structures	23BTCEL410/ 23BTCEP410	Green Building

UG Scheme-2023 (NEP-2020)
B. Tech. Civil Engineering with *Open Electives*

Open Elective -1 (Credits : 4) (Semester-III)		**Open Elective -2 (Credits : 2) (Semester-IV)**		**Open Elective - 3 (Credits : 2) (Semester-V)**	
23BTCEL203	Basics of Civil Engineering	23BTCELXXX	Environmental Science	23BTCELXXX	Engineering Geology

UG Scheme-2023 (NEP-2020)
B. Tech. Civil Engineering with Multidisciplinary Minor
Skill Enhancement Courses

Skill Enhancement Course-1 (Credits : 2) (Semester-I)		**Skill Enhancement Course-2 (Credits : 2) (Semester-II)**		**Skill Enhancement Course-3 (Credits : 2) (Semester-IV)**		**Skill Enhancement Course-4 (Credits : 2) (Semester-VI)**	
23BTCEP104	Computer Aided Drawing	23BT CEP107	Architectural Planning & Drawing	23BT CEP210	Computational tool for Survey (Total Station)	23BT CEP317	Analysis & Structural Design using Software' SAP2000
23BT CEP105	Designing of Structure using Sketch Up	23BT CEP108	Modelling & Photorealistic Design of Structure Using - 3D Max	23BT CEP211	Planning & Scheduling Primavera	23BT CEP318	Analysis & Structural Design using Software' STAAD Pro
23BT CEP106	Graphical Analysis using Excel	23BT CEP109	Modelling & Animation Rendering using REVIT Architecture	23BT CEP212	Complete Processes of Construction Industry	23BT CEP319	Analysis & Structural Design using Software- ANSYS

CIVIL ENGINEERING DEPARTMENT
Track for B.Tech. Civil Engineering with Honor's

Sem	**Structural Engineering**	
	Name of Courses	**Credit**
III	23MTSTRL528 New Engineering Materials and Techniques	4
IV	23MTSTRL535 Advanced Design of Steel Structures	4
V	23MTSTRL525 Matrix Analysis of Structures	4
VI	23MTSTRL410 Theory of Plates and Shells	4
VII/VIII	23MTSTRL409 Structural Dynamics	4
	Credit	**20**

Dr. Mahesh V. Raut
BOS Chairman Civil

SYLLABUS FOR THIRD SEMESTER

<table>
<tr><td colspan="10">Course Title: Mechanics of Materials</td></tr>
<tr><td rowspan="2">Semester</td><td rowspan="2">III</td><td colspan="4" rowspan="2">Teaching Scheme</td><td colspan="5">Evaluation Scheme</td></tr>
<tr><td colspan="3">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Term</td><td>EVEN</td><td>Th</td><td>Tu</td><td>Pr</td><td>Credits</td><td>TAE</td><td>CAE</td><td>ESE</td><td>INT</td><td>EXT</td></tr>
<tr><td>Course Category</td><td>ESC</td><td rowspan="2">3 Hrs.</td><td rowspan="2">1</td><td rowspan="2">2 Hrs.</td><td rowspan="2">4</td><td rowspan="2">10</td><td rowspan="2">15</td><td rowspan="2">50</td><td rowspan="2">25</td><td rowspan="2">-</td></tr>
<tr><td>Course Code</td><td>23BTCEL201/ 23BTCEP201</td></tr>
<tr><td>Teaching Mode</td><td>offline</td><td colspan="3" rowspan="2">5 Hrs.</td><td rowspan="2">Total</td><td colspan="3">75</td><td colspan="2">25</td></tr>
<tr><td>Duration of ESE</td><td>2 Hrs.</td><td colspan="5">100</td></tr>
</table>

Course Objectives	To study the various mechanical properties of materials
	To provide systematic methods for solving engineering problems in solid mechanics
	To use the fundamental concepts of stress, strain and elastic behavior of materials
Course Outcomes	**CO1:** Understand the behavior of materials under different stress and strain condition
	CO2: Develop the shear force and bending moment diagrams .
	CO3: Formulate the bending, torsional and shear stress equation and develop bending and shear stress distribution
	CO4: Evaluate the slope and deflection of beams subjected to loads .
	CO5: Determine the principal stresses and principal planes

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO2	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO3	2	3	-	-	-	-	2	-	-	-	-	-	2	3	2
CO4	2	3	-	-	-	-	2	3	-	-	-	-	2	3	2
CO5	2	-	-	-	-	-	2	-	-	-	-	3	2	3	2

Course Contents:

Unit	Contents	Hours
I	**Mechanical Properties and Uniaxial Problems**: Concept of stress and strain, Stress strain behavior of ductile and brittle material in uniaxial state of stress. Elastic constants, Relation between elastic constants. Uniaxial loading and deformation of simple cases of statically indeterminate problems under axial loading.	6
II	**Shear Force & Bending Moment Diagrams**: Determination of shear forces and Bending moment at a section, SF and BM diagram in beams, Differential relation between shear force and bending moment, Relation between load and shear force.	5
III	**Shear & Bending Stresses in Beam**: Bending stresses in simple beam, Assumptions and derivation of simple bending, Homogeneous and composite beams. Shear stresses in simple beams, shear stress distribution, Shear Stress in composite beams. **Torsion of Shafts**: Torsion of circular sections, Assumptions and derivation of relations between torsional moment, Shear stresses and angle of twist. Torsional stress in solid and Circular sections.	9

IV	**Slope & Deflection of determinate beams**: Differential equation relating deflection and moment shear and load, Deflection of simple beams by integration.	5
V	**State of Stress In Two Dimensions:** State of stress in two dimensions, Differential equation of equilibrium, Transformation of stresses , Principal stresses, Maximum shear stresses, Mohr's circle, Combined bending and torsion, Combined effect of Torsion and Shear.	6

Text Books	1.	James Gare, Mechanics of Material, 8th Edition, Cengage Learning, 2012.
	2	Gere and Timoshenko, "Mechanics of Materials", CBS publishers.
	3	B. C. Punmia, Mechanics of Material, 15th Edition, Laxmi Publications, 2005.
	4	Beer and Johnston, "Mechanics of Material", Tata Mc Graw Hill publication.

List of Practicals:

Sr. No.	Name of Experiments (Any Ten Experiment)
1	Study of Universal Testing Machine (U.T.M)
2	To determine the Tensile Strength of Steel specimen.
3	To perform shear test on different metals.
4	To perform Hardness test on various metals. (Brinell's hardness test & Rockwell hardness test)
5	To perform standard Torsion test on metals.
6	To perform the bending test on wooden beam and find its Flexural Rigidity.
7	To determine the compressive strength of wet and dry bricks
8	To determine the compressive strength of wooden block (Parallel & Perpendicular to the grains)

9	To determine the transverse strength of flooring tiles
10	To determine Impact strength of different metals by Izod Impact Test
11	To determine Impact strength of different metals by Charpy Impact Test

Course Title: **Soil Mechanics**										
Semester	III	Teaching Scheme				Evaluation Scheme				
						Theory			Practical	
Term	EVEN	Th	Tu	Pr	Credits	TAE	CAE	ESE	INT	EXT
Course Category	ESC	3 Hrs.	1	2 Hrs.	4	10	15	50	25	-
Course Code	23BTCEL202/ 23BTCEP202									
Teaching Mode	offline	5 Hrs.			Total	75			25	
Duration of ESE	2 Hrs.					100				

Course Objectives	To design and plan the residential buildings as per local bye-laws and produce different types of drawings for the same
Course Outcomes	**CO1:** Characterize and classify different types of soils
	CO2: Identify the methods for determination of soil properties and different types of

	classification Systems .
	CO3: Implement the concepts of flow of water through soil
	CO4: Apply the concept of compaction and consolidation on field .

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO2	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO3	2	3	-	-	-	-	2	-	-	-	-	-	2	3	2
CO4	2	3	-	-	-	-	2	3	-	-	-	-	2	3	2
CO5	2	-	-	-	-	-	2	-	-	-	-	3	2	3	2

Course Contents:

1	**Introduction & Physical properties of soil**: Introduction to Soil and Soil Mechanics, Civil Engineering problems related to soils, Complexity of soil nature, Soil formation and soil types, Soil- a three phase system, Solids-water-air relationships, water content, void ratio, porosity, degree of saturation, unit weight, specific gravity, their interrelationships and Laboratory determination	10
2	**Index properties of soil & Classification of soils**: Grain size distribution by sieve analysis, Consistency of clays and determination, Atterberg's limits and indexes as per IS-code, Necessity of classification, criteria for classification, classification based on grain size and plasticity, Indian standard classification system	10

3	**Permeability & Seepage analysis**: Darcy's law, methods of determination of coefficient of permeability of soils – constant head and falling head permeability tests, factors affecting permeability, approximate coefficient of permeability of common soils, field permeability tests, Seepage pressure, upward flow, quick condition, two-dimensional Laplace equation, Flow net and its properties Effective Stress Principle, Introduction to Liquefaction potential of soil	10
4	**Soil compaction:** Necessity of compaction in field, Standard Proctor test, Modified Proctor test, compaction curve, OMC and Maximum dry density, Compaction curve for sand, factors affecting 28 compaction, structure and engineering behavior of compacted soil, Zero air void line, Compaction in field, suitability of various compaction equipment **Consolidation:** The consolidation process, spring analogy, consolidation of laterally confined soil, Terzaghi's theory of one-dimensional consolidation (no derivation), solution of the consolidation equation, determination of coefficient of consolidation, square root time fitting method, logarithm of time fitting method, coefficient of compression, coefficient of volume change, consolidation settlement, consolidation of undisturbed specimen, determination.	12

Text Books	1.	Shah and Kale, Building Drawing and Design, 2nd Edition, Tata McGraw, 2002
	2	Singh, Alam, Soil Mechanics in Theory & Practice, Asia Publishing House, 12th Edition 2011
	3	Holtz, R.D. and Kovacs, W. D., An Introduction to Geotechnical Engineering, 2nd Edition, Prentice Hall, 1981
	4	Couduto, D.P., Geotechnical Engineering – Principles and Practices, 2nd Edition, Prentice Hall of India, 12th Edition, 2002
	5	Arora, K. R., Soil Mechanics & Foundation Engineering, Standard Publishers, 5th Edition

List of Practical

1.	Moisture content and Specific gravity of soil.
2.	Grain size Analysis – (Sieve Analysis).
3.	Consistency limit, plastic limit and liquid limit of soil.
4.	Hydrometer Analysis.
5.	Constant Head Permeability test of or Falling Head Permeability test.
6.	Consistency limit of soil (shrinkage limit).
7.	Field Density by sand replacement method.
8.	Field Density by core cutter method.
9.	Unconfined compression test.
10.	Direct shear Test.
11.	Triaxial shear test (Demonstration).
12.	Proctor compaction Test and Proctor needle test.

<table>
<tr><td colspan="11">Course Title: Disaster Management (Multidisciplinary Minor-1)</td></tr>
<tr><td rowspan="2">Semester</td><td rowspan="2">III</td><td rowspan="2" colspan="4">Teaching Scheme</td><td colspan="5">Evaluation Scheme</td></tr>
<tr><td colspan="3">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Term</td><td>EVEN</td><td>Th</td><td>Tu</td><td>Pr</td><td>Credits</td><td>TAE</td><td>CAE</td><td>ESE</td><td>INT</td><td>EXT</td></tr>
<tr><td>Course Category</td><td rowspan="2">ESC</td><td rowspan="2">2 Hrs.</td><td rowspan="2">-</td><td rowspan="2">2 Hrs.</td><td rowspan="2">2</td><td rowspan="2">10</td><td rowspan="2">15</td><td rowspan="2">50</td><td rowspan="2">25</td><td rowspan="2">-</td></tr>
<tr><td>Course Code</td><td>23BTCEL208</td></tr>
</table>

B. Tech. Civil Engineering with Multidisciplinary Minor

Teaching Mode	offline	4 Hrs.	Total	75	25
Duration of ESE	2 Hrs.			100	

Course Objectives	To understand various types of disaster situation and basic concept of disaster management
	To understand the various processes of risk management
	To apply basic concepts and scientific strategies to Control Disaster hazards and preparedness
Course Outcomes	Upon successful completion of this course, student will be able to:
	CO1: Understand Types, Trends, Causes, Consequences and Control of Disasters.
	CO2: Interpret the usefulness of integrating management principles in disaster Mitigation work.
	CO3: Apply the concept of Disaster Management
	CO4: Evaluate the different approaches needed to manage pre-during and post- disaster periods.
	CO5: Develop modern tools to solve the issues related to Disaster in line with Sustainable technology.

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

B. Tech. Civil Engineering with Multidisciplinary Minor

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO2	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO3	2	3	-	-	-	-	2	-	-	-	-	-	2	3	2
CO4	2	3	-	-	-	-	2	3	-	-	-	-	2	3	2
CO5	2	-	-	-	-	-	2	-	-	-	-	3	2	3	2

Course Contents:

Unit	Contents	Hours
I	**UNIT I: Introduction on Disaster** Different Types of Disaster: Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc. Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.	9
II	**UNIT II: Risk and Vulnerability Analysis** Risk: Its concept and analysis, Risk Reduction, Vulnerability: Its concept and analysis, Strategic Development for Vulnerability Reduction, Risk Management in disaster zone	9
III	**UNIT III: Disaster Preparedness** Disaster Preparedness: Concept and Nature, Disaster Preparedness Plan, Prediction, Early Warnings and Safety Measures of Disaster, Role of	9

	Information, Role of Government, International and NGO Bodies, Role of IT in Disaster Preparedness, Role of Engineers on Disaster Management.	
IV	**UNIT IV: Disaster Response** Disaster Response: Introduction, Disaster Response Plan, Communication, Participation, and Activation of Emergency Preparedness Plan Search, Rescue, Rescue Equipment, Rescue Methods Evacuation and Logistic Management Role of Government, International and NGO Bodies Psychological Response and Management (Trauma, Stress, Rumor and Panic), Relief and Recovery, Medical Health Response to Different Disasters	**9**
V	**UNIT V: Rehabilitation, Reconstruction and Recovery** Reconstruction and Rehabilitation as a Means of Development, Damage Assessment, Disaster Resistant House Construction Sanitation and Hygiene, Education and Awareness, Dealing with Victims' Psychology, Long-term Counter Disaster Planning, Role of Educational Institute.	9

Text Books	1	Singhal, J.P. Disaster Management, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423.
	2	Bhattacharya, T. Disaster Science and Management, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361.
	3	Gupta, A. K. and Sreeja, S. N. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011.
	4	Kapur, A. Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.
Reference Books	1.	Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
	2.	Government of India, National Disaster Management Policy,2009, 2019.

<table>
<tr><td colspan="11">Course Title: Basics of Civil Engineering (Open Elective-1)</td></tr>
<tr><td rowspan="2">Semester</td><td rowspan="2">III</td><td colspan="4" rowspan="2">Teaching Scheme</td><td colspan="5">Evaluation Scheme</td></tr>
<tr><td colspan="3">Theory</td><td colspan="2">Practical</td></tr>
<tr><td>Term</td><td>EVEN</td><td>Th</td><td>Tu</td><td>Pr</td><td>Credits</td><td>TAE</td><td>CAE</td><td>ESE</td><td>INT</td><td>EXT</td></tr>
<tr><td>Course Category</td><td rowspan="2">ESC</td><td rowspan="2">2 Hrs.</td><td rowspan="2">-</td><td rowspan="2">2 Hrs.</td><td rowspan="2">4</td><td rowspan="2">10</td><td rowspan="2">15</td><td rowspan="2">50</td><td rowspan="2">25</td><td rowspan="2">-</td></tr>
<tr><td>Course Code</td></tr>
<tr><td>Teaching Mode</td><td>offline</td><td colspan="3" rowspan="2">4 Hrs.</td><td rowspan="2">Total</td><td colspan="3">75</td><td colspan="2">25</td></tr>
<tr><td>Duration of ESE</td><td>2 Hrs.</td><td colspan="5">100</td></tr>
<tr><td>Course Objectives</td><td colspan="10">To design and plan the residential buildings as per local bye-laws and produce different types ofdrawings for the same</td></tr>
<tr><td rowspan="5">Course Outcomes</td><td colspan="10">Upon successful completion of this course, student will be able to:</td></tr>
<tr><td colspan="10">CO1: Characterize and classify different types of soils</td></tr>
<tr><td colspan="10">CO2: Identify the methods for determination of soil properties and different types of classificationSystems</td></tr>
<tr><td colspan="10">CO3: Implement the concepts of flow of water through soil</td></tr>
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</table>

Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes:

Course Outcomes	Program Outcomes and Program Specific Outcomes														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO2	2	-	-	-	-	-	2	-	-	-	-	-	2	3	2
CO3	2	3	-	-	-	-	2	-	-	-	-	-	2	3	2
CO4	2	3	-	-	-	-	2	3	-	-	-	-	2	3	2
CO5	2	-	-	-	-	-	2	-	-	-	-	3	2	3	2

Course Contents:

Unit	Contents	Hours
I	**UNIT I: Introduction to Civil Engineering** Introduction and scope of Civil Engineering. Role of Engineers in the infrastructure development. General concepts related to building.Selection of site, basic functions of buildings, types of buildings – Residential, Public, Commercial, and Industrial. Principles of planning, orientation of buildings, introduction to bye-laws regarding building line, Height of building, open space requirement, F.S.I., Carpet area, built up area, setbacks, ventilation. Components of Buildings Introduction to Types of loads on buildings. Substructure – Types of soils; rocks and foundation strata, concept of bearing capacity, Types of foundation and their suitability. Superstructure – Types of construction: Load Bearing, Framed, and Composite. Building	8

	Materials Introduction to basic construction materials; cement, bricks, stone, aggregates, reinforcing steel, structural glazing, structural steel; Concrete types: PCC, RCC, Prestressed, Precast and Ready Mix Concrete. Use of various eco- friendly materials in construction. Introduction to advance construction equipment's and techniques	
II	**UNIT II: Surveying:** Various types of maps and their uses; Introduction to digital mapping; Principles of survey. Introduction to various survey instruments such as EDM, Lasers, Total Station, and digital planimeter. Modern survey methods. Introduction to GIS, GPS and their applications. Transportation Engineering Role of transportation in national development; various modes of Transportation. Classification of Highways: Expressways, NH, SH, MDR, ODR, VR; Types of Pavements, Traffic Signs, signals, Parking system, and Causes of Accidents	7
III	**UNIT III: Environment and Natural Resource Management Water supply** Sources, drinking water requirements, impurities in water and their effects; Purification of water, modern purification processes; Standards of purified water. Waste Management: Collection and Disposal methods of Liquid, solid and gaseous wastes. Water Resources Engineering Introduction to Hydraulic structures of storage; water conveyance systems; Watershed management: Definition, Necessity and methods; Roof top rain water harvesting andGround water recharge: relevance and methods.	7
IV	**UNIT IV: Instrumentation in Civil Engineering Structures**: Various instruments used in construction, water resources, Environmental Engineering, Foundation Engineering, Thermocouples, condition monitoring equipment's, Half Cell Potentiometers, Strain Gauges. Management of Utilities using telemetry & SCADA System. Sustainable Development: Role of Engineers in Sustainable Development. Concept of greenbuildings and LEED Certification	6

Text Books	1	Bhavikatti, S. S. Elements of Civil Engineering, New Age International, 2019
	2	Punmia, B. C, Jain Ashok K,and Jain Arun K..Basic Civil Engineering, Laxmi Publication, 2003.
	3	Shetty, M.S. Concrete Technology, S. Chand, 2014
	4	Kanetkar and Kulkarni, Surveying and Levelling, Pune Vidyarthi Graha Prakashan, 2006
	5	Birdie G. S., and Birdie, J. S., Water Supply and Sanitary Engineering, Dhanpatrai Publication, 2018
	6	Kumar Sushil, Building Construction, Standard Publications, 2020
	7	Khanna & Justo, Transportation Engineering, Nem Chand and Brothers, 2001
	8	Shah and Kale, Building Drawing Design, Tata McGraw Hill Education, 2001