

# **Malnad College of Engineering, Hassan**

[An Autonomous Institution Affiliated to VTU Belagavi]



## **Autonomous Programme**

### **Bachelor of Engineering in Civil Engineering**

**Scheme & Syllabus**

**III & IV Semester**

**(2023 – 24 Admitted Batch)**

**Academic Year: 2024 – 25**

**Department of Civil Engineering**

### **Vision of the Department**

The Department of Civil Engineering will be a centre of excellence in industry-oriented teaching, training, research, professional ethics, social responsibility, and continuing education for practicing engineers through sponsored research and consultancy services.

### **Mission of the Department**

1. To improvise the curriculum to include contents pertaining to situational experience of variety of sites and develop a sense of social responsibility and to enhance research orientation of students through internship programs.
2. To enhance sponsored research and consultancy works to achieve effective industry-institute-interaction and conduct Continuing Education Programme for practicing engineers.
3. To inculcate professional ethics through quality and modern construction practices.
4. To switch over to modern methods of material testing, Engineering analysis and design.

### **Program Educational Objectives (PEOs):**

**PEO1:** The graduate will be successful professionally and contribute to core civil engineering construction projects, infrastructure projects, alternative construction technology projects, green buildings towards environmental sustainability for academic domain as well as for research and pursue higher studies.

**PEO2:** The graduate will be professionally sound in broad area of knowledge of various dimensions of civil engineering and allied fields.

**PEO3:** The graduate will be a team leader/effective team member with ethical values, versatile, quick learner will adapt to given professional context with lifelong learning capability.

## **PROGRAM OUTCOMES (POs)**

Engineering Graduates will be able to:

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Objectives(PSOs):**

**PSO1:** The Graduates will have the demonstrating ability to design a Civil Engineering system, components or process to meet desired project needs.

**PSO2:** Graduates will be familiar with Civil Engineering professional software tools and demonstrate their ability in applying them for the solution of design situations.

**Malnad College of Engineering, Hassan**  
**Department of Civil Engineering**

**Scheme of Evaluation for Theory Courses**

	Portions for CIE	Mode of Evaluation	Weightage in Marks
<b>CIE-1</b>	Syllabus to be decided by the Course Coordinators such that all the COs shall be covered.	Descriptive Test	10
<b>CIE-2</b>		Descriptive Test	10
<b>CIE-3</b>		Descriptive Test	10
<b>Activity</b>	Minimum of Two Activities to be conducted	Assignment/Case Study/Practical/Working Model/Quiz	20
		Total	50

Examination		Max. Marks	Minimum Marks to be scored	Minimum Average Marks to qualify
<b>CIE</b>	Tests	30	12 ( $\geq 40\%$ )	40 ( $\geq 40\%$ )
	Activities	20	08 ( $\geq 40\%$ )	
<b>SEE</b>		50	17.50 ( $\geq 35\%$ )	

**Scheme of Evaluation for Laboratory Courses**

Evaluation Type	Evaluation Modules	Marks
<b>Continuous Internal Evaluation (C.I.E.) in every Laboratory session by the Course Coordinator</b>	<b>Conduction of Experiments</b>	<b>10</b>
	<b>Observation and Tabulation of Results</b>	<b>10</b>
	<b>Record Writing</b>	<b>20</b>
	<b>Viva-Voce/Quiz</b>	<b>10</b>
<b>Continuous Internal Evaluation (C.I.E.)</b>		<b>50</b>
<b>Semester End Examination (S.E.E.)</b>		<b>50</b>

**Note:** The marks distribution to be made based on the rubrics for a particular laboratory course.

III SEMESTER											
Sl. No	Course category & Course Code		Course Title	Teaching Hours/Week				Examination			
				Theory Lecture	Tutorial	Practical /Drawing	Credits	Duration in hours	CIE Marks	SEE Marks	Total Marks
				L	T	P	C				
1	PCC	23CV301	Engineering Geology and Building Materials	3	0	0	3	3	50	50	100
2	IPCC	23CV302	Engineering Surveying	3	0	2	4	3	50	50	100
3	IPCC	23CV303	Strength of Materials	3	0	2	4	3	50	50	100
4	PCC	23CV304	Water Supply and Treatment Engineering	3	0	0	3	3	50	50	100
5	PCCL	23CV305	Computer Aided Building Planning and Drawing	0	0	2	1	3	50	50	100
6	ESC	23V306X	ESC/ETC/PLC	3	0	0	3	3	50	50	100
7	UHV	23SCR	Social Connect and Responsibility	0	0	2	1	1	100	---	100
8	AEC/ SEC	23CV358X	Ability Enhancement Course/Skill Enhancement Course - III	If the course is a Theory			1	1	50	50	100
				2	0	0					
				If a course is a laboratory				2			
				0	0	2					
9	MC	23NYP1	NSS,YOGA,PE	0	0	2	AUDIT		100		100
	Total						20	22			



THIRD SEMESTER: ENGINEERING SCIENCE COURSES (ESC)/ABILITY ENHANCEMENT COURSES (AEC)						
Sl. No.	Course Category and Course Code		Course Title:	L-T-P	Credits	Contact Hours
1.	ESC	23CV306A	Urban and Rural Planning	3-0-0	3	3
2	ESC	23CV306B	Sustainability in Engineering Design	3-0-0	3	3
3.	ESC	23CV306C	Environmental Protection and Management	3-0-0	3	3
4.	AEC/SEC	23CV358A	Smart Urban Infrastructure	1-0-0	1	2
5.	AEC/SEC	23CVL358B	Digital Drafting for Civil Engineers (Lab)	0-0-2	1	2
	<b>PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course</b> <b>PCCL: Professional Core Course Laboratory</b> <b>AEC: Ability Enhancement Course; UHV: Universal Human Value Courses</b>					

IV SEMESTER											
Sl. No.	Course category & Course Code		Course Title	Teaching Hours/Week			Credits	Examination			
				Theory Lecture	Tutorial	Practical / Drawing		Duration in hours	CIE Marks	SEE Marks	Total Marks
				L	T	P					
1.	PCC	23CV401	Basic Structural Analysis	2	2	0	3	3	50	50	100
2.	IPCC	23CV402	Fluid Mechanics and Hydraulics	3	0	2	4	3	50	50	100
3.	IPCC	23CV403	Concrete Technology	3	0	2	4	3	50	50	100
4.	ESC	23V405X	ESC/ETC/PLC	3	0	0	3	3	50	50	100
5.	AEC/ SEC	23CV456X	Ability Enhancement Course/Skill Enhancement Course- IV	If the course is Theory			1	1	50	50	100
				2	0	0		2			
				If the course is a lab							
				0	0	2					
6.	BSC	23CV407	Biology for Engineers	0	0	2	1	3	50	50	100
7.	UHV	23UHV	Universal Human Values	0	0	2	1	1	50	50	100
8	MC	23NYP2	NSS,YOGA,PE	0	0	2	AUDIT		100		100
Total							17	19			

FOURTH SEMESTER: ENGINEERING SCIENCE COURSES (ESC)/ABILITY ENHANCEMENT COURSES (AEC)						
Sl. No.	Course Category and Course Code		Course Title	L-T-P	Credits	Contact Hours
1.	ESC	23CV405A	Building Information Modelling in Architecture, Engineering and Construction (BIM)	0-0-3	3	3
2.	ESC	23CV405B	Construction Equipment, Plants and Machinery	3-0-0	3	3
3	ESC	23CV405C	Concreting Techniques and Practices	3-0-0	3	3
4	ESC	23CV405D	Water Resources Engineering	3-0-0	3	3
5	ESC	23CV405E	Waste water engineering	3-0-0	3	3
6	AEC/SEC	23CVL456A	Total Station Application in Civil Engineering (Lab)	0-0-2	1	2
7	AEC/SEC	23CV456B	Components of a Smart City	2-0-0	1	2
	<b>PCC: Professional Core Course; IPCC: Professional Core Course Theory Integrated with Practical of the same course</b> <b>PCCL: Professional Core Course Laboratory</b> <b>AEC: Ability Enhancement Course; UHV: Universal Human Value Courses</b>					

<b>Course Title</b>	<b>ENGINEERING GEOLOGY AND BUILDING MATERIALS</b>		
<b>Course Code</b>	23CV301	<b>(L-T-P) C</b>	(3-0-0) 3
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	3
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	40

**Course Objective:**

- 1. Study and identify different types of natural materials like rocks & minerals and soil.**
- 2. Give students a clear understanding on structural functions and role of materials to achieve that.**

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

<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Identify varieties of minerals and rocks based on structure and composition	PO1	
CO2	Apply your knowledge in various construction materials, for sustainable and innovative building solutions.	PO1	
CO3	Analyze modern construction materials designed for energy efficiency and sustainability	PO2	
CO4	Assess the properties of building materials & components to compare it to quality standards	PO7, PO9, PO10	

**MODULE – 1**

**10 Hrs.**

Application of Geology in Civil Engineering Practices, Understanding the earth, internal structure and composition. Classification of Rocks, Igneous Rocks, Sedimentary Rocks and Metamorphic Rocks of their properties with examples.

**Mineralogy:** Mineral properties, composition and their use in the manufacture of construction materials – Quartz Group (Glass); Feldspar Group (Ceramic wares and Flooring tiles); Kaolin (Paper, paint and textile); Asbestos (AC sheets); Carbonate Group (Cement); Gypsum (POP, gypsum sheets, cement); Mica Group (Electrical industries); Ore minerals - Iron ores (Steel); Chromite (Alloy); Bauxite(aluminum);Chalcopyrite(copper).

***Self- study component:- The students shall visit sites and learn to identify different types of rocks and minerals and study their performance***

<b>MODULE – 2</b>	<b>10 Hrs.</b>
<p>Stones: Varieties of building stones, qualities of good building stones, dressing of stones, selections and suitability of stones, uses of stones, decay and preservation of stones, quarrying of stones. Bricks- Qualities of brick making earth, standard specifications, properties and testing of bricks Plastics: Types, constituents of plastic, properties, uses of plastics in building industries Paints, Varnishes and Distempers: Constituents of oil paint, characteristics of a good paint, types of paints,. Varnishes – constituents of varnishes – types of varnishes, Distemper and application to new and old surfaces. Surface preservatives - metallic coating by hot dipping. Glass and its application in Civil Engineering.</p> <p><i>Self- study component: The students shall visit construction sites and learn to identify different types of building materials and study their performance</i></p>	
<b>MODULE – 3</b>	<b>10 Hrs.</b>
<p>Solid and hollow blocks, stabilized mud blocks, aerated blocks, rammed earth, reinforced brick work Properties and application of modern insulation materials in residential buildings Aerogel Vacuum Insulation Panels (VIPs) for building construction industry utilisation of FRP composites in the civil infrastructure Composite Ferro Cement System: s, Precast Concrete Blocks: Laminated Thermo Plastic Panels.</p> <p><i>Self- study component: The students shall visit the construction site and must identify the new construction materials and study their performance</i></p>	
<b>MODULE – 4</b>	<b>10 Hrs.</b>
<p>Brick Masonry: Different types of bonds - English, Flemish. Lintel its types and uses in buildings. Chejja its types and uses in building and chejja. Staircases: Types, Empirical design of doglegged staircase and open well staircase. Location of doors, size of doors and door frames, types of doors and windows, ventilators.. Form work: Material for form work, types of form works, shuttering and scaffolding details in RCC columns, beams and floors</p> <p><i>Self- study component: The students shall visit the construction sites and identify various types of doors , flooring materials and bonds in masonry</i></p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Parbin Singh , “Engineering &amp; General Geology [paperback] Katson educational series [Jan 01, 2013]</li> <li>2. B.C. Punmia, “Building Construction”, 10th edition, Laxmi Publications, New Delhi, 2007</li> <li>3. S.C Rangwala., “Engineering Materials”, 28th edition, Charotar Publishing House, Anand, 1997</li> </ol>	

**Reference Books:**

1. P.C. Varghese. "Building Construction", Prentice Hall of India, New Delhi, 2007
2. Sushil Kumar, "Building Construction", 16th edition, Standard Publishers & Distributors, New Delhi, 2005
3. K.S. Jagadish and B.V. Venkatarama Reddy, 1<sup>ST</sup> Edition  
"Alternative Building Materials and Technologies" New age international(p) ltd.
4. W B Mackay, "Building Construction" Vol 4, Pearson Publications.
5. Weblink NPTEL-Civil-[Basic construction materials - Course](#)

**MOOC Course:**

<https://archive.nptel.ac.in/courses/105/106/105106053/>

[https://onlinecourses.nptel.ac.in/noc23\\_ce107/preview](https://onlinecourses.nptel.ac.in/noc23_ce107/preview)

**Course Articulation Matrix**

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
<b>CO1</b>	2													
<b>CO2</b>	3													
<b>CO3</b>		3												
<b>CO4</b>							2		2	2				

Course Title	ENGINEERING SURVEYING		
Course Code	23CV302	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
CIE + SEE	50 + 50 Marks	Total Hours	50(40L+10P)

**Course Objective:**

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concept of surveying to field practice.

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Apply the knowledge of fundamentals of surveying to determine the relative position of points in horizontal plan.	PO1, PO2	
CO2	Apply the knowledge of fundamentals of surveying to calculate the relative position of points in vertical plan.	PO1, PO2	
CO3	Comprehend the knowledge of working principle and system of measurements in EDM	PO1	
CO4	Apply the knowledge surveying to set out simple, compound and reverse curves.	PO1, PO2	

MODULE – 1	12 Hrs.
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**Introduction** - Definition and Importance of survey, Classification of survey. Principles of survey. Classification of maps, Units of measurements, Conventional symbols.

**Chain surveying** - Accessories used in chain survey, Ranging, Reconnaissance survey, Field book, Index sketch, Errors, Map numbering system. Problems with a well-conditioned triangle.

**Compass surveying** - Basic definitions, Prismatic and Surveyor's compasses, Traversing, Declination, Quadrantal bearings, Whole circle bearings, Local attraction, and related problems.

*Self - study component: Students shall study the various maps and drawings in surveying.*

**Laboratory component:**

1. Field experiments to set out perpendiculars at various points on a given line using cross staff, tape and area calculation.
2. Direct and indirect ranging operations.
3. Measurement of bearing of the sides of a closed traverse.

<b>MODULE – 2</b>	<b>13 Hrs.</b>
<p><b>Leveling</b> – Objectives and uses of leveling, Definitions and Terms used in leveling, Types of levels, Correction to Curvature and Refraction, Calculation of RL by HI method and Rise and fall method, Fly leveling and Profile leveling, Numerical problems.</p> <p><b>Contouring</b> – Definition and Uses, Characteristics of contours, Methods of contouring, Interpolation of contours, Contour gradient</p> <p><i>Self-study component: Students shall visit the ongoing project of water supply and highway.</i></p>	
<p><b>Laboratory component:</b></p> <ol style="list-style-type: none"> <li>1. Profile leveling to draw the longitudinal and cross section of highway.</li> <li>2. Block levelling for preparation of contour Plan.</li> </ol>	
<b>MODULE -3</b>	<b>12 Hrs.</b>
<p><b>Theodolite Survey</b> - Theodolite and types, Fundamental axes and Parts of a transit theodolite, Uses of theodolite, Temporary adjustments of a transit theodolite, Measurement of horizontal angles using Repetition and Reiteration methods – Measurement of vertical angles.</p> <p><b>Trigonometric Levelling</b> - Determination of elevation of objects when the base is accessible and inaccessible by single plane and double plane method – Distance and difference in elevation between two inaccessible objects by double plane method, and related problems</p> <p><i>Self-study component: Students shall study the advanced survey techniques.</i></p>	
<p><b>Laboratory component:</b></p> <ol style="list-style-type: none"> <li>1. Determine the horizontal angle between the points by repetition and reiteration method</li> <li>2. Determine the vertical angle by single plane method using theodolite.</li> </ol>	
<b>MODULE -4</b>	<b>13 Hrs.</b>
<p><b>Curves</b> -- Necessity, types of curves, simple curves – elements, designation of curves,</p> <p><b>Simple curves</b> - elements – setting out of simple curves by linear methods and method of Rankine's deflection angles.</p> <p><b>Compound curves</b> - elements – setting out of compound curves.</p> <p><b>Reverse curve</b> - between two parallel straights – equal radius – unequal radius.</p> <p><b>Total station Survey</b> - EDM devices and their working principles, Co-ordinates system of measurements, Temporary adjustment of Total station, Parts of total station, Accessories.</p> <p><i>Self-study component: Students shall visit the ongoing highway projects.</i></p>	
<p><b>Laboratory component:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to Total Station, Parts of Total Station and setting up of total station.</li> </ol>	



**Text Books:**

1. Punmia B. C., “Surveying Vol 1 &2”, Laxmi Publications, Pvt. Ltd, New Delhi 2015.
2. Bassak N. N., “Surveying”, Tata McGraw Hill, 2004.

**Reference Books:**

1. Chandra A. M., “Higher Survey”, New Age International, 2006.
2. Roy. S. K., “Fundamentals of Surveying”, Prentice Hall of India, 2009.
3. Chandra A. M., “Plane Surveying”, New Age International ® Ltd.
4. Punmia B. C, Ashok K Jain, Arun K Jain, Higher Surveying Laxmi Publications Pvt. Ltd 2008.
5. S. S. Bhavikatti, Surveying and Levelling - Vol-1, I.K. International publishing house Pvt. Ltd, New Delhi, 2011

**MOOC Course:**

1. [NPTEL :: Civil Engineering - Surveying](#)
2. [Digital Land Surveying And Mapping \(DLS&M\) - Course \(nptel.ac.in\)](#)

Course Articulation Matrix	
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[illegible]

### Engineering Surveying Rubrics (23CV302)

	Excellent	Very Good	Good	Average
<b>Records /10</b>	<ul style="list-style-type: none"> <li>• Comprehensive and well-organized records</li> <li>• All entries are accurate, complete, and clearly documented</li> <li>• Detailed observations and results are presented systematically (10)</li> </ul>	<ul style="list-style-type: none"> <li>• Good organization and mostly accurate entries</li> <li>• Minor errors or omissions in the records</li> <li>• Observations and results are presented, but lack some detail(8)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic organization with several inaccuracies</li> <li>• Significant errors or omissions in the records</li> <li>• Observations and results are incomplete or unclear(6)</li> </ul>	<ul style="list-style-type: none"> <li>• Poorly organized records with many inaccuracies</li> <li>• Major errors or omissions throughout</li> <li>• Observations and results are largely missing or very unclear (4)</li> </ul>
<b>Procedure /03</b>	<ul style="list-style-type: none"> <li>• Procedure followed precisely as outlined in the manual</li> <li>• Clear, logical, and methodical execution of each step</li> <li>• No deviations or mistakes during the process(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure mostly followed correctly with minor deviations</li> <li>• Logical execution with some small errors</li> <li>• Minor steps missed or executed incorrectly(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure partially followed with significant deviations</li> <li>• Execution lacks clarity and has noticeable errors</li> <li>• Several steps missed or executed incorrectly(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure not followed correctly</li> <li>• Execution is disorganized and unclear</li> <li>• Many steps missed or executed incorrectly(0)</li> </ul>
<b>Conduction /05</b>	<ul style="list-style-type: none"> <li>• Excellent execution of the experiment</li> <li>• All apparatus used correctly and safely</li> <li>• Results obtained are highly accurate and reliable(5)</li> </ul>	<ul style="list-style-type: none"> <li>• Good execution with minor errors</li> <li>• Apparatus used mostly correctly with some small mistakes</li> <li>• Results obtained are fairly accurate and reliable(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic execution with noticeable errors</li> <li>• Apparatus used with several mistakes</li> <li>• Results obtained are somewhat accurate but less reliable(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor execution with many errors</li> <li>• Apparatus used incorrectly or unsafely</li> <li>• Results obtained are inaccurate and unreliable(0)</li> </ul>
<b>Viva Voce /02</b>	<ul style="list-style-type: none"> <li>• Excellent understanding of the experiment and underlying concepts</li> <li>• Answers to questions are clear, concise, and correct</li> <li>• Demonstrates a high level of confidence and competence(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Good understanding with minor gaps in knowledge</li> <li>• Answers to questions are mostly correct with minor errors</li> <li>• Demonstrates reasonable confidence and competence(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic understanding with several gaps in knowledge</li> <li>• Answers to questions are partially correct with noticeable errors</li> <li>• Demonstrates limited confidence and competence(0.5)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor understanding with many gaps in knowledge</li> <li>• Answers to questions are mostly incorrect or unclear</li> <li>• Demonstrates low confidence and competence(0)</li> </ul>

<b>Course Title</b>	<b>STRENGTH OF MATERIALS</b>		
<b>Course Code</b>	23CV303	<b>(L-T-P) C</b>	(3-0-2) 4
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	5
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	50(40L + 10P)
<b>Course Objective:</b> To understand how solid materials behave under various types of forces and loads. <b>Course Outcomes:</b> At the end of course, student will be able to:			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Comprehend the basic properties of materials and behavior of materials under load with basics of structural mechanism.	PO1, PO2, PO3	
CO2	Calculate the Bending Moments & Shear Forces for given statically determinate beams subjected to different types of loads and support conditions. Understand the behavior of long and short columns and to calculate their load carrying capacities under axial loading	PO2, PO3, PO4	
CO3	Calculate the bending stresses and shear stresses for a given beams of symmetric cross sections and represent the variation of fiber stresses and shear stresses in diagrams.	PO2, PO3, PO4	
CO4	Compute the deflection of statically determinate beams for various loads and support conditions and understand the concept of compound stresses and the applications of the same in 2-D problems.	PO2, PO3, PO4	
<b>MODULE – 1</b>			<b>12 Hrs.</b>
<b>Simple Stresses and Strains:</b> Introduction, Assumptions, Properties of materials, Types of stresses and strains, definition and units, Hooke's law, Poisson's ratio, volumetric strain, elastic constants and the relationship among them, Stress–Strain diagrams for ferrous and non-ferrous materials, Bars of varying cross sections -Tapering bars of circular and rectangular cross – sections, Elongation due to self-weight, Analysis of composite sections, thermal stresses including compound bars. <b>Self-Study Component:</b> <i>Learn to distinguish ferrous and non-ferrous materials, composite sections and concept of loading and stress.</i>			
<b>MODULE – 2</b>			<b>13 Hrs.</b>
<b>Bending moments and shear forces:</b> Statically determinate beams, Definition of shear force and Bending moment, Sign conventions, Relationship between intensity of loading, shear force and bending moment. S.F and B M diagrams for cantilever, simply supported and over-hanging beams subjected to point loads UDL, UVL and Couples. <b>Stresses in Beams</b> - Bending stresses in beams: Introduction, Pure bending, Assumptions in			

simple bending theory, Bernoulli's Beam bending equation, Modulus of rupture, Section modulus, Flexural rigidity, Beam of uniform strength, Bending stress distribution in rectangular, circular, I,T and channel sections (symmetric about one)

**Self-Study Component:** *Students shall work out Bending moment and shear force diagrams for typical loading of structural components. They shall also learn to estimate the bending stresses developed in the structural components.*

### MODULE – 3

**12 Hrs.**

**Shear stresses in beams:** Introduction, Expression for shear stress intensity, Shear stress distribution in rectangular section, Circular, I, T and channel sections, Numerical examples (symmetric about one axis).

**Torsion of Circular Shafts:** Introduction, Application of torsion in civil engineering, Assumptions, Equation for torsional shear stress in prismatic bar of circular cross-section, Strength and Stiffness, Torsional rigidity and Polar modulus, Power transmitted by solid and hollow circular shafts, Numerical examples.

**Self-Study Component:** *The students shall work out shear stress distribution for typical singly symmetric Cross sections. Torsional stresses in circular shafts and principal stresses and principal planes due to the action of torsional moment and bending moment shall be worked out for typical cases of distribution of torsional moment and bending moment.*

### MODULE – 4

**13 Hrs.**

**Deflection of Beams:** Definition of slope and deflections, Differential equation of flexure, Sign conventions, Expressions for slope and deflection for standard loading cases using (a) Double Integration method and (b) Macaulay's method for prismatic beams. Examples on cantilever beams, simply supported beams and over hanging beams carrying point loads, UDL, UVL and couples.

**Columns and Struts:** Introduction, Short and long columns, Euler's theory of long columns, Derivations, Assumptions and limitations, Radius of gyration, Effective length, Slenderness ratio, Buckling load (concepts of stability of structures), Rankien's formula and its applications.

**Self-Study Component:** *The students shall learn the importance of flexure by visiting sites of construction and workout slope & deflections in structural elements due to typical loading cases. The students shall calculate the buckling loads for long columns with different end conditions and hence understand the importance of end conditions in the buckling behaviour of columns.*

### Practical Component:

Tension test, compression test on mild steel and shear test on cast iron and mild steel specimen. Hardness tests on Ferrous and Non-ferrous metals– Brinell's apparatus and Impact test on Mild Steel (Charpy & Izod). Torsion test on Mild Steel circular section (Vertical and horizontal torsion tests). Experimental Investigation on Flexure Test on Wood under point load.

### Text Books:

1. Ramamrutham.S, "Strength of Materials", Dhanpath Rai Pub. New Delhi,1988

- ### Reference Books:

- MOOC Course:**

## Course Articulation Matrix

[illegible]

### Strength of Materials (23CV303)

	<b>Excellent</b>	<b>Very Good</b>	<b>Good</b>	<b>Average</b>
<b>Records /10</b>	<ul style="list-style-type: none"> <li>• Comprehensive and well-organized records</li> <li>• All entries are accurate, complete, and clearly documented</li> <li>• Detailed observations and results are presented systematically (10)</li> </ul>	<ul style="list-style-type: none"> <li>• Good organization and mostly accurate entries</li> <li>• Minor errors or omissions in the records</li> <li>• Observations and results are presented, but lack some detail(8)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic organization with several inaccuracies</li> <li>• Significant errors or omissions in the records</li> <li>• Observations and results are incomplete or unclear(6)</li> </ul>	<ul style="list-style-type: none"> <li>• Poorly organized records with many inaccuracies</li> <li>• Major errors or omissions throughout</li> <li>• Observations and results are largely missing or very unclear (4)</li> </ul>
<b>Procedure /03</b>	<ul style="list-style-type: none"> <li>• Procedure followed precisely as outlined in the manual</li> <li>• Clear, logical, and methodical execution of each step</li> <li>• No deviations or mistakes during the process(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure mostly followed correctly with minor deviations</li> <li>• Logical execution with some small errors</li> <li>• Minor steps missed or executed incorrectly(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure partially followed with significant deviations</li> <li>• Execution lacks clarity and has noticeable errors</li> <li>• Several steps missed or executed incorrectly(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure not followed correctly</li> <li>• Execution is disorganized and unclear</li> <li>• Many steps missed or executed incorrectly(0)</li> </ul>
<b>Conduction /05</b>	<ul style="list-style-type: none"> <li>• Excellent execution of the experiment</li> <li>• All apparatus used correctly and safely</li> <li>• Results obtained are highly accurate and reliable(5)</li> </ul>	<ul style="list-style-type: none"> <li>• Good execution with minor errors</li> <li>• Apparatus used mostly correctly with some small mistakes</li> <li>• Results obtained are fairly accurate and reliable(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic execution with noticeable errors</li> <li>• Apparatus used with several mistakes</li> <li>• Results obtained are somewhat accurate but less reliable(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor execution with many errors</li> <li>• Apparatus used incorrectly or unsafely</li> <li>• Results obtained are inaccurate and unreliable(0)</li> </ul>
<b>Viva Voce /02</b>	<ul style="list-style-type: none"> <li>• Excellent understanding of the experiment and underlying concepts</li> <li>• Answers to questions are clear, concise, and correct</li> <li>• Demonstrates a high level of confidence and competence(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Good understanding with minor gaps in knowledge</li> <li>• Answers to questions are mostly correct with minor errors</li> <li>• Demonstrates reasonable confidence and competence(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic understanding with several gaps in knowledge</li> <li>• Answers to questions are partially correct with noticeable errors</li> <li>• Demonstrates limited confidence and competence(0.5)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor understanding with many gaps in knowledge</li> <li>• Answers to questions are mostly incorrect or unclear</li> <li>• Demonstrates low confidence and competence(0)</li> </ul>

<b>Course Title</b>	<b>WATER SUPPLY AND TREATMENT ENGINEERING</b>		
<b>Course Code</b>	23CV304	<b>(L-T-P) C</b>	(3-0-0) 3
<b>Exam</b>	3 Hrs	<b>Hours / Week</b>	3
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total hours</b>	40
<b>Course Objective:</b> 1. Study drinking water quality standards and to illustrate qualitative analysis of water 2. Understand and design of different unit operations and unit process involved in water treatment process <b>Course Outcomes (COs):</b> Upon completion of the course, students shall be able to			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to POs</b>	<b>Mapping to PSOs</b>
CO1	Estimate average and peak water demand for a community.	PO1,PO2,PO7	-
CO2	Evaluate available sources of water, quantitatively and qualitatively and make appropriate choices for a community.	PO1,PO6, PO7	-
CO3	Evaluate water quality and environmental significance of various parameters and plan suitable treatment system	PO1,PO2,PO7	PSO1
CO4	Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.	PO1,PO2,PO7	PSO1
<b>MODULE –1</b>			<b>10 Hrs.</b>
<b>Introduction:</b> Need for protected water supply, Factors affecting water supply scheme and benefits. <b>Demand Of Water:</b> Types of water demands - domestic demand, institutional and commercial, public uses, fire demand. Factors affecting per-capita demand, variations in demand of water, Peak factor, Design periods and factors governing the design period. Different methods of Population forecasting. Fire demand - Estimation by Kuichling's formula, Freeman formula and National Board of Fire Under Writers formula. <b>Water Treatment:</b> Objectives and Treatment flowchart – significance of each unit. <b>Sources:</b> Concept of hydrological cycle, Surface and subsurface sources - suitability with regard to quality and quantity. Factors governing the selection of particular source of water			
<b>MODULE 2</b>			<b>10 Hrs.</b>
<b>Quality of Water:</b> Concept of safe water: wholesomeness, palatability and potable. Waterborne diseases including Health significance of Fluoride and Nitrates. Examination of water: Objectives, Physical, Chemical and Microbiological Examinations using analytical & instrumental techniques. Drinking water standards: BIS & WHO standards. Numerical problems on pH and MPN. <b>Collection and Conveyance of Water:</b> Intake structures - different types of intakes; factors for the selection and location of intakes. Pumps - Necessity, types, power of			

pumps, factors for the selection of a pump. Design of the economical diameter for the rising main.	
<b>MODULE 3</b>	<b>10 Hrs.</b>
<p><b>Aeration</b> – Principle and types of aerators. <b>Sedimentation</b>: Theory, settling tanks, types and design. Aided sedimentation- with coagulants, dosages, chemical feeding, flash mixing and flocculates. <b>Filtration</b>: Mechanism - theory of filtration, types of filters- slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design (excluding under drainage system and backwashing of filters). <b>Disinfection</b>: Definition, Requirements, methods of disinfection, Chlorination, chlorine demand, residual chlorine.</p>	
<b>MODULE 4</b>	<b>10 hrs.</b>
<p><b>Softening</b>: Definition, methods of removal of hardness by lime soda-process and zeolite process with merits and demerits. <b>Miscellaneous treatment</b>: Removal of colour, odour and taste with methods like aeration, use of copper sulphate, activated carbon treatment, oxidizing organic matters, removal of iron and manganese. Fluoridation and defluoridation. RO and Nano Filtration. <b>Methods of Distribution Systems</b>: System of supply, service reservoirs and their capacity determination, distribution systems of layouts. <b>Water Conservation</b> – Rain Water Harvesting.</p>	
<p><i>Self-Study: Visit to intake structure, water treatment plant and report working of each unit. Design of water treatment plant units and distribution system with population forecasting for the given city. Water conservation methods.</i></p>	
<p><b><u>Text Books :</u></b></p> <ol style="list-style-type: none"> <li>1. Water Supply Engineering: Environmental Engineering - Vol. I – 2017 Santosh Kumar Garg, Khanna Publisher, ISBN-10: 9788174091208</li> <li>2. Punmia B.C. and Ashok Kumar Jain, “<b>Environmental Engineering- I</b>”, Arihant Publications,</li> </ol>	
<p><b><u>Reference Books:</u></b></p> <ol style="list-style-type: none"> <li>1. Hammer and Hammer, “<b>Water Technology</b>”, Mc Graw Hill Publications Howard S. Peavy, Donald R. Rowe. George Tchobanoglous, “<b>Environmental Engineering</b>” - McGraw Hill International Ed. ISBN-10: 9351340260</li> <li>2. CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi, 3rd Edition, 2018, Akalank Publications; ISBN-10: 8176393819</li> </ol>	
<p><b><u>MOOC/NPTEL Courses:</u></b></p> <p><a href="https://onlinecourses.nptel.ac.in/noc21_ce3">https://onlinecourses.nptel.ac.in/noc21_ce3</a></p>	



Course Articulation Matrix														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	2	3												
CO2	3						2							
CO3	2						3						3	
CO4	3						3						3	

<b>Course Title</b>	<b>COMPUTER AIDED BUILDING PLANNING AND DRAWING</b>		
<b>Course Code</b>	23CV305	<b>(L-T-P) C</b>	(0-0-2) 1
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	02
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	12 (0L + 12P)
<p><b>Course Objective:</b> Provide students with a basic understanding to achieve skill sets to prepare computer aided engineering drawings using advanced tools and understand the details of construction of different building elements.</p> <p><b>Course Outcomes:</b> At the end of course, student will be able to:</p>			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Prepare, read and interpret the drawings in a professional set up.	PO5,PO6, PO12	
CO2	Plan and design residential and public buildings as per the requirements	PO5,PO8, PO10	
<b>MODULE – 1</b>			<b>12 Hrs.</b>
<p style="text-align: center;"><b>List of Exercises</b></p> <ol style="list-style-type: none"> <li>Standard layout of drawing sheet:, Size of drawing sheets, Title block as per B.I.S specifications Title of the drawing. Drawing number, Scale, Symbols used in the drawing, types of lines. Name of the firm, and Initials of staff, who have designed, checked and approved. The general principle of dimensioning: Purpose of Scale, units of measurements</li> <li>Plan, elevation and sectional details using paper and pencil for single storied residential building from the given single line diagram. (Set-back distances and calculation of carpet area, plinth area and floor area ratio).</li> <li>Introduction to CAD TOOLS.</li> <li>Plan, elevation and sectional details using CAD TOOLS for single storied residential building from the given single line diagram as per the byelaws.</li> <li>Plan, elevation and sectional details using paper and pencil and preparation of schedule of openings for double storied residential building from the given single line diagram.</li> <li>Plan, elevation and sectional details using CAD TOOLS and preparation of schedule of openings for double storied residential building from the given single line diagram as per the byelaws. (Furniture layout to be included)</li> <li>Plan and elevation using CAD TOOLS and preparation of schedule of openings for public buildings (School) from the given single line diagram.</li> <li>Sectional details using CAD TOOLS and preparation of schedule of openings for public buildings (School) from the given single line diagram.</li> <li>From a given single line diagram, preparation of electrical layout for a given building using CAD tools.</li> <li>From a given single line diagram, preparation of water supply and sanitary layout for a given building using CAD tools.</li> <li>Functional design of buildings using bubble diagram. Development or line diagram for a primary health center with given details and requirements.</li> </ol>			

- |     |   |
|-----|---|
| 12. | Functional design of buildings using bubble diagram. Development or line diagram for a office building (Engineer's office) with given details and requirements. |
| 13. | Functional design of buildings using bubble diagram. Development or line diagram for a college canteen with given details and requirements.                     |

**Text Books:**

1. MG Shah, CM Kale, SY Patki, “Building drawing with an integrated approach to Built Environment Drawing” , Tata Mc Graw Hill Publishing co. Ltd., New Delhi
2. Gurucharan Singh, “Building Construction”, Standard Publishers, & distributors, New Delhi.

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2. Gurucharan Singh, “Building Construction”, Standard Publishers, & distributors, New Delhi.

<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. “National Building Code”, BIS, New Delhi, 2016.</li> <li>2. CAD lab Manual, Department of Civil Engineering, MCE</li> </ol>
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1. “National Building Code”, BIS, New Delhi, 2016.
2. CAD lab Manual, Department of Civil Engineering, MCE

**MOOC Course:**  
i) [Engineering drawing and computer graphics - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/112102001)

- i) [Engineering drawing and computer graphics - Course \(nptel.ac.in\)](https://nptel.ac.in)

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### Computer Aided Building Planning & Drawing (23CV305)

	3	2	1	0/0.5
Drawing Accuracy. /03	All drawing elements are accurate and precise. No errors are present.(3)	All necessary drawing elements are evident. Three minor errors are present.(2)	Attempt was made to accurately create the drawing (1)	No attempt was made to accurately create the drawing (0)
Modern Tool Usage /03	The student has effectively used the software to do the given drawing. (3)	The student has the basic knowledge of most of the tools of the software to do the given drawing (2)	The student has the basic knowledge of some of the tools of the software to do the given drawing (1)	The student clearly failed to use the basic tools of the software to do the given drawing (0)
Completeness /02	All the three views are drawn completely (3)	Dimensions of few objects were missing(2)	Incomplete views (1)	No real attempt was made to draw the model (0.5)
Dimensions /02	Dimensions of all of the objects were shown(2)	Dimensions of few of the objects missing (2)	Dimensions of many of the objects missing (1)	Dimensions not shown (0.5)

<b>Course Title</b>	<b>URBAN AND RURAL PLANNING</b>		
<b>Course Code</b>	23CV306A	<b>(L-T-P) C</b>	(3-0-0) 3
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	3
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	40

**Course Objective: This Course will enable the students to**

- 1. Gain Knowledge of Rural, Urban life and fundamentals of architecture**
- 2. Gain comprehensive knowledge about development plans of a village, town with rules and regulations**

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

<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Comprehend the basic objects and principles of town planning and types of planning.	PO1, PO4, PO9	
CO2	Apply land use analysis, zoning regulations to development plan.	PO1, PO7, PO9	
CO3	Describe the concepts, principles, philosophies of great pioneers like Ebenezer Howard, Patrick Geddes, Le Corbusier, C.A. Doxiadis, etc. during and post-industrial revolution, transportation problems in the developing countries.	PO1, PO6, PO9	
CO4	Demonstrate the problems in rural areas, legislation in planning; Comprehend the knowledge on norms, procedures, etc., in planning;	PO1, PO6, PO9	

<b>MODULE – 1</b>	<b>10 Hrs.</b>
<p>Definition of Urban unit or town, Standard Urban areas, classification of towns and cities, Urban Infrastructure Management, Components of Urban Infrastructure, definition of planning by various planners, objects of town planning, aims of planning, main goals of Modern town planning, characteristics of successful planning, principles of town planning, necessity of town planning, physical, social and economic resources, origin of towns: Natural growth: Concentric spread, Ribbon Development, Satellite Growth, Scattered Growth, Planned Growth: Horizontal and Vertical Growth, types of planning, relationship between planning, policy and implementation, types of surveys, techniques of surveys, scale for structuring questionnaire. Selection of samples, type of selection of samples, errors in surveying. Population growth, density of population, occupational categories, evolution of towns in India: Ancient, medieval and modern, urbanization in India, Functional classification of towns.</p>	

***Self study component: Students shall collect the information from Census, the Hassan Development Authority, Municipality Office regarding population growth, occupational pattern of Hassan city and submit a report.***

## **MODULE – 2**

**10 Hrs.**

Definition of zoning, zoning regulations, principles of zoning, advantages of zoning, maps for zoning, Aspects of Zoning: Density, Height and Use Zoning, building bye-laws, developed and undeveloped area, developed and undeveloped land, land use and land use pattern in urban areas, the character of a town, categories of a town, densities of town, planning process, detailed classification of land uses, classification of urban road and rural roads, Perspective plan, Development plan, Annual plan and Plans of Projects/Schemes, Surveys to be conducted before Development Plan, objectives of a Master Plan, necessity, data to be collected, drawing to be prepared, features of a Master plan, planning standards, report, stages of preparation, method of execution, Outline and Comprehensive Development Plan.

***Self study component: Students shall collect the information from the internet on evolution of cities-visit the Hassan Development Authority and collect details on concept of zoning, Comprehensive Development plan for Hassan city submit a report.***

## **MODULE – 3**

**10 Hrs.**

The Industrial Revolution and Urban Planning : The Garden city concept, Satellite Towns, Philosophy of Patrick Geddes, Le Carbusier – C.A. Doxiades – Evolution of cities, Planning Theory: Land use theories – Descriptives – Exploratory and Speculative theories, Transportation Planning: Interdependence of the land use and traffic, Transportation problems in developing countries, Traffic flow characteristics, Transport Surveys and Parking Surveys.

***Self study component: Students shall collect the information from the local village panchayath office and collect details on the development plan of the village-socio economic aspects of housing, submit a report.***

## **MODULE – 4**

**10 Hrs.**

Rural Planning : Definition – Surveys – Development plan for a village – Problems of rural housing – Areas of development –Socio Economic aspects of housing, Legislation in Planning: Objectives of Development Controls – Technical considerations for formation of Building Bye-laws – Urban local bodies – Public health and sanitation – Public works and public utilities – Education and Social Welfare Development – Administrative and General Functions–Obligatory and Discretionary functions.

***Self study component: Students shall collect the information from the Urban local bodies and present a report on the obligatory and discretionary functions.***

### **Text Books:**

1. Rangawala.S.C., Rangawala P.S & Rangawala.K.S “ Town Planning” Charotar Publishing House,

- Anand, India, 1987. (Module 1, Module 2, Module3 and Module-4)
2. Abir Bandyapadhyay “ Text Book of Town Planning” Books and Allied (P) ltd, Calcutta, India 2000 (Module 1, Module 2, Module3 and Module-4)
3. Rame Gowda. K.S “ Urban and Regional Planning”, Prasaraanga, University of Mysore, Mysore, 1986 (Module 1, Module 2, Module3 and Module-4)

#### Reference Books:

1. Arthur.B.Gallion Simon Eisner “The Urban Pattern” CBS Publishers and Distributors, New Delhi, 1998.
2. Lewis Keeble, “Principles and Practices of Town & Country Planning”, The Estates Gazette Limited, London, 1969.
3. Kadiyali L. R., “Traffic Engineering & Transport Planning” Khanna Publishers, Delhi, 2005.
4. C A O’ Flaherty, “Transport Planning and Traffic Engineering”, Butterworth-Heinemann, An
5. Imprint of Elsevier, 2006. (Edited)
6. Partha Chakroborty & Animesh Das, “Principles of Transportation Engineering”, Prentice Hall of India Private Limited, New Delhi, 2003.
7. Kulshrestha S. K., “Dictionary of Urban and Regional Planning”, Kalpaz Publications, Delhi, 2006.
8. Urban Development Plans Formulation & Implementation (UDPFI) Guidelines, Ministry of Urban Affairs & Employment, Government of India, New Delhi.

#### MOOC Course:

1. [https://onlinecourses.nptel.ac.in/noc20\\_ar11/course](https://onlinecourses.nptel.ac.in/noc20_ar11/course)
2. [https://onlinecourses.swayam2.ac.in/cec20\\_ar01/course?](https://onlinecourses.swayam2.ac.in/cec20_ar01/course?)
3. [https://onlinecourses.nptel.ac.in/noc24\\_ar11/preview?](https://onlinecourses.nptel.ac.in/noc24_ar11/preview?)
4. [https://onlinecourses.nptel.ac.in/noc24\\_ce80/preview?](https://onlinecourses.nptel.ac.in/noc24_ce80/preview?)

#### Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2					1					
CO2	3						2		1					
CO3	3					2			1					
CO4	3					2			1					

Course Title	SUSTAINABILITY IN ENGINEERING DESIGN		
Course Code	23CV306B	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
CIE + SEE	50 + 50 Marks	Total Hours	40
<b>Course Objective:</b> Understand sustainable development goals, life cycle assessment, renewable energy integration, waste reduction, and environmentally conscious design practices.			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Explain the basics of sustainable Development, sustainable engineering, and its role in engineering	PO6, PO7	
CO2	Comprehend the integration methods of sustainability	PO3, PO7	
CO3	Apply the concepts of sustainable engineering and principles in engineering	PO1, PO7	
CO4	Apply the principle and methodology of life cycle assessment tool to engineering systems	PO5, PO7, PO9	
MODULE – 1		10 Hrs.	
Role of engineers, Exploring sustainability - Definition, System thinking, Engineering ecology, Concept of triple P, Overview of making a sustainable design - General applicable design steps, Design steps specific for a sustainable design, Challenges for a sustainable design - Challenges relative to a reference case, Stage-gate innovation funnel, Open innovation with sustainable development goals, Risks and required innovation effort constraints			
<i>Self-study Component: Assessment of sustainability in their neighborhood in education, water resources, food supplies, etc., identify the potential threats for sustainability, and explore the possible solutions for the same.</i>			
MODULE – 2		10 Hrs.	
Design process as teamwork - Forming design groups, Group dynamics, Setting goal and scope - Assigning the design problem, Goal of the design, Design scope, Defining value streams, Sustainability constraints - Guiding principle for sustainable design, People, Planet, Profit/Prosperity, Required domain knowledge partner and stakeholder identification, Design synthesis - Integral synthesis, Generation of solutions, Risk assessment and mitigation by research and development, Case studies			
MODULE – 3		10 Hrs.	
Preliminary solutions assessment, Quick scan Life Cycle Assessment (LCA) - Set-up, Goal definition and scoping, Inventory analysis, Impact assessment, Valuation, Improvement, LCA Epilogue, Evaluation of design - Stage/Gate evaluation with stakeholders, Rapid economic analysis method, Rapid social acceptance guideline, Rapid integral sustainable development assessment, Scenario set building			



for robustness test to future uncertainties, Red flags method forevaluation with outside stakeholders  
***Self-study Component: Perform a Life Cycle Assessment of any daily-use products or activities.***

#### MODULE – 4

**10 Hrs.**

Sustainability complexity and design competences, Acquiring key competences - Workshop setting, Sustainable design and scientific research, Sustainable design and conventional design, Examples from engineering practices - sustainable design and construction practices in the built environment – GRIHA and LEED rating systems

***Self-study Component: Explore the design aspects of a sustainable building / maintaining a sustainable transport system for MCE.***

#### Text Books:

1. Bakshi, B. R. (2019). Sustainable Engineering: Principles and Practice. United Kingdom: Cambridge University Press. ISBN: 9781108420457
2. Harmsen, J., and Jonker, G. (2012). Engineering for Sustainability: A Practical Guide for Sustainable Design. Netherlands: Elsevier Science. ISBN: 9780444538468

#### Reference Books:

1. Wasewar, K. L., and Rao, S. N. (Eds.). (2022). Sustainable Engineering, Energy, and the Environment: Challenges and Opportunities. United Kingdom: Apple Academic Press. ISBN: 9781000565058
2. Ramjeawon, T. (2020). Introduction to Sustainability for Engineers. United Kingdom: CRC Press. ISBN: 9781000026726
3. Babu, G. S., Saride, S., and Basha, B. M. (Eds.). (2017). Sustainability issues in civil engineering (p. 367). Singapore: Springer. DOI: 10.1007/978-981-10-1930-2. ISBN: 9789811019289
4. Gibson, A., and Johnson, A. (2014). Sustainability in Engineering Design. Netherlands: Elsevier Science. ISBN: 9780124045910

#### MOOC Course:

#### Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	3							
CO2			1				3							
CO3	2						3							
CO4					3		2							

Course Title	ENVIRONMENTAL PROTECTION AND MANAGEMENT		
Course Code	23CV306C	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
CIE + SEE	50 + 50 Marks	Total Hours	40
<b>Course Objective:</b> Understand the various components of the environment and the significance of the sustainability of a healthy environment.			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Explain various environmental pollution / contamination issues, code of practice and environmental legislation	PO1, PO6, PO7	
CO2	Discuss emerging environmental problems, preventive measures and forensics	PO1, PO6, PO7	
CO3	Describe urban land use patterns pollutant pathways and protection in urban ecosystems	PO1, PO6, PO7	
CO4	Discuss various aspects of environmental systems, biodiversity, natural resources and environmental sanitation	PO1, PO6, PO7	
MODULE – 1		10 Hrs.	
<b>Environmental Pollution:</b> (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Ground Water Pollution; Noise pollution; Soil Pollution and Air Pollution.			
<b>Waste Management &amp; Public Health Aspects:</b> Bio-medical Wastes: Solid waste: Hazardous wastes: E wastes: Industrial and Municipal Sludge.			
<b>Global Environments concern:</b> concept policies and case studies			
Groundwater depletion/recharging.			
Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people. Environmental Toxicology.			
MODULE – 2		10 Hrs.	
<b>Recent Trends</b> - Emerging Environmental problems, Responsibility and Degrees of freedom. Prevention of Significant Deterioration. Pollution prevention hierarchy. Environmental cost, Proactive and Passive Environmental management. Critical thinking on sustaining water resources. Remediation. Environmental Forensics. Sustainable development. Role of Environmental Engineers in Environmental Protection. Code of Environmental Ethics, economic growth and Environmental quality. Cradle to Grave and Grave to Cradle concepts.			
MODULE – 3		10 Hrs.	
<b>Urban and Rural Ecosystems</b> - Land use pattern and Landscape, Zoning regulation for different land users and externalities caused by mixed land uses, Special Economic Zone (SEZ), Coastal Regulation Zone (CRZ), Urban green belt concept – Biological species for Carbon Sequestration, Importance of lung space. Neighborhood concepts.			

**Environmental Legislation** - History, Rules and Acts, Declaration at Stockholm and Rio, Town and Country Planning Acts.

**Organizations involved in Environmental Protection:** MoEF CC, CPCB, SPCB, Water Boards, NGT, WHO, NEERI, CPHEEO and BIS.

**MODULE – 4**

**10 Hrs.**

**Environmental Systems** - Assimilative, Supportive and Carrying Capacity, NCR. Environmental Indices – AQI, WQI, NQI. Environmental Sustainability – Resource depletion and Environmental degradation – Control strategies.

Biodiversity – Concept and Importance. Renewable and Non- Renewable Natural Resources.

Environmental Public Health and Sanitation - Urban and Rural. Swimming pool, Water theme parks, Public bathing Ghats; Institutional Sanitation and Standards. Mass Balance concepts.

***Self-Study Component: Students shall visit town municipality office, pollution control board and various parts of the city and collect the information on methods adopted in managing solid waste and its rules and regulation and also various environmental legislation in protecting environment***

**Text Books:**

1. Richard. O. Mines. Jr. 2014. Environmental Engineering – Principles and Practice. John Wiley and Sons., USA, New York.
2. Gilbert M. Masters. 2005. Introduction to Environmental Engineering Science, 5th Edition. Prentice Hall of India. New Delhi.
3. RuthF. Weiner and Robin Matthews. 2007. EnvironmentalEngineering,4th Edition. Elsevier Science publications – First reprint in India.

**Reference Books:**

1. William W Nazaroff and Lisa Alvarez-Cohen. 2010. Environmental Engineering Science. John Wiley & Sons, New Delhi.
2. Verma P.S. and Agarwal V.K. 1998, Concept of Ecology. S. Chand & Company Ltd. Roorkee.
3. Rai, G.D. 1999. Non-conventional Energy Sources. 3rd Edition, Khanna Publications, New Delhi

**MOOC Course:**

1. <https://nptel.ac.in/courses/120108004>
2. [https://onlinecourses.nptel.ac.in/noc23\\_ch72](https://onlinecourses.nptel.ac.in/noc23_ch72)
3. [https://onlinecourses.nptel.ac.in/noc23\\_lw06](https://onlinecourses.nptel.ac.in/noc23_lw06)

**Course Articulation Matrix**

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2	1							
CO2	3					2	1							
CO3	3					1	2							
CO4	3					2	2							

Course Title	SMART URBAN INFRASTRUCTURE		
Course Code	23CV358A	(L-T-P) C	(1-0-0) 1
Exam	3 Hrs.	Hours/Week	1
CIE + SEE	50 + 50 Marks	Total Hours	14
<b>Course Objective:</b> 1. Practical understanding of Smart City Infrastructure 2. Learn about Organizational Structure of Smart City management in City			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Discuss the need, components of smart urban infrastructure.	PO6, PO7	-
CO2	Interpret the various types of infrastructures concepts and guidelines	PO6, PO8	-
CO3	Review the management of Smart urban infrastructure by artificial intelligence.	PO7, PO8	-
CO4	Report on the translation of the smart urban infrastructure initiatives by policies and case studies.	PO9, PO10, PO12	-
MODULE - 1		4 Hrs.	
Definition of Smart urban infrastructure. The components of smart urban infrastructure. The need, design principles and policy approaches. Advantages of smart urban infrastructure. Hierarchy of urban Development transportation Planning, Classification of Urban road, Footpath Cycle Tracks, Passenger Car Units (PCU), Parking Bus Terminals Truck Terminal Integrated Freight Complex, MRT options for the City, Urban Buses and characteristics ,TOD Norms Non-Motorised Vehicles (NMV), Road Safety, Special Requirements for Barrier Free Built Environment for Disabled and Elderly Persons, Inland Water Transportation , Airport Planning. <i>Self- study component: Prepare a report on the National corridor development programs of India.</i>			
MODULE – 2		4 Hrs.	
The physical, social and commercial infrastructure. Water Supply, Sewerage & Sanitation Drainage Rain water Harvesting , Electricity, Solid Waste Management, Domestic Gas Supply Pipelines Telecom Services , Service Level Benchmarking for Infrastructure <i>Self- study component: Watch and make a list of five YOUTube links on smart infrastructure projects</i>			

MODULE – 3										3 Hrs.					
Artificial Intelligence and management of smart urban Infrastructure of cities. Application and case studies. The challenges in the implementation of smart Infrastructure concepts. The science, technology and innovation driven –policy instruments to address the challenges.  <i>Self- study component: Download a document related to the topic of module 3 write a project proposal.</i>															
MODULE – 4										3 Hrs.					
Sustainable Development . Sustainable Planning Energy Efficiency. Urban Transport,. Urban Infrastructure. Climate Change Mitigation and Adaptation. Green Building City BioDiversity Index. Environment Policies and Statutory Obligation .National Environmental Policy (NEP), 2006 EIA Notification, 2006 .Environment Protection Act, 1986 Forest Conservation Act, 1980 , Ministry of New and Renewable Energy Environmental Guidelines Environmental Guidelines for Industries Guidelines for Rain Water Harvesting Guidelines for Buffer Zones Environment al Guidelines for Planning Eco fragile zones Coastal Area Eco Sensitive zones . Water bodies in Urban areas . Financing smart sustainable development.  <i>Self- study component: Prepare a presentation and report on the self study components carried out in the module 1, 2 and 3.</i>															
<b>Text Books:</b>  1. National level planning guidelines 'Urban Development Plans Formulation and ... The URDPFI Guidelines, 2014 Volume-I 2. Smart Cities and Infrastructure, Commission on science and technology for development, 19 <sup>th</sup> session, Geneva, May 2016. 3. People smart –sustainable cities, United Nations Publications 405 East 42nd Street S-09FW001 New York, NY 10017 United Stats of America Email: permissions@un.o															
<b>Reference Books:</b>  1. <a href="https://www.gfdrr.org/sites/default/files/D3_CaseStudy16_PaulJacobson_PPP_Smart_cities_original.1531294_896.pdf">https://www.gfdrr.org/sites/default/files/D3_CaseStudy16_PaulJacobson_PPP_Smart_cities_original.1531294_896.pdf</a> . 2. <a href="https://egyankosh.ac.in/bitstream/123456789/39131/1/Unit-2.pdf">https://egyankosh.ac.in/bitstream/123456789/39131/1/Unit-2.pdf</a> 3. <a href="https://unece.org/housing/smart-sustainable-cities">https://unece.org/housing/smart-sustainable-cities</a>															
<b>MOOC Course:</b> 1. Web Link to online course: <a href="https://www.coursera.org/learn/smart-cities">https://www.coursera.org/learn/smart-cities</a>															
<b>Course Articulation Matrix</b>															
Course Outcomes	Program Outcomes [POs]														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1						2	3								
CO2						3		1							
CO3							3	1							
CO4									3	2		2			

<b>Course Title</b>	<b>DIGITAL DRAFTING FOR CIVIL ENGINEERS</b>		
<b>Course Code</b>	23CVL358B	<b>(L-T-P) C</b>	(0-0-2) 1
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	2
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	14 (0L + 14P)

**Course Objective:** Students will gain knowledge on drafting works in Civil Engineering

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Prepare, read and interpret and create building model as per the given requirements	PO3, PO5, PO8	-
CO2	Develop a 3D model of a residential and commercial building with all the building elements	PO1, PO5, PO9, PO10	-

<b>MODULE - 1</b>	<b>14 Hrs.</b>
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List of Exercises:

1. Introduction to BIM. Using 3D tools creation of Levels and Grids. Application of various techniques used in the modeling of walls.
2. Using 3D tools creation of doors and windows, and various types of roofs.
3. The different types of floors, floor finishes, key steps involved in creation of ceilings.
4. The modeling of staircases and railings.
5. 3D Modeling of a single storied two-bedroom house with plumbing and sanitation details.
6. 3D Modeling of a framed structure like office building
7. Generation of Topo surface and contours using site tool for a given project. Rendering concepts and generation of walkthrough.
8. Placing room tags and room legend options. Creation of door schedule, window schedule and room schedule of a project.
9. Create new sheet and place views such as floor plans and plot the sheet.

**Self-study component:** Each student shall on the internet observe and understand spatial characteristics of architecturally designed Buildings, download and document the same. Relate and create similar features in the lab exercises. The students shall visit- ongoing project sites and study for real time experience of BIM.

**Text Books:**

1. Linkan Sagar, Sristry Rawal REVIT 2019 Architecture step by step. BPB Publications. 2019
2. S.P Arora, S.P.Bindra The Text book of Building Construction, Dhanpat Rai Publications.

**Reference Books:**

1. Shah. M. H. and Kale. C.M. “Building Drawing” Tata Mc Graw Hill Publishing Co, New Delhi.
2. Linkan Sagar, Sristry Rawal REVIT 2019 Architecture Training Guide, BPB Publications. 2019.
3. REVIT ARCHITECTURE lab manual.

**Course Articulation Matrix**

<b>Course Outcomes</b>	<b>Program Outcomes [POs]</b>													
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>			1		3	2		1						
<b>CO2</b>	1				3				2	2				

### Digital Drafting for Civil Engineers (23CVL358B)

	3	2	1	0/0.5
Drawing Accuracy. /03	All drawing elements are accurate and precise. No errors are present.(3)	All necessary drawing elements are evident. Three minor errors are present.(2)	Attempt was made to accurately create the drawing (1)	No attempt was made to accurately create the drawing (0)
Modern Tool Usage /03	The student has effectively used the software to do the given drawing. (3)	The student has the basic knowledge of most of the tools of the software to do the given drawing (2)	The student has the basic knowledge of some of the tools of the software to do the given drawing (1)	The student clearly failed to use the basic tools of the software to do the given drawing (0)
Completeness /02	All the three views are drawn completely (3)	Dimensions of few objects were missing(2)	Incomplete views (1)	No real attempt was made to draw the model (0.5)
Dimensions /02	Dimensions of all of the objects were shown(2)	Dimensions of few of the objects missing (2)	Dimensions of many of the objects missing (1)	Dimensions not shown (0.5)



<b>Course Title</b>		<b>SOCIAL CONNECT AND RESPONSIBILITY</b>	
<b>Course Code</b>	23SCR	<b>(L-T-P) C</b>	(0–0-2) 1
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	2
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	20
<b>Course Objective:</b> Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society. <b>Course Outcomes:</b> At the end of course, student will be able to:			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
1.	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	PO3, PO5,PO6	
2.	Communicate and connect with their surroundings	PO7,PO12	
<b>MODULE – 1</b>		<b>5 Hrs.</b>	
<b>Plantation and adoption of a tree:</b> Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant’s origin, its usage in daily life, and its appearance in folklore and literature.			
<b>MODULE – 2</b>		<b>5 Hrs.</b>	
<b>Heritage walk and crafts corner:</b> Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms.			
<b>MODULE – 3</b>		<b>5 Hrs.</b>	
<b>Organic farming and waste management:</b> Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
<b>MODULE – 4</b>		<b>5 Hrs.</b>	
<b>Water Conservation:</b> knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Food Walk City’s culinary practices, food lore, and indigenous materials of the region used in cooking.			
A total of 15-20 hours engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two faculty mentors. Faculty mentors will design the activities for evaluation.			

### **Guideline for Assessment Process:**

#### **Continuous Internal Evaluation (CIE)**

After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.

- Dairy recording the details of activity conducted
- Planning and scheduling the social connect
- Information/Data collected during the social connect
- Analysis of the information/data and report writing

Considering all above points allotting the marks as mentioned below

**Excellent 80 to 100**

**Good 60 to 79**

**Satisfactory 40 to 59**

**Unsatisfactory and fail  $\leq 39$**

### **Course Articulation Matrix**

<b>Course Outcomes</b>	<b>Program Outcomes [POs]</b>													
<b>COs</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO1</b>			3		2	3								
<b>CO2</b>							3					3		

<b>Course Title</b>	<b>BASIC STRUCTURAL ANALYSIS</b>		
<b>Course Code</b>	23CV401	<b>(L-T-P) C</b>	(2-2-0) 3
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	04
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	50 (26L + 24T)
<b>Course Objective:</b> To impart knowledge about concepts classical methods of structural analysis			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Comprehend the knowledge on various forms of engineering structures, role of determinacy of structures and analysis of trusses.	PO1,PO2	PSO1
CO2	Comprehend the behavior of arches and cables.	PO1,PO2	PSO1
CO3	Analyze the displacements of structures by energy methods & Mohr's theorems	PO1,PO2	PSO1
CO4	Analyze indeterminate structures to get an insight of behavior of structures under different types of loads	PO1,PO2	PSO1
<b>MODULE – 1</b>			<b>13 Hrs.</b>
<p><b>Introduction:</b> Meaning &amp; definition of structural analysis, Degrees of freedom, Static &amp; Kinematic indeterminacy. <b>Analysis of Plane Trusses:</b> Behavior of trusses, assumptions, analysis of statically determinate plane trusses by method of joints &amp; method of sections <b>Arches:</b> Three hinged circular and parabolic arches with supports at same and different levels, determination of horizontal thrust, normal thrust, radial shear and bending moment.</p> <p><i>Self-Study Component - The students shall visit different kinds of structures within the campus and outside the campus and learn to identify structural components.</i></p>			
<b>MODULE – 2</b>			<b>12 Hrs.</b>
<p><b>Cables:</b> Analysis of cables under point loads and udl, length of cables - Supports at same and at different levels. Displacements - Energy Methods: Strain energy and complementary strain energy, strain energy due to axial load, bending and shear, first theorem of Castigliano, Computation of slopes &amp; deflections of cantilever, cantilever bent &amp; simply supported beams.</p> <p><i>Self-Study Component - The students shall visit different structural arrangements pertaining to arches and cables and learn to identify their structural action.</i></p>			

[illegible]

<b>Course Title</b>	<b>FLUID MECHANICS AND HYDRAULICS</b>		
<b>Course Code</b>	23CV402	<b>(L-T-P) C</b>	(3-0-2) 4
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	5
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	50 (36L + 14P)
<b>Course Objective:</b> <ol style="list-style-type: none"> <li>To understand the basic principles of fluid mechanics</li> <li>To identify various types of flows</li> <li>To understand boundary layer concepts and flow through pipes</li> </ol>			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Comprehend the properties of fluid flow and flow assessment in pipe and open channel flows	PO1	
CO2	Apply the principles of mathematics to characterize fluid properties in dynamic and kinematic conditions and it's characteristics	PO1	
CO3	Analyze the characteristics of flow based on the operational characteristics under different operating conditions	PO2	
CO4	Validate the basic principles of fluid mechanics and it's practical applications and demonstrate it effectively by exhibiting team work and communications skills	PO9, PO10	
<b>MODULE 1</b>			<b>12 Hrs.</b>
<b>Fluids:</b> Definition, Types and Properties - Mass density, Specific volume, Specific weight, Relative density, Viscosity, Vapor pressure, Surface tension, Stability of bubble, droplet and jet, Capillarity. <b>Fluid Statics:</b> Fluid Pressure and its Measurements, Fundamental Equation of Fluid Statics. Hydrostatic forces on immersed bodies (vertical and inclined)  <i>Self-study component: Equilibrium conditions of submerge and floating bodies.</i>			
<b>MODULE 2</b>			<b>13 Hrs.</b>
<b>Fluid kinematics:</b> Methods of describing fluid motion, Types of fluid motion, Velocity and acceleration, Rotational and irrotational flows, Reynold's transport equation, Continuity equation, Velocity potential and Stream function, Cauchy-Reimann equations, Flownet. <b>Fluid dynamics:</b> Types of forces, Forces influencing fluid motion, Euler and Bernoulli's equations, Application of Bernoulli's equation, Flow measurement  <i>Self-study component: Linear momentum equation, Momentum correction factor, Applications of momentum equation.</i>			

MODULE 3	12 Hrs.
<p><b>Pipe flow:</b> Reynold's number and classification of flow, Head loss - Major &amp; Minor loss in pipe flow, Darcy-Weisbach equations and use of Moody's Diagram, Total energy and hydraulic gradient lines, Compound pipes, Pipes in series and parallel, Branching pipes. Water Hammer, Equations for pressure rise due to gradual and sudden closure of valves in rigid and elastic pipes - numerical problems.</p> <p><i>Self-study component: Surge tanks – types and functions</i></p>	
MODULE 4	13 Hrs.
<p><b>Uniform Open Channel Flow:</b> Flow measurement using notches and weirs – rectangular, triangular, trapezoidal notches. Uniform flow Equations for uniform flow - Chezy's and Manning's equations, Most economic channel sections of different geometry, Energy concepts in free surface flows. Specific energy and Specific force diagrams, Critical flow, and Hydraulic exponent for critical flow. Hydraulic Jump - Equation for a classic hydraulic jump, Energy loss and efficiency of a jump.</p> <p><i>Self-study component: Free surface flows, Comparison of open channel flow with pipe flow, Classification of flow in open channels.</i></p>	
<p><b>Practical Component:</b>  <b><u>A – EXERCISE:</u></b>  1. Determine Fluid Properties  2. Determination of Cd for:</p> <ul style="list-style-type: none"> <li>• Venturimeter and Orifice meter</li> <li>• Rectangular &amp; Triangular Notch</li> </ul> <p>3. Determination of hydraulic coefficients of vertical orifice</p> <p><b><u>B – STRUCTURED ENQUIRY:</u></b></p> <p>1. Determine the loss of head in pipes (Major loss and Minor loss)</p> <p><b><u>C – OPEN ENDED :</u></b></p> <p>1. Verification of Bernoulli's Equation</p> <p><b>Laboratory Component:</b> The laboratory component focuses on the assessment of students as an individual as well as a team player for the assigned group activity.  The laboratory component will be evaluated for 20 marks.</p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Modi P. N and Seth S. M, "Hydraulics and Fluid Mechanics, including Hydraulic Machines", Stanford Book House, New Delhi, 20th edition, 2015.</li> <li>2. Subramanya K, "Fluid Mechanics and Hydraulic Machines-problems and solutions", Tata McGraw Hill Publishing Co. Ltd., 2018.</li> <li>3. Bansal R. K, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi publications, New Delhi, Revised 9th edition, 2017.</li> </ol>	

**Reference Books:**

1. Gupta, S.C., 2006. Fluid mechanics and hydraulic machines. Pearson Education India.
2. Goyal, M.K., 2015. Fluid Mechanics and Hydraulic Machines. PHI Learning Pvt. Ltd.
3. Douglas J. F, Gasorick J. M, John Swaffield, Lynne Jack, "Fluid Mechanics", Fifth Edition, Pearson, 2005.
4. Kumar, M., Fluid Mechanics and Hydraulic Machines| | By Pearson. Pearson Education India.
5. Rajput, R.K., 2004. A textbook of fluid mechanics and hydraulic machines. S. Chand Publishing.
6. Mohd. Kaleem Khan, "Fluid Mechanics and Machinery", UK ed., Oxford University Press, May 2015

**MOOC Course:**

1. <https://youtu.be/47bEFVyczLk>

**Course Articulation Matrix**

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
COs														
CO1	2													
CO2	3													
CO3		3												
CO4									2	2				

## Fluid Mechanics & Hydraulics Machinery Laboratory Rubrics (23CV402)

	<b>Excellent</b>	<b>Very Good</b>	<b>Good</b>	<b>Average</b>
<b>Records /10</b>	<ul style="list-style-type: none"> <li>• Comprehensive and well-organized records</li> <li>• All entries are accurate, complete, and clearly documented</li> <li>• Detailed observations and results are presented systematically (10)</li> </ul>	<ul style="list-style-type: none"> <li>• Good organization and mostly accurate entries</li> <li>• Minor errors or omissions in the records</li> <li>• Observations and results are presented, but lack some detail(8)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic organization with several inaccuracies</li> <li>• Significant errors or omissions in the records</li> <li>• Observations and results are incomplete or unclear(6)</li> </ul>	<ul style="list-style-type: none"> <li>• Poorly organized records with many inaccuracies</li> <li>• Major errors or omissions throughout</li> <li>• Observations and results are largely missing or very unclear (4)</li> </ul>
<b>Procedure /03</b>	<ul style="list-style-type: none"> <li>• Procedure followed precisely as outlined in the manual</li> <li>• Clear, logical, and methodical execution of each step</li> <li>• No deviations or mistakes during the process(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure mostly followed correctly with minor deviations</li> <li>• Logical execution with some small errors</li> <li>• Minor steps missed or executed incorrectly(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure partially followed with significant deviations</li> <li>• Execution lacks clarity and has noticeable errors</li> <li>• Several steps missed or executed incorrectly(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Procedure not followed correctly</li> <li>• Execution is disorganized and unclear</li> <li>• Many steps missed or executed incorrectly(0)</li> </ul>
<b>Conduction /05</b>	<ul style="list-style-type: none"> <li>• Excellent execution of the experiment</li> <li>• All apparatus used correctly and safely</li> <li>• Results obtained are highly accurate and reliable(5)</li> </ul>	<ul style="list-style-type: none"> <li>• Good execution with minor errors</li> <li>• Apparatus used mostly correctly with some small mistakes</li> <li>• Results obtained are fairly accurate and reliable(3)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic execution with noticeable errors</li> <li>• Apparatus used with several mistakes</li> <li>• Results obtained are somewhat accurate but less reliable(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor execution with many errors</li> <li>• Apparatus used incorrectly or unsafely</li> <li>• Results obtained are inaccurate and unreliable(0)</li> </ul>
<b>Viva Voce /02</b>	<ul style="list-style-type: none"> <li>• Excellent understanding of the experiment and underlying concepts</li> <li>• Answers to questions are clear, concise, and correct</li> <li>• Demonstrates a high level of confidence and competence(2)</li> </ul>	<ul style="list-style-type: none"> <li>• Good understanding with minor gaps in knowledge</li> <li>• Answers to questions are mostly correct with minor errors</li> <li>• Demonstrates reasonable confidence and competence(1)</li> </ul>	<ul style="list-style-type: none"> <li>• Basic understanding with several gaps in knowledge</li> <li>• Answers to questions are partially correct with noticeable errors</li> <li>• Demonstrates limited confidence and competence(0.5)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor understanding with many gaps in knowledge</li> <li>• Answers to questions are mostly incorrect or unclear</li> <li>• Demonstrates low confidence and competence(0)</li> </ul>



<b>Course Title</b>	<b>CONCRETE TECHNOLOGY</b>		
<b>Course Code</b>	23CV403	<b>(L-T-P) C</b>	(3-0-2) 4
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	5
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	50 (36L + 14P)

**Course Objective:** To understand various aspects related to concrete ingredients, properties of concrete and concrete mix design

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

COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Apply the fundamental properties of concrete ingredients, for conventional and special concrete mixtures.	PO1	
CO2	Analyze the fresh and hardened concrete results for optimized mix design	PO2	
CO3	Demonstrate proficiency in conducting and interpreting non-destructive tests of concrete	PO2	
CO4	Validate the basic principles of concrete mix design and it's practical applications and develop it effectively by exhibiting teamwork and communications skills	PO9, PO10	

#### MODULE – 1

**12 Hrs.**

Concrete Ingredients – Cement, water and Aggregates: Chemical composition of cement, hydration of cement, types of cement, manufacture of OPC by wet and dry process (flow charts only). Testing of cement – fineness by sieve test and air permeability test, Normal consistency, setting time, soundness (by Le'Chatelier's and autoclave apparatus) compressive strength of cement, field testing of cement. Grades of Cement, Blended cement.

Quality of mixing water. Fine Aggregate - types, Gradation and zoning, fineness modulus, specific gravity, unit weight, moisture content, bulking, presence of deleterious materials. Coarse aggregate – Importance of size, shape and texture, gradation of aggregates, sieve analysis, specific gravity, unit weight, Alkali – Aggregate reaction, Flakiness and elongation indices, crushing and impact strengths, abrasion resistance tests (Relevant BIS provisions to be discussed regarding the properties of concrete ingredients).

Concrete Admixtures: Chemical admixtures - Plasticizer, super plasticizers, accelerators, retarders and air entraining agents, Mineral admixtures – fly ash, GGBS, silica fumes and rice husk ash - applications, advantages & disadvantages.

***Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of mix design pertaining to ongoing consultancy works.***

MODULE – 2	13 Hrs.
<p>Process of manufacture of concrete -Batching (volume batching and weigh batching) Mixing: Hand mixing and mechanical mixing, Transportation - wheel barrow, cable and ropeway, conveyer belt, pumping etc., Placing of concrete, Compaction – hand compaction and compaction by vibration, Curing – different methods of curing. Quality control aspects.</p> <p><b>Properties of Fresh Concrete:</b> Workability – factors affecting workability, measurement of workability – slump, flow test, compacting factor, Kelly Bal test and Vee-Bee consistometer. Segregation and bleeding. <b>Properties of Hardened concrete:</b> - Compressive Strength - Factors affecting strength - w/c ratio, gel/space ratio, effect of maximum size of aggregate and curing, Testing of hardened concrete- compressive strength, split tensile strength. flexural strength. Relation between compressive strength and tensile strength, bond strength, Modulus of rupture. Elasticity – relation b/w modulus of elasticity and strength, factors effecting modulus of elasticity, Poisson’s ratio. Shrinkage – plastic shrinkage, drying shrinkage and autogenous shrinkage, factors affecting shrinkage. Creep – measurement of creep, factors affecting creep.</p> <p><i>Self-Study Component - The students should visit construction site and learn to understand workability and properties of green and hardened concrete. Also, to visit the facility of Creep Rig to understand sustained loading on concrete specimens.</i></p>	
MODULE – 3	12 Hrs.
<p><b>Concrete mix design:</b> Concept of mix design, variables in proportioning, exposure conditions and statistical quality control of concrete, mix design as per IS:456-2000, IS :10262-2019 and SP-23, numerical examples on mix design as per IS. Method. Mix design with and without admixtures.</p> <p><b>Durability:</b> Definition, significance, permeability of concrete. Sulfate attack, chloride attack, carbonation, freezing and thawing, causes of cracking in concrete – plastic shrinkage, settlement cracks, construction joints, thermal expansion, structural design deficiencies etc</p> <p><i>Self-Study Component - The students shall visit the concrete lab and learn to identify the different types of cements, aggregates and testing facilities.</i></p>	
MODULE – 4	13 Hrs.
<p><b>Non destructive testing of concrete:</b> Principles, applications and limitations of Rebound hammer test, Penetration and pull out test, Ultrasonic pulse velocity test and Core test. <b>Special concretes:</b> Constituents, properties and applications of Light weight concrete, high density concrete, high strength and high-performance concrete, fiber reinforced concrete, SCC, HVFAC (High Volume Fly Ash Concrete) and Ready mixed Concrete.</p> <p><i>Self-Study Component - The students shall visit the concrete lab and learn to understand the principles of NDT and special concretes pertaining to ongoing research works.</i></p>	
<p><b>Practical Component:</b></p> <p>Determine normal consistency, setting time and soundness of cement by Le chatelier apparatus and determination of specific gravity and compressive strength of cement.</p>	

Determination of specific gravity, moisture content , water absorption and Sieve analysis of fine and coarse aggregate and of Workability by slump test, flow test, compaction factor and Vee Bee test of the concrete mix proportion.

Determination of crushing, Abrasion and Impact test. Shape tests. (Flakiness index, elongation index and Angularity number) of coarse aggregate and determination of compressive strength and split tensile strength of hardened concrete and demonstration of use of admixture and recycling of concrete aggregates

Determination of Specific Gravity, penetration and ductility softening point, Flash and fire point, Viscosity on bitumen and Marshall stability test on bituminous mixes .

### Text Books:

1. Shetty, M.S., “Concrete Technology- Theory and Practice”, S. Chand and Co, New Delhi. 2001.
2. Neville, A.M. and Brooks, J.J.- “Concrete Technology” ECBS edition, Pearson Education, Asia, 2004.

### Reference Books:

1. Gambhir, M.L, “Concrete Technology”, Tata Mc Graw Hill, New Delhi, 2002.
2. Krishna Raju, “Concrete Mix Design”, Sehgal Publishers, 2005.
3. IS:10262 -2009 Recommended guidelines for concrete mix design- BIS publication
4. A R Santhakumar , ‘ Concrete Technology’ Oxford IBH publishers
5. P K Mehta & Monteiro, ‘Concrete – Structure and properties. ICI.
6. N.Y.Nayak “ Concreting Applications

### MOOC Course:

[https://onlinecourses.nptel.ac.in/noc24\\_ce104/preview](https://onlinecourses.nptel.ac.in/noc24_ce104/preview)

### Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4									2	2				

## Concrete and Highway Material Testing Laboratory Rubrics (23CV403)

	<b>Exemplary</b>	<b>Accomplished</b>	<b>Reflecting the Improvement</b>	<b>Need Improvement</b>
<b>Records.</b> /10	<ul style="list-style-type: none"> <li>Comprehensive and well-organized records</li> <li>All entries are accurate, complete, and clearly documented</li> <li>Detailed observations and results are presented systematically (10)</li> </ul>	<ul style="list-style-type: none"> <li>Good organization and mostly accurate entries</li> <li>Minor errors or omissions in the records</li> <li>Observations and results are presented, but lack some detail (8)</li> </ul>	<ul style="list-style-type: none"> <li>Basic organization with several inaccuracies</li> <li>Significant errors or omissions in the records</li> <li>Observations and results are incomplete or unclear (6)</li> </ul>	<ul style="list-style-type: none"> <li>Poorly organized records with many inaccuracies</li> <li>Major errors or omissions throughout</li> <li>Observations and results are largely missing or very unclear (4)</li> </ul>
<b>Procedure :</b> Level of knowledge on fundamental laboratory tests /04	<ul style="list-style-type: none"> <li>Procedure followed precisely as outlined in the manual</li> <li>Clear, logical, and methodical explanation of each step</li> <li>No deviations or mistakes during the process (4)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure mostly followed correctly with minor deviations</li> <li>Logical explanation with some small errors</li> <li>Minor steps missed or explanation incorrectly (3)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure partially followed with significant deviations</li> <li>Explanation lacks clarity and has noticeable errors</li> <li>Several steps missed or explanation incorrectly (2)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure not followed correctly</li> <li>Explanation is disorganized and unclear</li> <li>Many steps missed or explanation incorrectly (0-1)</li> </ul>
<b>Conduction:</b> Level of knowledge on properties of materials and assessment using appropriate laboratory analysis /04	<ul style="list-style-type: none"> <li>Excellent execution of the experiment</li> <li>All apparatus used correctly and safely</li> <li>Results obtained are highly accurate and reliable (4)</li> </ul>	<ul style="list-style-type: none"> <li>Good execution with minor errors</li> <li>Apparatus used mostly correctly with some small mistakes</li> <li>Results obtained are fairly accurate and reliable (3)</li> </ul>	<ul style="list-style-type: none"> <li>Basic execution with noticeable errors</li> <li>Apparatus used with several mistakes</li> <li>Results obtained are somewhat accurate but less reliable (2)</li> </ul>	<ul style="list-style-type: none"> <li>Poor execution with many errors</li> <li>Apparatus used incorrectly or unsafely</li> <li>Results obtained are inaccurate and unreliable (0-1)</li> </ul>
<b>Viva Voce :</b> Level of knowledge on parameters of Concrete and their real time applications /02	<ul style="list-style-type: none"> <li>Excellent understanding of the experiment and underlying concepts</li> <li>Answers to questions are clear, concise, and correct</li> <li>Demonstrates a high level of confidence and competence (2)</li> </ul>	<ul style="list-style-type: none"> <li>Good understanding with minor gaps in knowledge</li> <li>Answers to questions are mostly correct with minor errors</li> <li>Demonstrates reasonable confidence and competence (1)</li> </ul>	<ul style="list-style-type: none"> <li>Basic understanding with several gaps in knowledge</li> <li>Answers to questions are partially correct with noticeable errors</li> <li>Demonstrates limited confidence and competence (0.5)</li> </ul>	<ul style="list-style-type: none"> <li>Poor understanding with many gaps in knowledge</li> <li>Answers to questions are mostly incorrect or unclear</li> <li>Demonstrates low confidence and competence (0)</li> </ul>

<b>Course Title</b>	<b>BUILDING INFORMATION MODELING IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION (BIM)</b>		
<b>Course Code</b>	23CV405A	<b>(L-T-P) C</b>	(0-0-3) 3
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	3
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	40

**Course Objective:**

1. To learn the concept of Building Information Modeling.
2. To understand the workflow followed in industry during creation of BIM 3D model which includes building the discipline-based model.
3. To explain the process of creating the BIM model.
4. To comprehend the various emerging trends of BIM

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

<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	Discuss the various dimensions of Building Information Modelling.	PO6, PO7	PSO1
CO2	Interpret the various planning tools regarding the BIM fundamentals	PO6, PO8	PSO1
CO3	Review the integrated roles and relationships in building the project information model	PO7, PO8	PSO1
CO4	Report on the aspects of interface of the Building Information Modelling .	PO9, PO10, PO12	PSO1

**MODULE – 1**

**10 Hrs.**

BIM: Scope and Definition: Introduction of Building Information Modelling, importance to construction managers, collaboration as the heart of the BIM process. The process driven way of working, BIM execution plan, Benefits of BIM, Virtual Design and Construction and integrated project delivery. Demonstration of REVIT software modeling.

***Self- study component: Visit a BIM project website and study the various dimensions of the project.***

**MODULE – 2**

**10 Hrs.**

BIM Fundamentals: Background, Level of Development, BIM dimensions and uses in the construction phase, phase planning, site utilization planning, 3D co-ordination and clash detection, virtual mock up, Digital fabrication and layout, field tracking, Design- Bid Build. The construction manager, BIM Co-ordinator/ manager.

***Self- study component: : watch a video of 3D co-ordination and clash detection and report on the same orally.***

MODULE – 3													10 Hrs.	
BIM Implementation: Introduction, creating the BIM strategy, ensuring better information management, legal and commercial issues, the BIM execution plan, roles and responsibilities, building the project information model, upskilling, BIM and the construction manager, soft landings.														
Self- study component: Download a BIM execution plan and interpret it. Write a report on the same.														
MODULE – 4													10 Hrs.	
Aspects of Interface and Case studies: BIM and a technologically advanced construction industry. Selecting the right tools and technologies for the BIM strategy, using mobile devices, software, proprietary versus open file formats, aligning deliverables with the tasks of constructions managers, plain language question, building information exchange. Classification Case studies														
Self- study component: Prepare a presentation and report on the one BIM project case study.														
Text Books:														
1. Building Information Modelling, Editors: PhD. Eng. Mariola Książek, MSc. Eng. Jerzy Rosłon, Iceland, Great Britain, 2017,														
2. <a href="https://science.osti.gov/-/media/sbir/pdf/Market-Research/BTO---Building-Information-Modeling-August-2020-Public.pdf">https://science.osti.gov/-/media/sbir/pdf/Market-Research/BTO---Building-Information-Modeling-August-2020-Public.pdf</a>														
Reference Books:														
1. <a href="https://www.autodesk.com/industry/aec/bimCOs?~:text=Building%20Information%20Modeling%20(BIM)%20is,business%20and%20the%20built%20world.">https://www.autodesk.com/industry/aec/bimCOs?~:text=Building%20Information%20Modeling%20(BIM)%20is,business%20and%20the%20built%20world.</a>														
2. <a href="https://constructible.trimble.com/construction-industry/what-is-bim-building-information-modeling">https://constructible.trimble.com/construction-industry/what-is-bim-building-information-modeling</a>														
MOOC Course:														
Course Articulation Matrix														
Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3	2							
CO2						2		1						
CO3							2	1						
CO4									3	2	1			

**Building Information Modeling in Architecture,  
Engineering & Construction Rubrics (23CV405A)**

	3	2	1	0/0.5
Drawing Accuracy. /03	All drawing elements are accurate and precise. No errors are present.(3)	All necessary drawing elements are evident. Three minor errors are present.(2)	Attempt was made to accurately create the drawing (1)	No attempt was made to accurately create the drawing (0)
Modern Tool Usage /03	The student has effectively used the software to do the given drawing. (3)	The student has the basic knowledge of most of the tools of the software to do the given drawing (2)	The student has the basic knowledge of some of the tools of the software to do the given drawing (1)	The student clearly failed to use the basic tools of the software to do the given drawing (0)
Completeness /02	All the three views are drawn completely (3)	Dimensions of few objects were missing(2)	Incomplete views (1)	No real attempt was made to draw the model (0.5)
Dimensions /02	Dimensions of all of the objects were shown(2)	Dimensions of few of the objects missing (2)	Dimensions of many of the objects missing (1)	Dimensions not shown (0.5)

Course Title	CONSTRUCTION EQUIPMENT, PLANTS AND MACHINERY		
Course Code	23CV405B	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
CIE + SEE	50 + 50 Marks	Total Hours	40
<b>Course Objective:</b> Introduce students to construction equipment and selected construction methods. This includes economy, selection, productivity of common construction equipment, and construction procedures for industrial, heavy civil, and commercial construction projects.			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Apply theoretical and practical aspects of project management techniques to achieve project goals.	PO1	
CO2	Comprehend the various types of construction equipment’s used for earthwork,	PO1	
CO3	Apply knowledge and skills of modern construction practices and techniques in tunnelling, drilling , blasting, dewatering, material handling conveyors its applications in various projects.	PO1	
CO4	Apply the concepts of various material handling techniques for appropriate projects.	PO1	
MODULE – 1		10 Hrs.	
<b>CONSTRUCTION EQUIPMENT</b> Identification – Planning of equipment – Selection of Equipment – Equipment Management in Projects – Maintenance Management– Equipment cost– Operating cost–Cost Control of Equipment - Depreciation Analysis – Replacement of Equipment- Replacement Analysis – Safety Management.			
MODULE – 2		10 Hrs.	
<b>EQUIPMENT FOR EARTHWORK</b> Fundamentals of Earth Work Operations-Earth Moving Operations-Types of Earth Work Equipment - Tractors, Motor Graders, Scrapers, Front end Waders – Dozer, Excavators, Rippers, Loaders, trucks and hauling equipment, Compacting Equipment, Finishing Equipment			
MODULE – 3		10 Hrs.	
<b>ASPHALT AND CONCRETE PLANTS</b> Aggregateproduction-DifferentCrushers–Feeders-ScreeningEquipment-HandlingEquipment Batching and Mixing Equipment-Pumping Equipment–Ready mix concrete equipment, Concrete pouring equipment. Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment.			



[illegible]

Course Title		CONCRETING TECHNIQUES AND PRACTICES			
Course Code		23CV405C	(L-T-P) C	(3-0-0)3	
Exam		3 Hrs.	Hours/Week	3	
CIE + SEE		50 + 50 Marks	Total Hours	40	
Course Objective: Test the basic properties of ingredients of concrete, fresh and hardened properties of concrete					
Course Outcomes: At the end of course, student will be able to:					
COs	Course Outcomes			Mapping to PO's	Mapping to PSO's
CO1	Evaluate the properties of concrete by conducting test on cement, aggregate and concrete (with & without admixtures) for using the data for mix design procedures.			PO1, PO2	
CO2	Illustrate the different materials used in a concrete mix including admixtures for the design purpose.			PO1, PO2	
CO3	Design a concrete mix as per requirement of construction project.			PO1, PO2	
CO4	Analyze the best practices in concrete construction from industry’s requirement, thumb rules, mitigation of concreting issues at Sites.			PO1, PO2	
MODULE – 1				10 Hrs.	
BLENDING OF AGGREGATES Fine aggregate: Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing. Coarse aggregate: Importance of size, shape and texture. Grading and blending of aggregate. Testing on aggregate, requirement. Recycled aggregate					
MODULE – 2				10 Hrs.	
MATERIAL PROPERTIES OF CONCRETE Rheological behavior of concrete, requirements of workability of concrete, Durability & Effect of environmental conditions, Strength & maturity of hardened concrete, Impact, Dynamic and fatigue behavior of concrete, shrinkage and creep of concrete, behavior of concrete under fire..					
MODULE – 3				10 Hrs.	
TESTING OF CONCRETE & MIX DESIGN  Concrete mix design, Basic considerations and choice a mix proportions, various methods of mix designs including IS Code method. Quality control and quality assurance of concrete, Acceptance criteria, Quality management in concrete construction, Inspection and testing of concrete. Non-destructive testing of concrete, core test and load test. RMC concrete - manufacture, transporting, placing, precautions, Methods of concreting- Pumping, under water concreting, shotcrete, High volume					

fly ash concrete concept, properties, typical mix. Self compacting concrete concept, materials, tests, properties, application and Typical mix.

## MODULE – 4

10 Hrs.

## PUMPING AND PLACING OF CONCRETE

Pumped concrete, Management of the Concrete Pumping Operation, Selection of Concrete Pump Rigs Before Deployment, Travelling to and from the Site (Truck-mounted Concrete Pump Rigs), During the Pour, Pumping Special Types of Concrete, Concrete Pump Rigs Inspection and Testing.

***Self Study Component:***

1. Study different types of alternative materials for fine & coarse aggregate and their specific uses in construction.
2. Study about maintenance procedure to ensure safety of concrete structures under the action of fire.
3. Prepare a mix design report using various alternate materials using in RMC plant.
4. Explore the various methods to transport concrete using various machineries.

**Text Books:**

1. Concrete Technology, Gambhir M.L, Tata McGraw Hill
2. Concrete Technology, M.S.Shetty, S.Chand & Company New Delhi

### Reference Books:

1. Neville, A.M., Properties of Concrete, Pearson Education Asia (P) Ltd, England, 2000.
2. Concrete microstructure, properties & materials, P.KumarMehata, Paulo & J.M. Monteiro,
3. Light Weight Concrete, Short & Kenniburg, Asia Publishing House, Bombay

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**MOOC Course:**

- ## 1. NPTEL-CIVIL-Concreting techniques and practices

## Course Articulation Matrix

[illegible]

Course Title	WATER RESOURCES ENGINEERING		
Course Code	23CV405D	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
CIE + SEE	50 + 50 Marks	Total Hours	40
<b>Course Objective:</b> 1. Develop understanding about different components of the hydrological cycle 2. Enable the students to estimate runoff, infiltration, evaporation, groundwater flow and peak floods.			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Explain the significance of the hydrological cycle and different sources of water and rainfall distribution.	PO1, PO2	PSO 1
CO2	Explain the significance of hydrological cycle and different sources of water and rainfall distribution	PO1, PO2	PSO 1
CO3	Describe the concept of river gauging, design discharge and hydrograph theory	PO1, PO2	PSO 1
CO4	Estimate the rate of flow for confined and unconfined aquifer	PO1,PO2	PSO 1
MODULE – 1		10 Hrs.	
<b>Introduction:</b> Scope of Hydrology and Water Resources. Hydrological cycle, types of representation, Qualitative representation of Hydrological cycle. Watershed, drainage and catchment area and water budget equation. Climatic seasons and rainy seasons in India. Precipitation: Definition, Types and Forms of precipitation, Measurement of precipitation and types of rain gauges, introduction to Telemetric Rain Gauges (TRG) and Tropical Rainfall  Measuring Mission (TRMM). Rainfall data source, Indian Meteorological Department (IMD) and state gauging department. Rain gauge network, optimum number of rain gauges. Various types of representation of precipitation data, Mass Curve and Estimation of missing precipitation data, Consistency of rainfall data. Different methods of computation of average depth of precipitation over an area  <i>Self-study component: Students should prepare a report on following a) visit a nearby Rain Gauge Station to observe the typical arrangements. b) Collect the information on Telemetric Rain Gauge (TRG) &amp; Tropical Rainfall Measurement Mission (TRMM). c) Visit the Indian Meteorological Department (IMD) and extract rainfall data.</i>			

MODULE – 2	10 Hrs.
<p><b>Water Losses: Infiltration,</b> Definition, processes, factors affecting infiltration. Measurement of infiltration (double ring infiltrometer), Horton’s infiltration curve and infiltration indices. <b>Evaporation,</b> Definition, process, factors affecting evaporation and measurement of evaporation by IS pan. <b>Evapo-transpiration.</b> Definition, PET and AET, factors affecting Evapo-transpiration and estimation of Evapo-transpiration by Blaney–Criddle equation and Lysimeters. <b>Runoff:</b> Definition, Components, factors affecting Runoff. Basin yield, rainfall-runoff relationship using simple regression analysis. Computation of maximum flood discharge using Dicken’s, Ryve’s and rational and Empirical formulae.</p> <p><i>Self-study component: Students should prepare a report: Visit a nearby IMD station and collect layout details for raingauge, evaporation pans, anemometer, and sunshine recorder.</i></p>	
MODULE – 3	10 Hrs.
<p><b>Stream flow measurement:</b> Area-Velocity and Slope-Area methods, Stage discharge curve, Runoff, Long and short-term runoff, hydrograph analysis - Components of hydrograph, separation of base flow. Unit hydrograph theory, derivation, and application of unit hydrograph. Computation of unit hydrograph ordinates of different duration, S-Curve &amp; its uses.</p> <p><b>Groundwater Hydrology: Soil water zones:</b> vertical distributions of soil water and ground water table. <b>Soil moisture relations:</b> definition and relation between Porosity, Specific retention, Specific yield. <b>Occurrence of ground water:</b> Definitions of aquifer, aquitard, aquifuge, aquiclude, perched aquifer and Unconfined aquifer, Confined aquifer, Leaky aquifer.</p> <p><i>Self-study component: Students should prepare a report on stream gauging station, stage discharge curve. Simple hydrograph on stream flow data of the nearby station.</i></p>	
MODULE – 4	10 Hrs.
<p><b>Aquifer parameters:</b> Types and classification of groundwater movement, Darcy’s law, and its validity. Definition, mathematical expression and units of Storage coefficient, Permeability, Hydraulic conductivity, Transmissivity, Storativity. <b>Well Hydraulics:</b> Assumptions in Steady radial flow into a confined and unconfined wells and expression for discharge into well, Yield and Safe Yield of an open well using pumping test and recuperation test, Specific capacity, Saline water intrusion in aquifers and control. Artificial ground water recharging.</p> <p><i>Self-study component: Students should prepare a report on a) collect the information on bore-log data and Ground water level of an observation well. b) Map of major river basins of India c) List of important water resource projects of India and in Karnataka.</i></p>	
<p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Subramanya, K. (2013). Engineering Hydrology. India: McGraw Hill Education (India) Private Limited.</li> <li>2. Reddy, P. J. R. (2011). A Textbook of Hydrology. India: University Science Press</li> </ol>	
<p><b>Reference Books:</b></p> <p><b>Brenndtson R, Bhunya P, Ojha, C. S. P. (2008). Engineering Hydrology, India: Oxford University Press</b></p> <p><b>Garg S K (2013), Hydrology and Water Resources Engineering India: Khanna Publishers, Delhi.</b></p>	

**MOOC Course:**

1. NPTEL Link: <https://youtu.be/IphCId7mkhk>

1. NPTEL Link: <https://youtu.be/IphCId7mkhk>

## Course Articulation Matrix

[illegible]

<b>Course Title</b>	<b>WASTEWATER ENGINEERING</b>		
<b>Course Code</b>	23CV405E	<b>(L-T-P) C</b>	(3-0-0) 3
<b>Exam</b>	3 Hrs	<b>Hours / Week</b>	3
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total hours</b>	40
<b>Course Objective:</b> To inculcate the basics concepts of waste water treatment, its design and management <b>Course Outcomes (COs):</b> Upon completion of the course, students shall be able to			
<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to POs</b>	<b>Mapping to PSOs</b>
CO1	Estimate average and peak wastewater from a community and design suitable conveyance systems for sewage and storm water.	PO1, PO2, PO6, PO7	-
CO2	Evaluate wastewater quality to suggest suitable small scale treatment option	PO1, PO2, PO6, PO7	-
CO3	Design a comprehensive wastewater treatment system to achieve required quality standards for safe disposal and reuse of wastewater	PO1, PO2, PO6, PO7	PSO1
CO4	Design an effective and efficient sludge and wastewater disposal system	PO1, PO6, PO7	PSO1
<b>MODULE –1</b>			<b>10 Hrs.</b>
<b>Introduction:</b> Wastewater disposal - Necessity for sanitation, types of sewerage systems and their suitability. <b>Quantity of Sewage:</b> Dry weather flow, factors affecting dry weather flow, Estimation of storm flow, Rational method and Empirical formulae of design of storm water drain, Time of concentration. <b>Design of Sewers:</b> Hydraulic formulae for velocity, self-cleansing and non-scouring velocities, Design of hydraulic elements for circular sewers flowing full and for partially full, Sewer pipe material, Shapes of sewers, laying of sewers, jointing and testing of sewers, ventilation and cleaning of sewer.			
<b>MODULE –2</b>			<b>10 Hrs.</b>
<b>Sewer Appurtenances:</b> Catch basins, Manholes, Flushing tanks, oil and grease traps, Drainage traps, Basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage. <b>Sewage Pumps -</b> Need, Types of pumps and pumping stations. <b>Analysis of Sewage:</b> Physical, chemical, and biological characteristics, concepts of Aerobic and Anaerobic activity, CNS cycles, more emphasis on BOD and COD –significance, Sampling and techniques.			

MODULE –3												10 Hrs.		
<b>Disposal of Effluents:</b> By dilution, self-purification phenomenon, oxygen sag curve, Zones of purification, Sewage farming, sewage sickness, Disposal standards on land and water, Chlorination of sewage. <b>Treatment of Sewage:</b> Flow diagram of municipal sewage treatment plant. <b>Primary treatment:</b> screening, grit chambers, skimming tanks and design of primary sedimentation tank.														
MODULE – 4												10 hrs.		
<b>Secondary treatment:</b> Trickling filter (introduction only), Activated sludge process - Principle and flow diagram, methods of aeration, modifications, F/M ratio, Design of ASP. Methods of sludge disposal: Sludge digestion and Sludge drying beds. <b>Miscellaneous Treatment Methods:</b> Septic tanks and Oxidation Pond. Introduction to RBC, UASB, Anaerobic filters.														
<i>Self-Study: Student shall visit the nearby Industry and observe the methods adopted for sewage treatment and disposal. The students shall submit a report of their observations under self-study components.</i>														
<b>Text Books :</b> 1. S. K. Garg —Environmental Engineering: Sewage Disposal and Air Pollution Engineering (Volume - 2), 33 Edition, 2015, Khanna Publishers, ISBN: 9788174092304, 8174092307. 2. Punmia B. C. and Jain A., “Environmental Engineering-II, Arihant Publications, 1995 (Ch. 1 & 2)														
<b>Reference Books:</b> 1. Waste Water Treatment, Disposal and Reuse -Metcalf and Eddy inc, Tata McGraw Hill Publications (2008 Edition), ISBN-10: 0071008241, ISBN-13: 978-0071008242 2. Wastewater treatment Concepts and Design Approach by Karia G.L., Chritian R.A. Second Edition, 2013. Prentice Hall India Private limited, ISBN-10: 8120328604, ISBN-13: 978-8120328600. 3. Water and Waste water Engineering Vol-II -Fair, Gayer and Okun, Wiley publishers, New York. 2008, ISBN-10: 0470411929, ISBN-13: 978-0470411926 4. Howard S. Peavy, Donald R. Rowe, “Environmental Engineering”, George Tchnobanoglous, McGraw Hill International Ed., 1996. 5. CPHEEO Manual on —Wastewater Collection, Treatment and Disposal, Ministry of Urban Development, Government of India, New Delhi.														
<b>MOOC/NPTEL Courses:</b> Wastewater Treatment and Recycling by Prof. Manoj Kumar Tiwari, IIT Kharagpur <a href="https://onlinecourses.nptel.ac.in/noc24_ce105/preview">https://onlinecourses.nptel.ac.in/noc24_ce105/preview</a>														
<b>Course Articulation Matrix</b>														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	2						3							
CO3	3	2											3	
CO4	3						2						3	



<b>Course Title</b>	<b>TOTAL STATION APPLICATION IN CIVIL ENGINEERING</b>		
<b>Course Code</b>	23CVL456A	<b>L-T-P</b>	(0-0-2) 1
<b>Exam</b>	3 Hrs.	<b>Hours/Week</b>	2
<b>CIE + SEE</b>	50 + 50 Marks	<b>Total Hours</b>	14

**Course Objective:**

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concept of surveying to field practice.

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

<b>COs</b>	<b>Course Outcomes</b>	<b>Mapping to PO's</b>	<b>Mapping to PSO's</b>
CO1	To determine the relative position of points in horizontal plan and vertical plan using total station.	PO1, PO2, PO5, PO9	
CO2	Develop plans, draw maps and draft reports for surveying projects of Civil Engineering works.	PO1, PO2, PO5, PO9	

**List of Experiments**

**14 Hrs.**

1. To carry out Temporary adjustments of total station
2. To Determine the horizontal angle and vertical angle between the points using total station
3. To determine the horizontal distance between two points using Total station
4. To determine the difference in elevation between two points using Total station
5. To Determine the area of given boundary by using total station
6. To Conduct profile levelling and cross section leveling of existing highway.
7. To stake out unknown points using total station.
8. To Prepare contour map with Block leveling by using total station.
9. To set out a simple curve using total station
10. Preparation of Centre line marking, Column positioning and Footing marking using Total station.

**Reference Materials:**

1. Basak. N. N., "Surveying", Tata McGraw Hill Publishing Co., ltd, 2004
2. Punmia, B. C, "Irrigation and Water Power Engineering", Laxmi Publications, New Delhi, 1992.
3. Khanna, S. K. & Justo CES, "Highway Engineering", Nemchand Brothers, Roorkee, 2003.
4. Garg, S. K., "Water Supply Engineering", Khanna Publishers, New Delhi, 2007

**MOOC Course:**

1. [Digital Land Surveying And Mapping \(DLS&M\) - Course \(nptel.ac.in\)](https://nptel.ac.in)

**Course Articulation Matrix**

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
COs														
CO1	3	2			2				2					
CO2	3	2			2				2					

## Total Station Application in Civil Engineering Laboratory Rubrics (23CV456A)

	Excellent	Very Good	Good	Average
<b>Records. /20</b>	<ul style="list-style-type: none"> <li>Comprehensive and well-organized records</li> <li>All entries are accurate, complete, and clearly documented</li> <li>Detailed observations and results are presented systematically (10)</li> </ul>	<ul style="list-style-type: none"> <li>Good organization and mostly accurate entries</li> <li>Minor errors or omissions in the records</li> <li>Observations and results are presented, but lack some detail(8)</li> </ul>	<ul style="list-style-type: none"> <li>Basic organization with several inaccuracies</li> <li>Significant errors or omissions in the records</li> <li>Observations and results are incomplete or unclear(6)</li> </ul>	<ul style="list-style-type: none"> <li>Poorly organized records with many inaccuracies</li> <li>Major errors or omissions throughout</li> <li>Observations and results are largely missing or very unclear (4)</li> </ul>
<b>Procedure /10</b>	<ul style="list-style-type: none"> <li>Procedure followed precisely as outlined in the manual</li> <li>Clear, logical, and methodical execution of each step</li> <li>No deviations or mistakes during the process(3)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure mostly followed correctly with minor deviations</li> <li>Logical execution with some small errors</li> <li>Minor steps missed or executed incorrectly(2)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure partially followed with significant deviations</li> <li>Execution lacks clarity and has noticeable errors</li> <li>Several steps missed or executed incorrectly(1)</li> </ul>	<ul style="list-style-type: none"> <li>Procedure not followed correctly</li> <li>Execution is disorganized and unclear</li> <li>Many steps missed or executed incorrectly(0)</li> </ul>
<b>Conduction /10</b>	<ul style="list-style-type: none"> <li>Excellent execution of the experiment</li> <li>All apparatus used correctly and safely</li> <li>Results obtained are highly accurate and reliable(5)</li> </ul>	<ul style="list-style-type: none"> <li>Good execution with minor errors</li> <li>Apparatus used mostly correctly with some small mistakes</li> <li>Results obtained are fairly accurate and reliable(3)</li> </ul>	<ul style="list-style-type: none"> <li>Basic execution with noticeable errors</li> <li>Apparatus used with several mistakes</li> <li>Results obtained are somewhat accurate but less reliable(1)</li> </ul>	<ul style="list-style-type: none"> <li>Poor execution with many errors</li> <li>Apparatus used incorrectly or unsafely</li> <li>Results obtained are inaccurate and unreliable(0)</li> </ul>
<b>Viva Voce /10</b>	<ul style="list-style-type: none"> <li>Excellent understanding of the experiment and underlying concepts</li> <li>Answers to questions are clear, concise, and correct</li> <li>Demonstrates a high level of confidence and competence(2)</li> </ul>	<ul style="list-style-type: none"> <li>Good understanding with minor gaps in knowledge</li> <li>Answers to questions are mostly correct with minor errors</li> <li>Demonstrates reasonable confidence and competence(1)</li> </ul>	<ul style="list-style-type: none"> <li>Basic understanding with several gaps in knowledge</li> <li>Answers to questions are partially correct with noticeable errors</li> <li>Demonstrates limited confidence and competence(0.5)</li> </ul>	<ul style="list-style-type: none"> <li>Poor understanding with many gaps in knowledge</li> <li>Answers to questions are mostly incorrect or unclear</li> <li>Demonstrates low confidence and competence(0)</li> </ul>

Course Title	COMPONENTS OF A SMART CITY		
Course Code	23CV456B	(L-T-P) C	(2-0-0) 1
Exam	3 Hrs.	Hours/Week	2
CIE + SEE	50 + 50 Marks	Total Hours	24
<b>Course Objective:</b> <b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Discuss the need, key outcomes that define a Smart city.	PO1, PO6, PO7	
CO2	Interpret the guiding principles and steps to make a city smart	PO1, PO6, PO8	
CO3	Review the financing pattern and the bench marking for smart cities	PO1, PO7, PO8	
CO4	Report on the translation of the smart city initiatives by the government of India.	PO1, PO9,PO10	
MODULE – 1		6 Hrs.	
Definition of Smart city. The key outcomes that define a smart city. The need for smart city. The guiding principles of smart cities. The various steps that need to be considered to make the city smart.  <i>Self- study component: Visit a smart city website and study the various projects of the smart cities mission.</i>			
MODULE – 2		6 Hrs.	
Smart City initiatives worldwide, the Indian scenario, The process of selection for smart cities. Case studies. The challenges before the Indian smart cities.  <i>Self- study component: : Download the document of a smart city and understand the process of development of the vision for the city by people participation</i>			
MODULE – 3		6 Hrs.	
Policies and regulations, the funding pattern. The nature and extent of the central government support. Program financing and loan repayment process. Tendering for smart cities. The proposed benchmarks for smart city. Program monitoring.  <i>Self- study component: Download the document of a smart city and understand the financial scheme</i>			

MODULE – 4										6 Hrs.					
The smart city initiatives by the Government of India - Policy for smart city, Mission statement & guidelines, Case studies. Implementation and monitoring of projects.															
<i>Self- study component: Prepare a presentation and report on the self study components carried out in the module 1, 2 and 3.</i>															
<b>Text Books:</b>															
1. Making a City Smart: Learnings from the Smart Cities Mission, Ministry of Housing and Urban Affairs, Government of India. March 2021 (New Delhi)															
2. Smart cities in India, Pallavi Shukla, Information Analyst, TERI and Programme Officer, TERI ENVIS Center on Renewable Energy & Environment The Energy & Resources Institute, (TERI) Website: <a href="http://www.teriin.org">www.teriin.org</a> (2015)															
<b>Reference Books:</b>															
1. <a href="https://unece.org/sites/default/files/2021-01/SSC%20nexus_web_opt_ENG_0.pdf">https://unece.org/sites/default/files/2021-01/SSC%20nexus_web_opt_ENG_0.pdf</a>															
2. Mission statement & guidelines on Smart City Scheme". Government of India - Ministry of Urban Development <a href="http://smartcities.gov.in/upload/uploadfiles/files/Smart%20City%20Guidelines(1).pdf">http://smartcities.gov.in/upload/uploadfiles/files/Smart City Guidelines(1).pdf</a> .															
<b>MOOC Course:</b> Online Course: <a href="https://www.coursera.org/learn/urban-development">https://www.coursera.org/learn/urban-development</a>															
<b>Course Articulation Matrix</b>															
Course Outcomes		Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	
CO1	3					2	2								
CO2	3					2		2							
CO3	3						2	2							
CO4	3								3	2					

### Components of Smart City Rubrics (23CV456B)

Evaluation Scheme					
Event	Proficient	Acceptable	Needs Improvement	Unacceptable	Pts.
	10-8 - excellent	7-5- good	4-2- fair	2 less - poor	
Inscription of one's thought on the topic	Precise and in depth information, sufficient amount of information.	Precise information, sufficient information.	Some information is inaccurate, sufficient information.	Information is inaccurate and not relevant to the topic	
Content is aligned to the objective	All content aligns to the objective	Most content aligns to the objective, some extraneous information related to the topic may exist	Some content aligns to the objective, additional information is included that may or may not relate to the topic	Information included that may or may not relate to the topic	

**Rubrics of SEE evaluation for ‘Components of a Smart City’**  
**Course Code: 22CV456**

	<b>15-20 Marks(Excellent)</b>	<b>10-14 Marks(Good)</b>	<b>5-9 Marks(Average)</b>	<b>0-4 Marks(Poor)</b>
<b>Report (20 Marks)</b>	<ul style="list-style-type: none"> <li>Report is prepared as per the given format.</li> <li>It consists of all required details.</li> <li>Quality of the content is very good with very few Grammatical mistakes.</li> </ul>	<ul style="list-style-type: none"> <li>Report is prepared as per the given format.</li> <li>It consists of all required details. Whereas details regarding report are incomplete.</li> <li>Quality of the content is good with some grammatical mistakes.</li> </ul>	<ul style="list-style-type: none"> <li>Report is not prepared as per the given format.</li> <li>It consists of few required details of 2 to 3 steps. Whereas details regarding report are missing.</li> <li>Quality of the content is average with a lot of Grammatical mistakes.</li> </ul>	<ul style="list-style-type: none"> <li>Report is not prepared as per the given format.</li> <li>It is incomplete.</li> <li>Quality of the content is poor and inconsistent with a lot of grammatical mistakes.</li> </ul>
	<b>15-20 Marks (Excellent)</b>	<b>10-14 Marks(Good)</b>	<b>5-9 Marks(Average)</b>	<b>0-4 Marks(Poor)</b>
<b>Present ation (20 Marks)</b>	<ul style="list-style-type: none"> <li>Content of the presentation is as per the given format.</li> <li>It consists of all required details.</li> <li>Communication skill of the presenter is very good.</li> <li>There is proper coordination among team members in presenting content of their team work.</li> </ul>	<ul style="list-style-type: none"> <li>Content of the presentation is as per the given format.</li> <li>Few required details are missing.</li> <li>Communication skill of the presenter is good.</li> <li>There is some lack of coordination among team members in presenting content of their team work.</li> </ul>	<ul style="list-style-type: none"> <li>Content of the presentation is not as per the given Format.</li> <li>Required details are missing.</li> <li>Communication skill of the presenter is average.</li> <li>There is lack of coordination among team members in presenting Content of their teamwork.</li> </ul>	<ul style="list-style-type: none"> <li>Content of the presentation is not as per the given format.</li> <li>Required details are missing.</li> <li>Communications skill of the presenter is poor.</li> <li>There is no coordination among team members in presenting content of their team work.</li> </ul>
	<b>9-10 Marks(Excellent)</b>	<b>6-8 Marks(Good)</b>	<b>3-5 Marks(Average)</b>	<b>0-2 Marks(Poor)</b>
<b>Viva-voce (10 Marks)</b>	<ul style="list-style-type: none"> <li>Student has answered all questions correctly.</li> <li>The quality of answers is excellent.</li> </ul>	<ul style="list-style-type: none"> <li>Student has answered few questions correctly.</li> <li>The quality of answers is good.</li> </ul>	<ul style="list-style-type: none"> <li>Student made an attempt to answer to the questions asked, but the answers are partially correctly.</li> <li>The quality of answers is average.</li> </ul>	<ul style="list-style-type: none"> <li>Student made an attempt to answer for few questions, but the answers are incorrect.</li> <li>The quality of answers is poor.</li> </ul>

Course Title	BIOLOGY FOR ENGINEERS		
Course Code	23CV407	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE + SEE	50 + 50 Marks	Total Hours	24
Course Objective: Course Outcomes: At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Explain the structure and functions of various organ systems in human body in an engineering perspective.	PO1, PO3, PO12	
CO2	Relate the basic principles of engineering mechanics to human body.	PO1, PO3, PO12	
CO3	Relate various natural transport mechanics in engineered systems.	PO1, PO3, PO12	
CO4	Compare the mechanics of fluids in natural and engineered systems.	PO1, PO3, PO12	
MODULE – 1		6 Hrs.	
Introduction to Human anatomy: Overview of human anatomy, Structural Organization of the human body-cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, nervous system, muscular system and skeletal system.			
MODULE – 2		6 Hrs.	
Skeletal System: Material Properties of bones, Stress and Strain, Bending Moment and torsional Loads, Area, Moment of Inertia, Joints of Human Body and Degree of Freedom.			
MODULE – 3		6 Hrs.	
Transport System in the Human Body: Transportation of matter (solids, liquids and gases), removal of waste products, convection and diffusion mechanisms, Fick’s Law, Osmosis for water Balance, Comparison of engineering system design with transport systems in human body.			
MODULE – 4		6 Hrs.	
Circulatory System: Fluid Mechanics in Human body, Comparison of natural system with engineered system, Viscosity of fluids, Type of fluid Flow and the influence of Reynolds’ number, Fluid energy, Hydrostatic Pressure, Comparison of Engineering System Designs with circulatory systems in human body.			



**Text Books:**

1. Johnson A T (2018), Biology for Engineers, CRC Press.

- Reference Books:**

1. Vaccari, D A Strom, P F & Alleman, J E (2005), Environmental Biology for engineers and Scientists. John Wiley & Sons
2. Smarsly, K (2010) Biologically- inspired condition monitoring of civil engineering structures, International Journal of computer and Electrical Engineering, 2 (4), 770.

- ## Course Articulation Matrix

[illegible][illegible]

Course Title	UNIVERSAL HUMAN VALUES		
Course Code	23UHV	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE + SEE	50 + 50 Marks	Total Hours	28
<b>Course Objective:</b> The course aims at the development of the value education by the right understanding through the process of self-exploration (about themselves), family, society and nature/existence. Strengthening of self-reflection by development of commitment and courage to act are presented as the prime focus throughout the course towards qualitative transformation in the life of the student.			
<b>Course Outcomes:</b> At the end of course, student will be able to:			
COs	Course Outcomes	Mapping to PO's	Mapping to PSO's
CO1	Start exploring themselves, get comfortable with each other and with the teacher and they start appreciating the need and relevance for the course. Also they are able to note that the natural acceptance (intention) is always for living in harmony.	PO6, PO7, PO8, PO9, PO12	
CO2	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.	PO6, PO7, PO8, PO9, PO12	
CO3	Present sustainable solutions to the problems in society and nature. They are also able to CIE + SEE that these solutions are practicable and draw roadmaps to achieve them.	PO6, PO7, PO8, PO9, PO12	
MODULE – 1		8 Hrs.	
Introduction to Value Education : Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.			
MODULE – 2		6 Hrs.	
Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Lecture, Understanding Harmony in the Self Tutorial, Harmony of the Self with the Body to ensure self-regulation and Health.			
MODULE – 3		8 Hrs.	
Harmony in the Family, Nature and Existence: Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order. Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature recyclability and			

self-regulation in nature. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

#### MODULE – 4

**6 Hrs.**

Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models, Typical Case Studies, Strategies for Transition towards Value-based Life and Profession..

#### Text Books:

1. The Textbook: A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher’s for a Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

#### Reference Books:

1. Jeevan Vidya:EkParichaya, ANagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2. HumanValues, A.N.Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book). 4
4. The Story of My Experiments with Truth-by Mohandas Karamchand Gandhi
5. Small is Beautiful-E.F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-J C Kumarappa
8. Bharat Mein Angreji Raj–Pandit Sunderlal.
9. Redis covering India-by Dharampal
10. Hind Swarajor Indian Home Rule-by Mohandas K. Gandhi.
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland(English)
13. Gandhi-Romain Rolland(English)

#### Self-Learning Activities

1. *Sharing about One self and Exploring Natural Acceptance*
2. *Exploring Harmony of Self with the Body*
3. *Exploring the Feeling of Respect*
4. *Exploring the Four Orders of Nature Lecture and Exploring Co-existence in Existence*
5. *Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order*

#### Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	1	3	2			1		
CO2						2	1	3	2			1		
CO3						2	1	3	2			1		