

**NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY**

**(An Autonomous College under VTU)**

**NAAC Accredited with 'A+' Grade**

**Bachelor of Engineering**

**Department of Civil Engineering**

**III to VIII SEMESTER (Scheme)**

**III & IV SEMESTER (Syllabus)**



**Outcome**

**Based Education 2022-2023**

**Department of Civil Engineering**

**Nagarjuna College of Engineering & Technology**

**Mudugurki Village, Venkatagiri Kote Post, Devanahalli Taluk,**

**Bangalore District-562164**



An Autonomous College under VTU

## **DEPARTMENT OF CIVIL ENGINEERING**

### **VISION**

To transform the students as leaders in Civil Engineering to achieve professional excellence in the challenging future

### **MISSION**

- M1:** To provide the Civil Engineering knowledge and skills for students through an excellent academic environment.
- M2:** Adopting innovative teaching techniques using modern engineering tools for designing, modeling and analyzing the societal and environmental problems.
- M3:** Developing Communication skill, leadership qualities through team work and skills for continuing education among the students.
- M4:** To inculcate moral, ethical and professional values among students to serve the society.
- M5:** Validate engineering knowledge through innovative research projects to enhance their employability and entrepreneurship skills.

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

- **PEO1:** Graduates in Civil Engineering will apply the technical knowledge for sustainable societal growth.
- **PEO2:** Graduates of civil Engineering will demonstrate designing, modeling and analyzing skills.
- **PEO3:** Graduates in Civil Engineering will demonstrate good communication skills, dynamic leadership qualities with concern for environmental protection.
- **PEO4:** Civil Engineering graduates will be capable of pursuing higher studies, take up research and development work blended with ethics and human values.
- **PEO5:** Civil engineering graduates will have the ability to become entrepreneurs thereby switching over from responsive engineering to creative engineering.

### **Program Outcomes (Pos)**

- **PO-1:** Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and Civil Engineering principles to the solution of complex problems in Civil Engineering.
- **PO-2:** Problem Analysis: Identify, formulate, research literature and analyze complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
- **PO-3:** Design/Development of Solutions: Design solutions for complex Civil Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, cultural, societal and environmental considerations.
- **PO-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 related to Civil Engineering problems.
- **PO-5:** Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering tools such as CAD, FEM, GIS, etc. including prediction and modeling to complex Civil Engineering activities with an understanding of the limitations.

- **PO-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 Civil Engineering practice.
- **PO-7:** Environment and Sustainability: Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts and demonstrate the knowledge and the need for sustainable development.
- **PO-8:** Ethics: Apply ethical principles and commit to professional ethics and responsibilities while following the Civil Engineering practice.
- **PO-9:** Individual and Team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.
- **PO-10:** Communication: Communicate effectively on complex Civil 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.
- **PO-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 Civil Engineering projects and in multidisciplinary environments.
- **PO-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 Outcome (PSO)

- **PSO-1:** Apply the knowledge of Civil Engineering in Sustainable Infrastructure developments.
- **PSO-2:** Identify, analyze and manage Civil Engineering problems with ethical and social responsibilities.
- **PSO-3:** Implementation of relevant codes/ specifications/ guidelines to arrive at comprehensive solutions to address societal needs and exhibit communication and teamwork skills.

*Scheme & Syllabus*  
*With effect from*  
*Academic Year **2022-23***



**NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU**

**B.E. in Civil Engineering**

Scheme of Teaching and Examination 2021-22

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS), Effective from the academic year 2022-23

**IV SEMESTER**

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Duration in Hours	Examination			Credits
					Theory / Lecture	Tutorial	Practical / Drawing	Self-study Component		CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	PCC	22CVT41	Structural Analysis	CV	2	2	-	-	3	50	50	100	3
2	IPCC	22CVI42	Public Health Engineering (IC)	CV	3	-	2	-	3	50	50	100	4
3	IPCC	22CVI43	Fluids Mechanics and Machinery(IC)	CV	2	2	2	-	3	50	50	100	4
4	PCC	22CVL44	Building Construction and PlanningLab	CV	2	-	-	-	3	50	50	100	1
5	ESC	22ESC45	Concrete Technology	CV	3	-	-	-	3	50	50	100	3
6	BSC	22BSC46	Earth Science in Engineering	BSC	2	-	2	-	2	50	50	100	3
7	AEC	22AEC47	Technical writing	HSMC	1	-	-	-	-				1
8	UHV	22UHV48	Universal Human Value	HSMC	-	2	-	-	1	50	50	100	1
9	PET	22CPH49	Employability Skill-1	PET	-	-	-	-	-	-	-	-	0
<b>TOTAL</b>										<b>450</b>	<b>450</b>	<b>900</b>	<b>20</b>

## NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

### B.E. in Civil Engineering

Scheme of Teaching and Examination 2022-2023

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS), (Effective from the academic year 2023-2024)

### V SEMESTER

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Duration in Hours	Examination			Credits
					Theory / Lecture	Tutorial	Practical / Drawing	Self-study Component		CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	HSMC	22CVT51	Construction Management & Entrepreneurship	CV	3	-	-	-	3	50	50	100	3
2	IPCC	22CVI52	Design of RCC Structures	CV	3	-	-	-	3	50	50	100	4
3	IPCC	22CVI53	Geo Technical Engineering-1	CV	3	-	-	-	3	50	50	100	4
4	PCCL	22CVL54	Concrete Laboratory	CV	-	-	2	-	3	50	50	100	1
5	PCC	22CVP55X	<b>Professional Elective –I</b> 1. Alternate building materials 2. Structural Analysis-2 3. Air pollution controlling and Monitoring 4. Geographic Information System & Practice	CV	3	-	-	-	3	50	50	100	3
6	AEC	22AEC56	Environmental Studies	CV	1	-	-	-	3	50	50	100	1
7	AEC2	22AEC58	Research Methodology & IPR	CV	2	-	-	-	2	50	50	100	2
8	PCC	22CVP59	Mini Project	CV	-	-	4	-	3	50	50	100	2
				<b>TOTAL</b>									20



## NAGARJUNA COLLEGE OF ENGINEERING & TECHNOLOGY, BENGALURU

**B.E. in Civil Engineering**

Scheme of Teaching and Examination 2022-2023

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS), (Effective from the academic year 2023-2024)

### VI SEMESTER

Sl. No.	Course and Course Code		Course Title	Teaching Department	Teaching Hours / Week				Duration in Hours	Examination			Credits
					Lectur	Tutori	al/	Drawi		CIE	SEE	Total	
					L	T	P	S					
1	IPCC	22CVI61	Design & drawing of Steel Structures (Design of steel structures thro' STAD)	CV	2	2	2	-	3	50	50	100	4
2	IPCC	22CVI62	Transportation Engineering	CV	2	2	2	-	3	50	50	100	4
3	PCCL	22CVL63	Structures Lab	CV			2		3	50	50	100	1
4	PEC	22CVT64X	<b>Professional Elective</b> 1. Hydraulic Structures 2. Bridge Engineering 3. Ground Water & Hydrology 4. Remote Sensing and Photogrammetry	CV	3	-	-	-	3	50	50	100	3
5	MEP	22CVT65X	<b>Open Elective</b> 1. Intelligent Transport system 2. Environmental Protection & Management 3. Energy Efficiency in Green Buildings 4. Railways and Airport Engineering	CV	3	-	-	-	3	50	50	100	3
6	AEC	22AEC66	Application of AI in Civil Engineering	CV	2	-	2	-	3	50	50	100	3
7	MP	22CVT67	Mini Project	CV	1	-	-	2	3	50	50	100	2
8													
<b>TOTAL</b>										400	400	800	20





**III SEM**

<b>Course Title</b>	<b>NUMERICAL TECHNIQUES, STATISTICS AND PROBABILITY DISTRIBUTIONS.</b>		
<b>Course Code</b>	<b>22MATC31</b>	<b>CIE Marks</b>	<b>50</b>
<b>Course Type</b>	<b>Theory</b>	<b>SEE Marks</b>	<b>50</b>
<b>Teaching Hours/Week (L: T: P: S)</b>	<b>2:2:0:0</b>	<b>Total Marks</b>	<b>100</b>
<b>Total Hours of Pedagogy</b>	<b>40 hours</b>	<b>Exam Hours</b>	<b>03</b>
		<b>Credits</b>	<b>03</b>

**Course objectives:**

The goal of the course **Numerical Techniques, Statistics and Probability Distributions** for civil engineering is to

- Have an insight into Statistical methods, Correlation and regression analysis.
- Learn the concept of solving the ordinary differential equations arising in engineering applications, using numerical methods.
- Develop the probability distribution of discrete and continuous random variables, Markov chain, Joint probability distribution occurs in civil engineering.
- Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.

**Teaching-Learning Process (General Instructions)**

**These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.**

1. In addition to the traditional lecture method, different types of innovative teaching methods maybe adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self-study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
  - As an introduction to new topics (pre-lecture activity).
  - As a revision of topics (post-lecture activity).
  - As additional examples (post-lecture activity).
  - As an additional material of challenging topics (pre-and post-lecture activity).
  - As a model solution of some exercises (post-lecture activity).

**Module-1**

**Curve Fitting and Statistical Methods.:**

Curve Fitting: Curve fitting by the method of least squares, fitting the curves of the forms

$$y = ax + b, y = ax^2 + bx + c \text{ and } y = ax^b$$

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation, problems. Regression analysis, lines of regression, problems

**(8 Hours)**

**[Text 1: 24.1, 24.4, 24.5, 24.6, 25.12, 25.13, 25.14, 25.16]**

<p><b>Self-Study: Fitting of the curves <math>y = ab^x</math> and <math>y = ae^{bx}</math>.</b> Angle between two regression lines, problems. (RBT Levels: L1, L2 and L3)</p>	
<p><b>Module-2</b></p>	
<p><b>Numerical Solution of Simultaneous and Second order Ordinary Differential Equations:</b> Numerical solutions of simultaneous first order differential equations-Picard's method, Taylor's series method and Runge-Kutta method (No derivations of formulae). Second-order differential equations - Runge-Kutta method and Milne's predictor and corrector method (No derivations of formulae). <span style="float: right;"><b>(8 Hours)</b></span></p> <p><b>Self-study:</b> Solution of Laplace's equation using standard five-point formula. (RBT Levels: L1, L2 and L3)</p>	
<p><b>Module-3</b></p>	
<p><b>Probability Distributions:</b> Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions - problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. <span style="float: right;"><b>(8 Hours)</b></span></p> <p>[Text 1: 26.1, 26.2, 26.7, 26.8, 26.9, 26.10, 26.13, 26.14, 26.15, 26.16] <b>Self-study:</b> Exponential distribution. (RBT Levels: L1, L2 and L3)</p>	
<p><b>Module-4</b></p>	
<p><b>Joint probability distribution &amp; Markov Chain:</b> <b>Joint probability distribution:</b> Joint Probability distribution for two discrete random variables, expectation, covariance and correlation. <b>Markov Chain:</b> Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. <span style="float: right;"><b>(8 Hours)</b></span></p> <p>[Text 3: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 5.6, 5.7] <b>Self-Study:</b> Joint Probability distribution for two continuous random variables. (RBT Levels: L1, L2 and L3)</p>	
<p><b>Module-5</b></p>	
<p><b>Sampling Theory:</b> Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. <span style="float: right;"><b>(8 Hours)</b></span></p> <p>[Text 1: 27.1, 27.2, 27.3, 27.4 27.5, 27.7, 27.9, 27.10, 27.11, 27.12, 27.13, 27.14, 27.15, 27.16, 27.17, 27.18] <b>Self-Study:</b> Point estimation and interval estimation. (RBT Levels: L1, L2 and L3)</p>	
<p><b>Teaching-Learning Process for allmodules</b></p>	<p><b>Chalk and Talk/PowerPoint presentation/YouTube videos.</b></p>

**Course Outcomes (Course Skill Set):**

After successfully completing the course, the students will be able:

1. Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
2. To solve mathematical models represented by initial or boundary value problems involving ordinary differential equations.
3. Apply discrete and continuous probability distributions in analyzing the probability models arising in the civil engineering field.
4. Use Markov's chains in analyzing the probability models arising in civil engineering field and construct joint probability distributions.
5. Demonstrate the validity of testing the hypothesis.

**Evaluation Details:**

Evaluation Type		Component	Max Marks	Marks Reduced to	Min. Marks	Evaluation Details	
Theory Component	Internal Assessment Tests (IAT)	IAT-1	25	25	20	Average of two IATs, Scaled down to 25 marks	
		IAT-2	25				
	Comprehensive Continuous Evaluations (CCE)	CCE-1	25	25		Any two Assessment methods as per 22OB4.2 of regulations. Average of two CCEs, scaled down to 25 marks	
		CCE-2	25				
<b>Total CIE -Theory</b>				<b>50</b>	<b>20</b>		
<b>SEE</b>			100	<b>50</b>	<b>18</b>		Conducted for 100 marks And scaled down to 50.
<b>CIE + SEE</b>				<b>100</b>	<b>40</b>		

**Suggested Learning Resources:****Text Books:**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2018.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed. (Reprint), 2016.
3. **Seymour Lipschutz and Marc Lars Lipson:** "Probability", (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010.

**Reference Books:**

1. **B.V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed.
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> reprint, 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" Laxmi Publications, 10<sup>th</sup> Ed., 2022.

4. **C. Ray Wylie, Louis C. Barrett:** “Advanced Engineering Mathematics” McGraw – Hill Book Co. New York, 6<sup>th</sup> Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** “Engineering Mathematic for Semester I and II”, Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H.K. Dass and Er. Rajnish Verma:** “Higher Engineering Mathematics” S.Chand Publication 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** “Calculus” Cengage publications, 7<sup>th</sup> edition, 4<sup>th</sup> Reprint 2019.

**E-Resources:**

- <http://.ac.in/courses.php?disciplineID=111>
- [http://www.class-central.com/subject/math\(MOOCs\)](http://www.class-central.com/subject/math(MOOCs))
- <http://academicearth.org/>
- VTU e-Shikshana Program
- VTU EDUSAT Program

**Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Quizzes
- Assignments
- Seminars

**CO- PO Mapping:**

Course Outcomes	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12
22MATC31.1	3	3	1									
22MATC31.2	3	3	2									
22MATC31.3	3	3										
22MATC31.4	3	3										
22MATC31.5	2	3	1									

**Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped**



<b>STRENGTH OF MATERIALS</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs./week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22CVT32</b>	<b>2-2-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3hours</b>	<b>50hr</b>
<b>Prerequisites:</b>						
<ul style="list-style-type: none"> <li>• Basic Mathematics and Physics</li> <li>• Engineering Mechanics</li> </ul>						
<b>Course Objectives:</b>						
This course will enable students						
<ol style="list-style-type: none"> <li>1. To understand the basic concepts of the stresses and strains for different materials and strength of structural elements.</li> <li>2. To know the development of internal forces and resistance mechanism for one dimensional and two dimensional structural elements.</li> <li>3. To analyze and understand different internal forces and stresses induced due to representative loads on structural elements.</li> <li>4. To evaluate the behavior of torsion members, columns and struts.</li> </ol>						
<b>Syllabus</b>						
<b>Module 1</b>						
<p><b>Simple Stresses and Strains:</b> Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of regular sections.</p> <p>Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship between elastic constants Thermal stresses and strain ; Numerical examples for the applied Engineering problems</p>						
<b>(9+2) Hrs</b>						
<b>Module 2</b>						
<p><b>Bending moment and shear force in beams:</b> Definition of shear force and bending moment, Sign convention, Relationship between loads, shear force and bending moment. Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) with salient features for all varieties of Beams (statically determinate) and Loads. Numerical examples for the applied Engineering problems</p>						
<b>(8+2) Hrs</b>						
<b>Module3</b>						
<p><b>Bending stress in Beams:</b> Introduction – Bending stress in beam, Pure bending, Assumptions in simple bending theory, Derivation of Simple bending equation, modulus of rupture, section modulus, Flexural rigidity, Numerical examples for the applied Engineering problems</p>						
<p><b>Shear stress in Beams:</b> Derivation of Shear stress intensity equations, Derivation of Expressions for the shear stress intensity for regular cross sections of the beams (such as rectangle, triangle, I section, T- section etc.,) Numerical examples for the applied Engineering problems</p>						
<b>(8+2) Hrs</b>						
<b>Module 4</b>						
<p><b>Transformation stresses:</b> Transformation of plane stress and strain; Principal stresses and strains; Mohr's circle.</p>						
<p><b>Deflection of Beams:</b> Bending deflection of beams by direct integration method (double integration and Macaulay's Method); Application of direct integration method to simple indeterminate systems Numerical examples for the applied Engineering problems</p>						
<b>(4+4+2) Hrs</b>						

### Module5

**Elastic stability of columns:** Introduction – Short and long columns, Euler’s theory on columns, Effective length, slenderness ratio, radii of gyration, buckling load, Assumptions, derivations of Euler’s Buckling load for different boundary conditions, Limitations of Euler’s theory. Rankine’s formula and related problems.

**Torsion:** Twisting moment in shafts, simple torque theory, derivation of torsional equation, application of rigidity modulus, polar modulus, Transmission of power through hollow and solid shafts, Numerical Problems Numerical examples for the applied Engineering problems

**(4 + 3+2) Hrs**

**Course Outcomes:**

- Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
- To develop shear force-Bending moment diagrams of a beam and to analyse their effect
- Determine the deflections and rotations produced by the three fundamental types of loads: axial, torsional and flexural.
- Analyze slenderness in columns subjected to axial loads and also to determine effective section of the column

**Text Books:**

- Ferdinand P. Beer and E. Russel Johnston(jr) “Mechanics of Materials: Mcgraw-hill Education Publisher, 6th Edition, 2013
- R. Subramanyam, “Strength of Materials”, Oxford University Press, 3<sup>rd</sup> Edition-2016
- B.C Punmia, Ashok Jain, Arun Jain, “ Strength of Materials”, Laxmi Publication- 2018-22, Publications,10<sup>th</sup> Edition-2018.

**ReferenceBooks:**

- Timoshenko and Young “Elements of Strength of Materials”, East West Press,5<sup>th</sup> edition2003
- I B Prasad, “ Strength of Materials”, CBS Publishers
- I.H. Shames and J.M. Pitarresi, Introduction to the Solid Mechanics, 3rd Ed., Prentice Hill, New Delhi, 1989.

**E-Resources**

- StrengthofMaterialswebcoursebyIITRoorkee<https://nptel.ac.in/courses/112107146>
- StrengthofMaterialsvideocoursebyIITKharagpur<https://nptel.ac.in/courses/105105108/>
- StrengthofMaterialsvideocoursebyIITRoorkee<https://nptel.ac.in/courses/112107147/18>
- Allcontentsorganized<http://www.nptelvideos.in/2012/11/strengthof-materials-prof.html>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2												2	1
CO2	3	2												1	1
CO3	3	2												2	2
CO4	3	2												1	2
CO	3	2												1.5	1.5

<b>CONSTRUCTION MATERIALS AND TECHNOLOGY(IC)</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22CVI33</b>	<b>2-2-2-0</b>	<b>4</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>50</b>
<b>Course Objectives:</b>						
<p>The students will be able to</p> <p>To gain knowledge of various materials and processes involved in building construction.</p> <p>To apply the knowledge for building planning and estimation.</p> <p>To understand material usage in different types of masonry and application of water proofing</p>						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>INTRODUCTION TO CONSTRUCTION MATERIALS</b>						
<p>Structural clay products: Bricks, Concrete blocks, manufacturing process of bricks. Natural stone: Types, qualities of good stone for construction.</p> <p>Timber: Natural timber, properties, Timber products. Plywood, veneers, laminates</p> <p>Lime, cement, admixtures: Properties and uses, Types, field test and manufacturing process</p>						
<b>[8 hours]</b>						
<b>Module – 2</b>						
<b>Introduction to building construction:</b> Components of a Building viz. foundations, walls, lintels roofs, openings, framed structures and masonry structures.						
<b>Foundation:</b> Function and requirements of a good foundation, Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil, Introduction to spread, combined, strap, mat and pile foundations. (Numerical problems on Combined footings- Reinforcement calculations not considered).						
<b>[8 hours]</b>						
<b>Module – 3</b>						
<b>Masonry:</b> Terms used in Masonry, Classification of Masonry, Bonds in Brick work, Reinforced Brick Masonry, Joints in stone masonry, Introduction to load bearing, cavity and partition walls. (Numerical problems on Masonry wall Design – width and height calculations)						
Damp proofing, water proofing and anti-termite treatment, Definition of technical terms, Defects, causes and sources of dampness, damp proofing and terrace water proofing methods, Pre and post constructional anti termite treatment.						
<b>[8 hours]</b>						
<b>Module – 4</b>						
<b>Modern materials</b>						
Glass – Ceramics – Sealants for joints – Fiber glass reinforced plastic – Clay products -Refractories – Composite materials – Types – Applications of laminar composites – Fiber textiles-Geo-membranes and Geo- textiles for earth reinforcement and improvement of properties						
<b>[8 hours]</b>						
<b>Module – 5</b>						
<b>Energy in building materials:</b> Environmental issues related to Building Materials, Green Concept in buildings.						
<b>Introduction to Construction Planning-Scheduling for activities- Critical path method (CPM) and PERT network modelling</b>						
<b>[8 hours]</b>						
<b>List of Experiments</b>						
<p>Tests on Bricks (water absorption, dimension analysis, compressive strength).</p> <p>Tests on coarse and Fine Aggregates (Specific Gravity, Sieve Analysis and loose and dense density test)</p> <p>Tests on Cement, Specific Gravity, Normal Consistency, Initial Setting Time, Final Setting Time, Soundness of cement.</p> <p>Charpy and Izod Impact test on Ductile Materials (Mild Steel)</p> <p>Tension test (Mild Steel)</p> <p>Bending test on Wood.</p> <p>Hardness test: Brinnell's and Vicker's hardness test on Ductile Materials (Aluminum and Mild Steel)</p>						

[10 hours]

**Course Outcomes:**

1. understand the property , use , advantage and disadvantage of different material used in construction
2. Understand the importance of building components.
3. Describe the construction process of various components of a building.
4. Understand the impact of building construction on society and demonstrate awareness of contemporary issues.

**Text Books:**

A Text Book Building Materials, by P.G. Varghese, Prentice-Hall of India Pvt. Ltd., Publication., 2nd Edition,,2015

Building Construction, Sushil Kumar, Standard Publication and Distributors, New Delhi, 19th Edition, 2001.

Building Construction, by Dr. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, Laxmi Publications Pvt Ltd.

**Reference Books:**

Advances in Building Materials and Construction by Mohan Rai and M.P. Jain Singh – publication by CBRI, Roorkee.

Building Materials (3rd revised edition), S.K. Duggal, New Age International publishers, India. Jagadish. K.S, “Alternative Building Materials Technology”, New Age International, 2007.

M. S. Shetty, “Concrete Technology”, S. Chand & Co. New Delhi. Neville AM, “Properties of Concrete”, ELBS Publications, London.

[L. S. Srinath](#) PERT and CPM Principles and Applications Affiliated East-West Press 2001 Relevant BIS codes, Relevant IS Codes and IRC Codes.

PO'S PSO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1											1		
CO2	2	1											1		
CO3	2	1											1		
CO4	2						2						1		
CO	2.25	1					2						1		

<b>GEODETIC ENGINEERING (IC)</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22CVI34</b>	<b>2-2-2-0</b>	<b>4</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>48 Hrs</b>
<b>Prerequisites:</b>						
Mathematics Civil Engineering Foundation A good understanding of the above topics is essential.						
<b>Course Objectives:</b>						
This course enables the students <ol style="list-style-type: none"> <li>To gain knowledge about the conventional, latest methods.</li> <li>To understand the instruments used for measuring distances, angles and elevation of objects.</li> <li>To perform levelling to compute areas and volumes of the existing ground profiles.</li> </ol>						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>Introduction to Surveying:</b> Importance of Surveying in Civil Engineering, Concepts of plane and geodetic surveying, Principles of surveying –Plans and maps – Surveying equipment’s						
<b>Compass surveying:</b> Prismatic and surveyor’s compasses, temporary adjustments, Meridians, Bearings and compass traversing with Numerical problems on bearings and included angles. <span style="float: right;">[6L+2T]</span>						
<b>Module – 2</b>						
<b>Levelling</b> – Principles and basic definitions – Types of Levels – Types of adjustments and objectives – Types of levelling – Simple, Differential, Fly, Reciprocal, Profile, Cross sectioning – Booking of levels – Rise & fall and H. I method with numerical Problems. Effect of Curvature of Earth and Refraction.						
<b>Contouring-</b> Characteristics and uses of Contours, methods of contour surveying						
<b>Areas</b> - Determination of areas consisting of irregular boundary and regular boundary.						
<b>Volumes</b> - Determination of volume of earth work in cutting and embankments for level section, volume of borrow pits, capacity of reservoirs. <span style="float: right;">[6L+2T]</span>						
<b>Module – 3</b>						
<b>Theodolite Surveying:</b> Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible. Traversing: Methods of traversing, traverse computations and adjustments, Omitted measurements.						
<b>Modern Surveying Methods:</b> Principle and types of E.D.M. Instruments, <span style="float: right;">[6L+2T]</span>						
<b>Module – 4</b>						
<b>Curves:</b> Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.						

**Tacheometric Surveying:** Principles of Tacheometry, stadia and tangential methods of Tacheometry,  
**Advanced instrumentation in surveying:** Introduction to total station, uses of total station, advantages and applications of total station. Profile levelling and Traversing using total Station  
 Field Procedure for total station survey, Errors in Total Station Survey, Global Positioning System-Principle and Applications

[6L+2T]

### Module – 5

**Photogrammetry and aerial survey:** Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

**Remote sensing:** Introduction, Principle of Remote sensing, EMR, types, resolutions, types of satellites, type of sensors, LIDAR, visual and digital image processing and its applications.

[6L+2T]

#### List of Surveying Lab Experiments

Sl No.	Name of the Experiment
1	Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass.
2	Determination of distance between two inaccessible points using compass
3	To determine difference in elevation between two points using simple and differential levelling technique using both HI and Rise and Fall methods.
4	To determine the difference in elevation between two points using Reciprocal levelling and to determine the collimation error.
5	To conduct profile levelling for water supply / sewage line and to draw the longitudinal section to determine the depth of cut and depth of filling for a given formation level.
6	Measurement of horizontal angles with method of repetition using theodolite.
7	Measurement of vertical angles using theodolite.
8	To set out simple curves using linear methods—offsets from Chords produced.
9	To set out simple curves using Rankine’s deflection angles method.
10	Traverse survey using total Station.

#### Course Outcomes:

- Understand the basic concepts of surveying.
- Utilization surveying instruments based on the needs.
- Develop skill to carry out geodetic surveying in the field.
- Explain latest technologies and modern instruments used in survey.
- Estimate the area of a given plot and quantities of earthwork involved in cuttings and fillings.

**Text Books:**

- Dr B C Punmia, “Surveying Volume I”, (Chapter 1,2,3, 4, 6, 7, 9,10,11,12,13,16,18&22), Lakshmi Publications Pvt Ltd, 6th Edition, 2005, ISBN 978-81-700-8853-0
- Dr B C Punmia, “Surveying Volume II”, (Chapter 1, 2, 3, 4, 6, 7 & 15), Lakshmi Publications Pvt Ltd, 6th Edition, 2005, ISBN 978-81-700-8853-0
- Kanetkar T P and S V Kulkarni, Surveying and Leveling Part I, Pune Vidyarthi Griha Prakashan,1988,

**Reference Books:**

- C Venkatramiah, “ Text Book of Surveying”, (Chapter 1, 2, 3, 4, 5,7, 8 ,9,10,11& 12), Universities Press (India) Pvt. Ltd, 5th Edition, 1996.
- S.K. Roy, “Fundamentals of Surveying”, (Chapter 1, 3& 19), Prentice-Hall of India Pvt. Limited, 2004, 2nd Edition, ISBN: 81-20-312-60-0.
- R Subramanian, Surveying and Leveling, Second edition, Oxford University Press, New Delhi, ISBN 10: 0198085427.
- Chandra A M, “Plane Surveying and Higher Surveying”, New age International Pvt. Ltd., Publishers, New Delhi.
- Duggal S K, “Surveying (Vol – 1 & 2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

**E-Resources**

- [http://lib.uniten.edu.my/libsite/index.php?option=com\\_joomd&view=item&layout=detail&typeid=2&id=202&Itemid=790](http://lib.uniten.edu.my/libsite/index.php?option=com_joomd&view=item&layout=detail&typeid=2&id=202&Itemid=790)
- <http://ascelibrary.org/journal/jsued2>
- [www.survivorlibrary.com/.../engineers\\_surveying\\_instruments\\_1892.pdf](http://www.survivorlibrary.com/.../engineers_surveying_instruments_1892.pdf)

**Online Courses and Video Lectures**

- <https://www.udemy.com/course/surveying/>
- <https://www.udemy.com/course/total-station-surveying-and-mapping/>
- <https://www.udemy.com/course/advanced-surveying-technology/>
- <https://nptel.ac.in/courses/105107122>

POs & PSOs															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				1							2	2	1
CO2	3	2				1							3	2	1
CO3	3	2				1							2	2	1
CO4	3	2	1		3	1						2	3	2	2
CO5	3	2										2	3	2	1
CO	3	2	1		3	1						2	2.6	2	1.2

<b>BUILDING PLANNING AND DRAWING LAB –I</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22CVL35</b>	<b>0-0-2-0</b>	<b>1</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>20 Hours</b>
<b>Prerequisites:</b>						
Awareness of building components and their positions						
<b>Course Objectives:</b>						
1.To enable students to gain drafting knowledge 2. To visualize the various components of a building 3. To design and draw the various types of buildings based on the given functional requirements.						
<b>MODULE 1</b>						
Development of plan, elevation, section and schedule of openings for the given line diagram of residential buildings such as; i) Single bed room single story buildings, ii) Two bed room single story buildings and <b>iii) Two storied buildings (Only for Practice)</b>						
<b>[5 hours]</b>						
<b>MODULE 2</b>						
To prepare geometrical drawing of various component of buildings such as i) Stepped wall footings, ii) Isolated and combined RCC column footings, iii) RCC dog legged and open newel stair cases, iv) Doors & windows (Fully paneled doors & glazed windows)						
<b>[5 hours]</b>						
<b>MODULE 3</b>						
Functional design of buildings using inter connectivity diagrams (bubble diagram), development of line diagram of residential buildings, public buildings such as Primary Health Centre, office buildings and school buildings.						
<b>[5 hours]</b>						
<b>MODULE 4</b>						
Preparation of water supply, sanitary and electrical layouts for a given single line diagram.						
<b>[5 hours]</b>						
<b>Course Outcomes:</b>						
<b>CO1:</b> Understand basic principles of building design and planning.						
<b>CO2:</b> Explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.						
<b>CO3:</b> develops basic drawing skills; create architectural and working drawing drawings						
<b>CO4:</b> Prepare service layouts.						
<b>Text Books:</b>						
1. Building Drawing”, by Shah M. H. And Kale C. M., Tata McGraw Hill Publishing Co. 2002						
2. Gurucharan Singh, “Building Construction”, Standard Publishers, & distributors, New Delhi.						
3. Malik R S and Meo G S, “Civil Engineering Drawing”, Asian Publishers/Computech Publications Pvt Ltd.						



**Reference Books:**

1. A Course in Civil Engineering Drawing”, by V. B. Sikka, S. K. Kataria & Sons.
2. Time Saver Standard by Dodge F. W., F. W. Dodge Corp.,
3. IS:962- Code of practice for architecture and building drawing National Building code, BIS, New Delhi

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

<b>SOCIAL CONNECT &amp; RESPONSIBILITIES</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Lecture Hours</b>
<b>22UHV36</b>	<b>0-0-2-0</b>	<b>01</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>15 Hours</b>
<b>Course Objectives:</b>						
<p>The Course will</p> <ul style="list-style-type: none"> <li>• Enable the student to do a deep dive into societal challenges being addressed by NGO(s), social enterprises &amp; the government and build solutions to alleviate these complex social problems through immersion, design &amp; technology.</li> <li>• Provide a formal platform for students to communicate and connect with their surroundings.</li> <li>• Enable to create of a responsible connection with society.</li> </ul>						
<b>Syllabus</b>						
<b>Module – 1</b> <span style="float: right;"><b>[3 hours]</b></span>						
Plantation and adoption of a tree: Plantation of a tree that will be adopted for four years by a group of B.Tech.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> <span style="float: right;"><b>[3 hours]</b></span>						
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photoblog and documentary on evolution and practice of various craft forms						
<b>Module – 3</b> <span style="float: right;"><b>[3 hours]</b></span>						
Organic farming and waste management: usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.						
<b>Module – 4</b> <span style="float: right;"><b>[3 hours]</b></span>						
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices.						
<b>Module – 5</b> <span style="float: right;"><b>[3 hours]</b></span>						
Food Walk City’s culinary practices, food lore, and indigenous materials of the region used in cooking.						
<b>Course Outcomes:</b>						
<p>The students are expected to have the ability to:</p> <ol style="list-style-type: none"> <li>1. Understand social responsibility</li> <li>2. Practice sustainability and creativity</li> <li>3. Gain knowledge of heritage culture</li> <li>4. Adopt and implement water conservation in surrounding areas</li> <li>5. Explore the variety of indigenous food material of different regions</li> </ol>						

## POs &amp; PSOs

PO'S CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>C1</b>	1					3	3		3			3		3	
<b>C2</b>	1					3	3		3			3		3	
<b>C3</b>	1					3	3		3			3		3	
<b>C4</b>	1					3	3		3			3		3	
<b>C5</b>	1					3	3		3			3		3	
<b>C</b>	<b>1</b>					<b>3</b>	<b>3</b>		<b>3</b>			<b>3</b>		<b>3</b>	

<b>RURAL, URBAN PLANNING AND ARCHITECTURE</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs./week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22ESC371</b>	<b>3-0-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3hours</b>	<b>40hr</b>
<b>Prerequisites:</b>						
<ul style="list-style-type: none"> <li>• Basic Mathematics and Physics</li> <li>• Engineering Mechanics, Basic Drawing</li> </ul>						
<b>Course Objectives:</b>						
<p>This course will enable students</p> <ol style="list-style-type: none"> <li>1. To make the student understand about the past and present architecture of different parts of the world</li> <li>2. Rural and urban planning and growth and circulation of patterns and effect of increase in urbanization</li> <li>3. The basic planning required for urban and rural centres with respect to physical and social aspects</li> <li>4. Student s to visit the different place of architecture monuments to understand the concept</li> <li>5. To understand different types of architecture and planning</li> </ol>						
<b>Syllabus</b>						
<b>Module 1</b>						
<p>Introduction: Aim and importance of Architecture, Architecture as a fine art. Role of an architect and an engineer. Essential principles and qualities of architecture with examples Factors of architecture: Mass, Form, Colour, Solids, and Voids, Uniformity, Balance and Symmetry, Painting with examples.</p>						
<b>7 Hrs</b>						
<b>Module 2</b>						
<p>Architectural influence of the following: Association, Tradition, Climate, Materials, Topography, Religion social customs and aspiration of time. Architectural characteristics of the following architecture with examples. 1. Egyptian, 2. Greek, 3. Roman, 4. Buddhist, 5. Hindu, 6. Jain, 7. Chalukyan, 8. Modern architecture Factors that have influence present day Modern Architecture, Aesthetic difference between the past and present Architecture. Students are advised for a technical tour related Architecture and town planning to gain additional knowledge in this subject</p>						
<b>8 Hrs</b>						
<b>Module3</b>						
<p>The origin and growth of cities</p> <p>Human development in the cities and urbanization with human colonial, Rural and urban pattern of growth, Factors that promote growth and development of Rural and urban areas.</p> <p>Ancient Town Planning in India: Principles of town planning and circulation pattern with examples</p> <p>Industrialization: Impact on town planning,</p>						
<b>8 Hrs</b>						
<b>Module 4</b>						

Urbanization and urban change

Urbanization and economic growth- urbanization cycle- stages of differential urbanization law of primate city

Stages of urban development- re-urbanisation, counter urbanisation, sub-urbanisation, ex-urbanisation

Types of urbanised regions- city regions- conurbation- urban field- megalopolis – ecumenopolis

Urban change- process and underlying factors- demographic change- economic changes functional types of cities

**9 Hrs**

### **Module5**

Influence of key Architects and planners and evolution of New Towns

Concept- garden cities - - neighborhood unit- Ebenezer Howard, Barlow, Abercrombie, Milton Keynes- private sector new towns- New towns in Europe and Third World-New communities - New town in U.S.- green-field-brownfield debate- green belt towns -nontraditional planned developments- new urbanism - master planned communities

Urban renewal and post- war reconstruction, the picturesque city-the contribution of Geddes, Mumford, Corbusier, Doxiadis and Jane Jacobs

Emerging concepts- Global City, Inclusive City, Liveable City, Safe City, Future City - Impact of new town movement on post-independent Indian city planning -beginning of modern town planning in India

**8 Hrs**

#### **Course Outcomes:**

- Understand importance of architecture in rural and urban planning
- Understand Influence of architecture
- Development of Urban regions
- Design infrastructure for rural and urban region

#### **Text Books:**

- Carter, H (1972): The Study of Urban Geography, Edward Arnold.
- Indian architecture – Vol. I & II – Perey Brown
- Town planning – Rangwala, Charoathar Publication

#### **ReferenceBooks:**

- History of Architecture – Fletcher
- Urban pattern – Galliaon
- Principle of town and country planning – Lewis Keeble

#### **E-Resources**

- <https://archive.nptel.ac.in/courses/124/107/124107158/>
- <https://www.youtube.com/watch?v=SKKAIv9cNCA>
- <https://www.youtube.com/watch?v=uTywQgFmmgI>

	<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>PSO3</b>
<b>CO1</b>						2	2	2				1	2		1
<b>CO2</b>						2	2	2				1	2		1
<b>CO3</b>						2	2	2				1	2		3
<b>CO4</b>						2	2	2				1	2		3
<b>CO</b>						<b>2</b>	<b>2</b>	<b>2</b>				<b>1</b>	<b>2</b>		<b>2</b>

## HYDROLOGY AND IRRIGATION ENGINEERING

Course Code	L-T-P-S (Hrs/week)	Credits	CIE Marks	SEE Marks	SEE Duration	Total Lecture Hours
<b>22ESC372</b>	<b>3-0-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>40</b>

**Prerequisites:**

Basic Physics , Environmental Science

**Course Objectives:**

This course will enable students to

- Understand the concept of hydrology, hydrologic cycle and its components.
- Determine the losses occurs from precipitation
- Provide knowledge about the stream flow and use concept of unit hydrograph.
- Provide the knowledge about irrigation, soil-water-crop relationship especially for Indian conditions.
- Determine the reservoir capacity and design canals based on the water requirement of various crops.

### Syllabus

#### Module – 1

**Hydrology:** Introduction, Importance of hydrology, Global distribution of water and Indian water availability, Practical application of hydrology, Hydrologic cycle (Horton’s representation). Water budget equation.

**Precipitation:** Introduction, forms of precipitation, types of precipitation, measurement of precipitation, methods of computing average rainfall, interpolation of missing data, adjustment of missing data by double mass curve method. Hyetograph and mass curve of rainfall. (Theory and Problems).

**[8 Hours]**

#### Module – 2

**Losses from Precipitation:**

**Evaporation:** Definition, factors affecting, measurement (Class A pan). Estimation using empirical methods (Meyer’s and Rohwer’s equation), evaporation control.

**Evapo-transpiration:** Definition, factors affecting, measurement & estimation (Blaney criddle method).

**Infiltration:** Definition, factors affecting, measurement (double ring infiltrometer), infiltration indices, Horton’s equation of infiltration. (Theory and Problems).

**[8 Hours]**

#### Module – 3

**Stream Flow:** Stream – classification of stream, stream gauging, measurement of discharge, stage-discharge relations.

**Hydrograph** – Definition, Factors affecting flood hydrograph, Components of a hydrograph, Base flow separation, Effective rainfall, Unit Hydrograph- Definition, Assumptions and Limitations of Unit hydrograph, Derivation of units of hydrograph, Unit hydrograph from simple storms, Unit hydrograph of different durations , S - Curve method.

[8 Hours]

#### Module – 4

**Irrigation Engineering:** Introduction, need for irrigation, advantages and disadvantages of irrigation, environmental impacts of irrigation, Systems of irrigation, infiltration galleries, sewage irrigation and supplemental irrigation. Indian soils, functions of irrigation soils, maintaining soil fertility, soil-water-plant relationship, soil-moisture. Irrigation relationship, Definition of gross command area, cultural command area, intensity of irrigation, time factor, crop factor.

[8 Hours]

#### Module – 5

**Water Requirement of Crops and Design of Canals:** Introduction, definitions, crop seasons of India, water requirement of a crop, duty, delta, base period, Consumptive use, Irrigation efficiencies, Assessment of irrigation water. frequency of irrigation

**Reservoirs and Canals:** Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam. Definition and types of canals, Alignment of canals, Design of canals by Kenedy's and Lacey's methods.

[8 Hours]

#### Course Outcomes:

Students will be able to

- Understand the concept of hydrology and components of hydrologic cycle such as precipitation, infiltration, evaporation and transpiration.
- Utilize the Technique to measure the Quantify runoff and use concept of unit hydrograph.
- Gain basic knowledge about irrigation and irrigation system in Indian context and Formulate and analyze the relationship between soil-water-crop
- Design canals and canal network based on the water requirement of various crops.
- Determine the capacity of reservoir.

#### Text Books:

1. Subramanya K: "Hydrology", Tata McGraw Hill Co., New Delhi, ISBN: 9781259029974.
2. Madan Mohan Das, Mim Mohan Das: "Hydrology", PHI Learning Private Ltd., New Delhi, 2009, ISBN: 9788120337077.
3. Jayarami Reddy: "A Text Book of Hydrology", Lakshmi Publications, New Delhi, ISBN: 9788170080992.



**Reference Books:**

1. Ven Te Chow: "Handbook of applied hydrology", McGraw Hill Book company 1964, ISBN: 978-0070107748.
2. S. K. Garg: "Irrigation Engineering and Hydraulic structures", Khanna Publication, New Delhi, ISBN: 978-8174090478.
3. P.N.Modi: "Irrigation, Water Resources and Water Power Engineering", Standard Book house, New Delhi, ISBN: 978-8189401290.
4. R.K.Sharma: "Hydrology and Water Resources Engineering", New Delhi, ISBN: EBK0019826.
5. H.M. Raghunath, "Hydrology", Wiley Eastern Publication, New Delhi

**E-Resources**

1. <http://nptel.ac.in/downloads/105105110/>
2. <http://nptel.ac.in/courses/105103213>
3. <https://easyengineering.net/water-resources-and-irrigation>
4. <http://www.vtulive.com/downloads/download/civil-v-hydrology-and-irrigation-engineering-notes-pdf/>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2				2	1		1			1	1		3
CO2	2	2				2	1		1			1	1	1	3
CO3	2	3				2	1		1			1	1	1	1
CO4	2	2				3	1		1			1	1	1	3
CO5	2	3				2	1		1			1	1	1	2
C	2.2	2.4				2.2	1		1			1	1	1	2.4

<b>SUSTAINABLE DESIGN CONCEPT FOR BUILDING SERVICES</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs./week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22ESC373</b>	<b>3-0-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3hours</b>	<b>40hr</b>
<b>Course Objectives:</b>						
This course will enable students						
<ol style="list-style-type: none"> <li>1. To facilitate learners to understand sustainable building designs and its parameters such as energy and water efficiency, Comfort in buildings, and waste management.</li> <li>2. To expose the learners to shading systems, thermal and visual comfort.</li> <li>3. To impart fundamental knowledge on Life cycle assessment and Green ratings and Certifications.</li> </ol>						
<b>Syllabus</b>						
<b>Module-I</b>						
<p><b>Introduction to Sustainability and Climatology:</b> Overview of Sustainability – Global energy scenario, carbon footprint and climate action, Net zero in carbon offsetting, Water neutral, Sustainable construction and resource management. Green buildings - Selection of site – preservation and planning, Influence of climate on buildings, Basics of climatology, Earth–Sun relationship, Solar angles and sun path diagram, Design of shading systems.</p>						
<b>[8 Hrs]</b>						
<b>Module-II</b>						
<p><b>Comfort in Buildings:</b> Thermal comfort – Basics of Thermodynamics, Convection/radiation heat transfer, Heat gain through various elements of a building, Thermal comfort models and case studies Acoustics – Building acoustics, measures, defects and prevention of sound transmission Indoor Air Quality – Effects, design consideration and integrated approach for IAQ management Visual comfort – Enhancement strategies for Day lighting and Artificial.</p>						
<b>[8 Hrs]</b>						
<b>Module-III</b>						
<p><b>Energy, water efficiency and waste management in buildings:</b> Energy efficiency – Energy efficiency in building envelope and energy-efficient HVAC and Lighting as per Energy Conservation Building Code (ECBC) 2017, Energy simulation, Energy management system – Renewable energy and Energy Audit. Water Efficiency – Planning and design of water management system, Rain water harvesting, Water efficient design and fixtures, Treatment and reuse and Water efficient landscape system. Waste management – Types of waste and its treatment methods, Construction and demolition waste management, Waste management in residential, commercial buildings, healthcare facilities.</p>						
<b>[10 Hrs]</b>						
<b>Module-IV</b>						
<p><b>Sustainable rating systems:</b> Green building rating systems- LEED, BREEAM and others,</p> <p>Indian Green building rating systems – IGBC &amp; GRIHA. IGBC criteria for certification –siteselection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits.</p>						
<b>[7 Hrs]</b>						
<b>Module-V</b>						

**Sustainable rating systems:** Green building rating systems- LEED, BREEAM and others, Indian Green building rating systems – IGBC & GRIHA. IGBC criteria for certification –site selection credits, pre-design credits, detailed design credits, pre-construction credits, construction credits, post construction credits.

[7 Hrs]

**Course Outcomes:**

1. Comprehend sustainable design, climatology, shading systems and analyze heat transfer mechanisms in buildings.
2. Assess the design considerations and parameters for thermal comfort, visual comfort, indoor air quality and acoustics.
3. Develop solutions for energy efficiency, water efficiency and waste management in buildings.
4. Adopt green project management methodology and evaluate building life cycle assessment.
5. Implement green practices during the construction and operation phase of the buildings for achieving green rating.

**Text Books:**

1. HarharaIyer G, Green Building Fundamentals, Notion Press
2. Dr. Adv. HarshulSavla, Green Building: Principles & Practices
3. IGBC Green new building rating system - version 3.0 - Abridged reference guide

**Reference Books:**

1. The Sustainable Habitat Handbook (6 Volume Set), GRIHA Version 2019
2. National Building Code – 2016, Volume 1&2, Bureau of Indian Standards
3. Energy Conservation Building Code – 2017 (with amendments up to 2020), Bureau of Energy Efficiency

**E-Resources**

E-learning content on L&T Edu Tech Platform.

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	-	-	-	-	-	2	3	2	-	2	-	1	3	1	2
<b>CO2</b>	1	-	-	1	-	2	3	2	-	2	-	1	2	2	3
<b>CO3</b>	-	-	-	1	-	1	2	2	-	-	-	1	2	-	2
<b>CO4</b>	1	-	-	1	-	3	3	3	-	2	-	1	3	2	1
<b>CO5</b>	2	-	-	-	-	1	3	2	-	-	-	1	3	1	2
<b>CO</b>	<b>1.33</b>			<b>1</b>		<b>1.8</b>	<b>2.8</b>	<b>2.2</b>		<b>2</b>		<b>1</b>	<b>2.6</b>	<b>1.5</b>	<b>2</b>

<b>FIRE SAFETY IN BUILDINGS</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs./week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
<b>22ESC374</b>	<b>3-0-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3hrs</b>	<b>40</b>
<b>Prerequisites:</b>						
Basic concept of building Components						
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>• To understand the importance of fire safety</li> <li>• To learn various techniques involved in fire safety</li> <li>• To design fire resistant buildings using proper materials and methods</li> </ul>						
<b>Module 1</b>						
Fire: Introduction, Basic concepts of fire protection, Fire as a process of combustion, planning for fire protection, fire resistance Ventilation and fuel controlled fire, process of combustion: flash over condition, effect of fire on construction material, design of fire resistance steel structure, concrete structure						
<b>Module 2</b>						
Fire safety: urban planning, escape and refuge, internal planning, detection and suppression Introduction to lift design, design of lift system, expected stop and floor of reversal, different cases, simulation, arrangements and escalators						
<b>Module 3</b>						
Introduction to flow system: water supply, constant demand, variable demand and diversity factor, control systems Flow in pipe networks and fixture units, design of water supply distribution system, flow in waste water pipes.						
<b>Module 4</b>						
Introduction to HVAC: governing equations to HVAC process, numerical problem on HVAC system, psychometric chart, equation based approach Electrical systems: design of electrical systems, intelligent building, life cycle cost and basics of building maintenance, stages of maintenance management, planning for building maintenance, periodicity of maintenance management, estimation of repair cycle, cost profile of maintenance, lamp replacement, building inspection, planned and Ad-hoc maintenance						
<b>Module 5</b>						
Condition survey and health evaluation of buildings, diagnosis of building by visual survey, case studies of visual survey, effect of corrosion and alkali aggregate reaction, sampling and choice of test location Non-destructive testing, core strength test, carbonation and chloride measurement, electrical method of progress measurement Repair, rehabilitation, retrofit, periodicity and economics of condition survey, interpretation of test results						
<b>Course outcomes</b>						
At the end of the course, the student will be able to :						
1. Understand types of fire, combustion process and fire resistance						
2. Plan for fire safety and design of lifts						
3. Design flow network in buildings						

4. Design of electrical systems and maintenance
5. Perform health evaluation of buildings and suggest remedies

**Text Books**

1. J A Purkiss, Fire Safety Engineering: Design of Structures, ISBN 13 978-8131220085, Elsevier, 2009
2. V K Jain, Fire Safety in Buildings, ISBN-13 978-938980219, New Age International Private Limited; Third edition, 2020
3. Markus,T.A. & Morris, E.N., "BUILDING CLIMATE AND ENERGY" Pitman publishing limited. 1980.
4. Croome,J.D .& Roberts,B.M., "AIR CONDITIONING AND VENTILATION OF BUILDINGS, VOL-1".Pergamon press.
5. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989.
- 6.SP-35 (1987): Handbook of Water supply & drainage-BIS
7. N.B.C.-2007 BIS

**Reference Books**

1. An introduction to fire dynamics -D.DRYSDALE
2. Structural fire protection Edt by T.T.LIE
3. Elevator technology - G.C.BARNEY
4. HEATING VENTILATING AND AIR CONDITIONING Analysis and Design - Faye C. McQuiston and Jerald D. Parker.
5. Building Maintenance Management-R.LEE
6. Developments In Building Maintenance -I.EJ. GIBSON
7. Concrete Structures: materials, Maintenance And Repair D.CAMPBELL,ALLEN & H.ROPER

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- Assignment students: A case study of fire hazard in building and restoration procedure Adopted

**Web links and Video Lectures (e-Resources):**

- <https://archive.nptel.ac.in/courses/105/102/105102176/>

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1						2					1		2	
CO2	2		2				2					1		2	
CO3	3		3				2					1		2	
CO4	2		2				2					1		2	
CO5	1		2				2					1		2	
CO	1.8		2.25				2					1		2	

<b>BUILDING SERVICES</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Hours</b>
22AEC38A	1-0-0-0	1	50	50	3 hours	15 Hours
<b>Prerequisites:</b>						
<b>Building planning, building materials</b>						
<b>Course Objectives:</b>						
Students will be able						
1.To understand different types of services provided in the building						
2. To gain knowledge about the building services and layout as per the building.						
3. To learn about the various methods of maintenance in construction industry.						
<b>Syllabus</b>						
<b>Module – 1</b>						<b>[3 hours]</b>
<b>Introduction to Building Services.</b> Definition of building services. Classification of building services. Introduction to Fire and Life safety: causes of fire, fire classification of buildings, fire water storage requirements, fire control room and code of practices.						
<b>Module – 2</b>						<b>[3 hours]</b>
<b>Electrical services in the building,</b> Technical terms and symbols for electrical installations, electrical layout of building (ex- residence, small work shop, show room, school building) and Type of cold and hot water systems.						
<b>Module – 3</b>						<b>[3 hours]</b>
<b>Lifts and Escalators</b> –Definition and types of lifts and escalators, location and sizes as per NBC 2005, different type of conveyors.						
<b>Module – 4</b>						<b>[3 hours]</b>
<b>Need for maintenance-</b> objectives, types of maintenance, factors influencing maintenance, Agencies causing deterioration.						
<b>Module – 5</b>						<b>[3 hours]</b>
<b>Building Maintenance-</b> common building defects and their Symptoms (identifying the cracks in structures), preventive and remedial measures for defects in building components, developing a repair budget.						
<b>Course Outcomes:</b>						
On completion of this course, students are able to						
1. Manage the building services provisions in big construction sites.						
2. Select the suitable electrical as well mechanical services for the given requirements of structures.						
3. Synchronize the construction activities with installation of building services						
4. Choose the appropriate type of maintenance depending upon necessity and requisite budget.						
<b>Text Books:</b>						
1. S. M. Patil “Building Services” Seema Publication, Mumbai Revised second edition. ISBN no : 8175259805						
2. R. Udaykumar “Building Services” „Eswar Press -Chennai , ISBN NO-9788178740638						
3. NBC” Relevant Parts: BIS New Delhi,ISBN NO-81-7061-026-5						
<b>Reference Books:</b>						
1. Jain V K,” Services in Building Complex and High Rise Buildings”, Khanna Publishers, ISBN NO-. 978-81-7409-245-8						
2. Current literature”						

**E-Resources**

- <http://civildigital.com/pavement-design-road-construction-design-parameters/><http://civildigital.com/pavement-design-examples/>

**Online Courses and Video Lectures**

NPTEL/SWAYAM

	PO1	PO2	PO3	PO4	PO5	PO6	PO17	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2		2				1			3
CO2								2				1	1		
CO3						3		2				1			2
CO4						2	1					1			
CO5															
CO						2.3	1	2				1	1		2.5

PHYSICAL EDUCATION (SPORTS & ATHLETICS) – I					
<b>Course Code</b>	:	<b>22PE39</b>	<b>CIE</b>	:	<b>100 Marks</b>
<b>Credits: L:T:P</b>	:	0:0:1			
<b>Total Hours</b>	:	30 P			
<b>Course Outcomes:</b> At the end of the course, the student will be able to					
<ol style="list-style-type: none"> <li>1. Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness</li> <li>2. Familiarization of health-related Exercises, Sports for overall growth and development</li> <li>3. Create a foundation for the professionals in Physical Education and Sports</li> <li>4. Participate in the competition at regional/state / national / international levels.</li> <li>5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.</li> </ol>					
<b>Module I : Orientation</b>				<b>5 Hours</b>	
<ol style="list-style-type: none"> <li>A. Lifestyle</li> <li>B. Fitness</li> <li>C. Food &amp; Nutrition</li> <li>D. Health &amp; Wellness</li> <li>E. Pre-Fitness test.</li> </ol>					
<b>Module II : General Fitness &amp; Components of Fitness</b>				<b>15 Hours</b>	
<ol style="list-style-type: none"> <li>A. Warming up (Free Hand exercises)</li> <li>B. Strength – Push-up / Pull-ups</li> <li>C. Speed – 30 Mtr Dash</li> <li>D. Agility – Shuttle Run</li> <li>E. Flexibility – Sit and Reach</li> <li>F. Cardiovascular Endurance – Harvard step Test</li> </ol>					
<b>Module III : Recreational Activities</b>				<b>10 Hours</b>	
<ol style="list-style-type: none"> <li>A. Postural deformities.</li> <li>B. Stress management.</li> <li>C. Aerobics.</li> <li>D. Traditional Games.</li> </ol>					

**Scheme and Assessment for auditing the course and Grades:**

<b>Sl. No.</b>	<b>Activity</b>	<b>Marks</b>
<b>1.</b>	Participation of student in all the modules	20
<b>2.</b>	Quizzes – 2, each of 15 marks	30
<b>3.</b>	Final presentation / exhibition / Participation in competitions/ practical on specific tasks assigned to the students	50
<b>Total</b>		<b>100</b>



# IV SEM

STRUCTURAL ANALYSIS						
Course Code	L-T-P-S (Hrs/week)	Credits	CIE Marks	SEE Marks	SEE Duration	Total Hours
22CVT41	2-2-0-0	3	50	50	3 hours	50
<b>Prerequisites:</b>						
Basic concepts of physics and mathematics. Analysis of forces systems with different structures.						
<b>Course Objectives:</b>						
Course objectives: This course will enable students						
1. To determine slope and deflections in beams and trusses.						
2. To analyze arches and cable structures.						
3. To analyze different structural systems and interpret data using slope deflection method. 4. To apply matrix operations in analyzing structures.						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>Structural Systems and Deflection of beams</b> - Conditions of equilibrium, degrees of redundancy, degrees of freedom, determinate and indeterminate structures, Linear and non- linear structural systems.						
<b>Arches and Cables:</b> Introduction, Three-hinged circular and parabolic arches with supports at the same and different levels; Determination of normal thrust, radial shear and bending moment; Analysis of cables under point loads and UDL; Length of cables with supports at the same and different levels; Stiffening trusses for suspension cables. <b>(08 + 02hours)</b>						
<b>Module – 2</b>						
Deflection of beams: Moment area method and conjugate beam method, the first theorem of Castigliano, Betti's law						
<b>Three moment theorem – Continuous and Fixed beams with and without sinking supports</b> <b>(08 + 02 hours)</b>						
<b>Module – 3</b>						
Clark Maxwell's Theorem of reciprocal deflection, strain energy method and unit load method. Redundant Structures						
<b>The Second Theorem of Castigliano</b> , Consistent deformation method, slope deflection method <b>(08+02 hours)</b>						
<b>Module – 4</b>						
<b>Energy Principles and Energy Theorems:</b> Definition, Strain, Bending and Shear, Theorem of minimum Potential energy, Principle of virtual displacements; Principle of virtual forces, Strain energy and complementary energy; Strain energy due to axial force, bending shear and torsion; Deflection of determinate beams and trusses using total strain energy. <b>(08+02 hours)</b>						
<b>Module – 5</b>						
<b>Matrix Methods of Structural Analysis:</b> Definition of stiffness and flexibility methods, comparison to classical methods						
<b>Stiffness Method:</b> Stiffness matrix, Analysis of continuous beams and plane trusses using system approach; Analysis of simple plane frames using system approach with kinematic indeterminacy up to 3. <b>(08+02 hours)</b>						
<b>Course Outcomes:</b> An ability to						
At the end of the course the student will be able to :						
1. To analyse the behaviour of structures for displacement responses.						
2. Analyse arches and cables for stress resultants.						



PUBLIC HEALTH ENGINEERING (IC)						
CourseCode	L-T-P-S (Hrs/week)	Credits	CIE Marks	SEE Marks	SEE Duration	Total Hours
22CVI42	2-2-2-0	4	50	50	3 hours	50 Hours
<b>Prerequisites:</b>						
Basic knowledge of water cycle, water resources, pollutants.						
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>To analyse the variation of water demand and to estimate water requirement for a community.</li> <li>To study the drinking water quality standards and to illustrate qualitative analysis of water.</li> <li>To understand and design of different unit operations and unit process involved in water treatment process.</li> </ul>						
<b>Syllabus</b>						
<b>Module – 1</b>						
<p><b>Demand of Water:</b> Water: Need for protected water supply, Demand of Water: Types of water demands - domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor.</p> <p><b>Design period:</b> factors governing the design periods, population forecasting, different methods with merits and demerits, Numerical Problems on different population forecasting methods. <span style="float: right;">(8L+2T)</span></p>						
<b>Module – 2</b>						
<p><b>Sources and Collection of Water:</b> Surface and Subsurface Sources – With regard to quality and Quantity. Intake structures - types of intakes –Factors to be considered in selection of intake structures.</p> <p><b>Water quality Characteristics:</b> Sampling objectives, significance and techniques, Methods, Preservation techniques. Physical, chemical and biological characteristics of water. Drinking water quality standards as per BIS and WHO guidelines. <span style="float: right;">(8L+2T)</span></p>						
<b>Module – 3</b>						
<p><b>Purification of Water:</b> Objectives, unit operations and unit processes, Treatment Flow chart – Significance of each unit. Screening, Types of screens, design, Sedimentation -theory, settling tanks, types, design.</p> <p><b>Coagulation:</b> Different types of coagulants (Optimisation of coagulant to be carried out in the laboratory), sedimentation aided with coagulation, chemical feeding, flash mixing, Flocculation. Optimum dosage of coagulant – Jar test apparatus (Analysis to be conducted in laboratory session). <span style="float: right;">(8L+2T)</span></p>						
<b>Module – 4</b>						
<p><b>Filtration:</b> Mechanism -theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning. Operational problems in filters. Design of slow and rapid sand filter without under drainage system.</p> <p><b>Disinfection and Water softening:</b> Methods of disinfection with merits and demerits, Chlorination, types of chlorination (Analysis to be conducted in laboratory session for Breakpoint chlorination). Numerical problems, Water Softening: Lime soda and Zeolite process. <span style="float: right;">(8L+2T)</span></p>						

### Module – 5

**Sanitation:** Need for sanitation, methods of sewage disposal, types of sewerage systems, conservancy, public latrine, concept of Eco – Sanitation, trenching and composting methods, two pit latrines, aqua privy, septic tank, soak pit.

**Water borne and Communicable diseases:** Different types of water borne diseases, general methods of control. Communicable diseases: terminologies, methods of transmission, general methods of control.

[8L + 2T]

### List of Experiments

#### Experiments to be carried out are:

1. Determination of pH, Conductivity and Turbidity.
2. Determination of Acidity and Alkanity.
3. Determination of Calcium, magnesium and Total hardness.
4. Determination of solids in sewage
5. i) Total solids, ii) suspended solids, iii) Dissolved solids iv) Volatile solids, fixed solids and v) settle able solids.
6. Determination of Chlorides.
7. Determination of Dissolved Oxygen.
8. Determination of Biochemical Oxygen Demand.
9. Determination of Chemical Oxygen Demand.
10. Determination of percentage of available chlorine, Residual Chlorine and Chlorine demand.
11. Determination of Optimum dosage of coagulant using Jar test apparatus.
12. Determination of phosphates, Nitrates, Iron and Manganese using spectrophotometer.
13. Air Quality Monitoring (Ambient, Stack Monitoring, Indoor Air Pollution) Demonstration.

#### Course Outcomes: An ability to

- Understand the different types of water demand and design period.
- Estimate future population by different population forecasting methods.
- Evaluate water quality and environmental significance of various water quality parameters with respect to public health and safety and suggest suitable water treatment systems.
- Design the different units of water treatment plant.
- Achieve knowledge on sanitation and different types of communicable diseases.
- Acquire capability to conduct experiments and estimate the concentration of different pollution parameters and compare the obtained results with the concerned guidelines and regulations.

#### Text Books:

- S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi 2010
- B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering, Laxmi Publications (P) Ltd., New Delhi 2010.
- B C Punmia, “Environmental Engineering vol-II”, Laxmi Publications 2nd, 2016
- Karia G.L., and Christian R.A, “Wastewater Treatment Concepts and Design Approach”, Prentice Hall of India Pvt. Ltd., New Delhi. 3rd, Edition, 2017
- S.K.Garg, “Environmental Engineering vol-II, Water supply Engineering”, Khanna Publishers, – New Delhi, 28th edition and 2017

- Howard S. Peavy, Donald R. Rowe, George T, “Environmental Engineering” - Tata McGraw Hill, New York, Indian Edition, 2013.

**Reference Books:**

- CPHEEO Manual on water supply and treatment engineering, Ministry of Urban Development, Government of India, New Delhi.
- Mark.J Hammer, Water & Waste Water Technology, John Wiley & Sons Inc., New York, 2008.

**E-Resources**

- <https://nptel.ac.in/courses/105105178>
- <https://nptel.ac.in/courses/105106119>

**Online Courses and Video Lectures**

- <https://nptel.ac.in/courses/105105178>
- <https://nptel.ac.in/courses/105106119>

POs & PSOs															
PO'S CO'S	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012	PS01	PS02	PS03
CO1															
CO2	1														
CO3	1	2	3			3	3	3				3			2
CO4			3					2							3
CO5						2	2								2
CO6	1	3	3			3	3	3	3	3		3			3
CO	1	2.5	3			2.66	2.66	2.66	3	3		3			2.5

FLUID MECHANICS AND MACHINERY (IC)						
Course Code	L-T-P-S (Hrs/ week)	Credits	CIE Marks	SEE Marks	SEE Duration	Total Hours
22CVI43	2-2-2-0	4	50	50	3 hours	50 Hours
<b>Prerequisites:</b>						
Basic concepts of Engineering Mechanics, Force systems. Knowledge about fluids and hydraulic Machines.						
<b>Course Objectives:</b>						
This course will enable students						
1.To gain knowledge on basic principles of fluid mechanics, hydrostatics, hydrodynamics, hydraulic machines						
2. To understand the applications of these principles to Civil Engineering.						
3. To enable to solve problems associated with pipe flow and open channel flow.						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>FLUIDS &amp; PROPERTIES</b> : Definition of fluid and their properties, Fluid pressure measurements, Newton’s law of viscosity(problems), Newtonian & non-Newtonian fluids, ideal & real fluids , Pascal’s law, Measurement of pressure using manometer (Simple & Differential manometers).						
<b>HYDROSTATICS</b> : Total pressure and center of pressure on vertical and inclined plane surfaces (problems), Pressure diagram..						
<b>(6L+2T)</b>						
<b>Module – 2</b>						
<b>KINEMATIC</b> : Types of fluid flow, continuity equation in Cartesian coordinates, flow nets, Classification of fluid flow, Stream line, Streak line, Path line, Stream tube.						
<b>DYNAMICS</b> : Euler’s equation of motion, Bernoulli’s equation, Application-Venturimeter, Orifice meter, Pitot tube.						
<b>(6L+2T)</b>						
<b>Module – 3</b>						
<b>FLOW MEASUREMENT</b> : Concept of Venturimeter, Orifimeter, Classification of orifice and mouth piece, Hydraulic coefficients, Discharge over Rectangular, Triangular and Cipoletti notch.						
<b>FLOW THROUGH PIPES</b> : Major and minor losses, pipes in series and parallel, Darcy-Weisbach Equation, Hydraulic Gradient Line, Total energy line. (Numerical problems).						
<b>(6L+2T)</b>						
<b>Module – 4</b>						
<b>FLOW IN OPEN CHANNELS</b> : Classification of Flow through channels, Most economical channel sections: Rectangular, Triangular, trapezoidal (Uniform flow) - derivations.						
<b>IMPACT OF JET ON VANES</b> : Force exerted by a jet of water on fixed plates- vertical, inclined, symmetrical curved plates.						
<b>(6L+2T)</b>						
<b>Module – 5</b>						
<b>CENTRIFUGAL PUMPS</b> : Definition and classification Centrifugal pumps, Work done and efficiency, Multi stage pumps, Pumps in series and parallel.						
<b>TURBINES</b> : Definition and classification turbines, Pelton wheel and components, Velocitytriangle, Reaction turbine-Francis turbine, Working proportions.						
<b>(6L+2T)</b>						

### List of Experiments

1. Verification of Bernoulli's Equation.
2. Determination of Coefficient of discharge through Venturimeter and Orificemeter.
3. Determination of Major losses in pipes.
4. Determination of Coefficient of discharge through Venturiflume.
5. Calibration of Triangular notch, Rectangular notch.
6. Determination of Coefficient of discharge for Broad crested weir.
7. Determination of force exerted by a jet on flat and curved vanes.
8. Determination of efficiency of centrifugal pump.
9. Determination of efficiency of Pelton wheel turbine.
10. Determination of efficiency of Kaplan or Francis turbine

### Course Outcomes:

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

1. Understand fundamental properties of fluids and solve problems on Hydrostatics
2. Identify fundamental kinematics, dynamics of a fluid element and calculate discharge through pipes, irrigation channels and water supply pipe lines .
3. Measure the loss of head in pipes and channels.
4. Compute discharge through pipes, notches, weirs and open channels of various cross sections
5. Differentiate between different type of water pumps, turbines and understand their operation characteristics

### Text Books:

- P.N.Modi and S.M.Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House, New Delhi , 20<sup>th</sup> Edition, 2015, ISBN 9788189401269.
- K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGrawhill, New Delhi, 1<sup>st</sup> edition May 23, 2013, ISBN-13:978-1259006845.
- R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications ,New Delhi , 2010, ISBN:9788131808153.
- S.K. Som, G. Biswas and S. Chakraborty, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw Hill Publications, 3<sup>rd</sup> edition, 2011, ISBN: 9780071329194.

### Reference Books:

- Victor L. Streeter, Benjamin Wylie E and Keith W. Bedford- Fluid Mechanics ,Tata McGraw Hill publishing Co Ltd,New Delhi.
- J.F.Douglas,J .M .Gasoreik, John Warfield ,Lynne Jack – Fluid Mechanics ,Pearson ,Fifth edition.
- C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, "Fluid Mechanics and ISBN: 9780195699630.
- S.K SOM and G.Biswas – " introduction to Fluid Mechanics and Fluid Machines, TataMcgraw Hill, New Delhi, 3<sup>rd</sup> edition, 2011, ISBN: 9780071329194.

### E-Resources

- <https://searchworks.stanford.edu/view/10496310>
- <https://searchworks.stanford.edu/view/13576277>
- <https://searchworks.stanford.edu/view/11842972>
- <http://elearning.vtu.ac.in/10CV35>

### Online Courses and Video Lectures

- <http://nptel.ac.in/courses/105103192>



<b>POs &amp; PSOs</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2										1	3	2	
<b>CO2</b>	3	2	1						2			1	3		
<b>CO3</b>	3	2	1						2				1		
<b>CO4</b>	3	2	1						2				1		
<b>CO5</b>	3	2	1						2				2		
<b>C</b>	3	2	1						2			1	2	2	

## BUILDING CONSTRUCTION AND PLANNING LAB

Course Code	L-T-P-S (Hrs/ week)	Credits	Exam marks	Exam Duration	Course Type
22CVL44	2-0-0-0	1	50:50	3 hours	PCC

### Prerequisites:

Students should know to identify different types of various components of building.

### Course Objectives:

To enable students

1. To gain skill set to prepare computer aided engineering drawings
2. To Visualize the various components of a building
3. To know the details of construction based on the engineering drawings.
4. To understand the details of construction of different building elements.

### List of Experiments

1. Simple Engineering Drawings with CAD Tools.
2. Drawing plan, elevation and sectional elevation using CAD software for Single storey residential building.
3. Drawing plan, elevation and sectional elevation using CAD software for Double storey residential building.
4. Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for Hostel building.
5. Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for Hospital building.
6. Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for School building.
7. Three-Dimensional Drawing of plan, elevation and sectional elevation including using CAD software for Double storey residential building.
8. Three-Dimensional Drawing of plan, elevation and sectional elevation CAD software for Three storey residential building.

### Course Outcomes:

During the course of study students will develop understanding of:

- Prepare, read and interpret the drawings in a professional set up.
- Develop drawings from given line diagram.
- Know the procedures of submission of drawings and Develop working and submission drawings for building.
- Prepare Service layouts.
- Plan and design of residential or public building as per the given requirements.

### Text Books:

- MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/Computech Publication Pvt Ltd

### Reference Books:

- "A Course in Civil Engineering Drawing", by V. B. Sikka, S. K. Kataria & Sons.
- Time Saver Standard by Dodge F. W., F. W. Dodge Corp.,
- IS:962- Code of practice for architecture and building drawing National Building code,
- BIS, New Delhi



<b>CONCRETE TECHNOLOGY</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Lecture Hours</b>
<b>22ESC45</b>	<b>2-2-0-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>40 Hours</b>
<b>Prerequisites:</b>						
Basic knowledge on construction materials and technology.						
<b>Course Objectives:</b>						
<ul style="list-style-type: none"> <li>• Outline the manufacturing and types of cement and concrete and its application.</li> <li>• Assess the methods of measuring properties of concrete</li> <li>• Describe various strengths of concretes and enhancing the properties of concrete using admixture</li> <li>• Analyze the methods of mix proportion and importance of ready-mix concrete</li> <li>• Classify various special concrete depending on their application.</li> </ul>						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>Concrete Ingredients Cement –</b>						
Cement manufacturing process, steps to reduce carbon footprint, chemical composition and their importance, hydration of cement, types of cement. Testing of cement. 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 aggregates Water – qualities of water. Chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Mineral admixtures – Pozzolan and cementitious materials, Fly ash, GGBS, silica fumes, Metakaolin and rice husk ash.						
<b>[8 hours]</b>						
<b>Module – 2</b>						
<b>Fresh Concrete Workability-</b>						
Factors affecting workability. Measurement of workability–slump, Compaction factor and Vee-Bee Consistometer tests, flow tests. Segregation and bleeding. Process of manufacturing of concrete- Batching, Mixing, Transporting, Placing and Compaction.						
Curing – Methods of curing – Water curing, membrane curing, steam curing, accelerated curing, self-curing. Good and Bad practices of making and using fresh concrete and Effect of heat of hydration during mass concreting at project sites.						
<b>[8 hours]</b>						
<b>Module – 3</b>						
<b>Hardened Concrete Factors</b>						
Influencing strength, W/C ratio, gel/space ratio, Maturity concept, Testing of hardened concrete, Creep – factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage, Factors affecting shrinkage. Definition and significance of durability. Internal and external factors influencing durability.						
Mechanisms- Sulphate attack – chloride attack, carbonation, freezing and thawing. Corrosion, Durability requirements as per IS-456, In situ testing of concrete- Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.						
<b>[8 hours]</b>						

#### Module – 4

##### Concrete Mix Proportioning

Concept of Mix Design with and without admixtures, variables in proportioning and Exposure conditions, Selection criteria of ingredients used for mix design, Procedure of mix proportioning. Numerical Examples of Mix Proportioning using IS-10262:2019.

[8 hours]

#### Module – 5

##### Special Concretes

RMC- Requirements, properties, advantages and disadvantages. Self- Compacting concrete- concept, materials, tests, properties, application and typical mix Fiber reinforced concrete - Fibers types, properties, application of FRC. Light weight concrete-material properties and types. Typical light weight concrete mix and applications, materials, requirements, mix proportion and properties of Geo polymer Concrete, High Strength Concrete and High Performance Concrete.

[8 hours]

##### Course Outcomes:

- Relate material characteristics on the properties of concrete.
- Recognize the rheological properties of concrete.
- Understand the durability performance of concrete subjected to different exposures.
- Illustrate proportioning of different types of concrete mixes as per BIS.
- Select a suitable type of concrete based on applications.

##### Text Books:

- Neville A.M. “Properties of Concrete”-4th Ed., Longman.
- M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
- Kumar Mehta. P and Paulo J.M. Monteiro “Concrete-Microstructure, Property and Materials”, 4th Edition, McGraw Hill Education, 2014

##### Reference Books:

- M L Gambir, “Concrete Technology”, McGraw Hill Education,2014.
- N. V. Nayak, A. K. Jain Handbook on Advanced Concrete Technology, ISBN: 978-81-8487-186-9
- Job Thomas, “Concrete Technology”, CENGAGE Learning,2015.

##### E-Resources

- <https://archive.nptel.ac.in/courses/105/102/105102012/>

PO'S CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	1						2				2		1	2
CO2	1							3				1		2	3
CO3	3	2					2	3				1	2	3	3
CO4	2							1							1
CO5	2						2						2	1	2
C	2.2	1.5					2.00	2.25				1.33	2	1.75	2.2

<b>EARTH SCIENCES ENGINEERING</b>						
<b>Course Code</b>	<b>L-T-P-S (Hrs/week)</b>	<b>Credits</b>	<b>CIE Marks</b>	<b>SEE Marks</b>	<b>SEE Duration</b>	<b>Total Lecture Hours</b>
<b>22BSC46</b>	<b>2-0-2-0</b>	<b>3</b>	<b>50</b>	<b>50</b>	<b>3 hours</b>	<b>40 Hours</b>
<b>Prerequisites:</b>						
Basics of Geology and Civil Engineering Knowledge						
<b>Course Objectives:</b>						
To make students to learn						
<ul style="list-style-type: none"> <li>• The Principles of Engineering Geology and Properties of Earth resource.</li> <li>• Earth processes and natural hazards.</li> <li>• Natural Building Materials and their properties.</li> <li>• Geological structures and their impact on engineering construction.</li> <li>• Water resource management and conservation.</li> </ul>						
<b>Syllabus</b>						
<b>Module – 1</b>						
<b>INTRODUCTION:</b> Geology and its role in the field of civil engineering. Earth: Its internal structure and composition.						
<b>MINERALOGY :</b> Description and identification of Rock forming minerals and Ores, based on physical and special properties;						
Quartz and its varieties; Feldspar group; Mica group; carbonate group; Hornblende, Olivine, Asbestos, Talc, Gypsum, Garnet, Corundum. Magnetite, Hematite, Limonite, Pyrite, Chalcopyrite, Pyrolusite, Psilomalane, Chromite, Galena, Bauxite.						
<b>(7 Hours)</b>						
<b>Module – 2</b>						
<b>GEOMORPHOLOGY:</b> Epigene and Hypgene geological agents; rock weathering and its types; Soil formation, types, erosion and remedial measures; Geological action of rivers with different drainage patterns; Geological action of wind. Coastal zones, coastal landforms, continental shelf, continental rise, continental slope, abyssal plain, mid-oceanic ridges, trenches, tsunamis. Landslides; causes effects and remedial measures.						
<b>(5 Hours)</b>						
<b>Module – 3</b>						
<b>PETROLOGY:</b> Rocks as fundamental units and building materials of the earth crust and their engineering applications: As building stones, road metals and stones for decoration, pavement, cladding, roofing, flooring, concreting and foundation engineering. Rock Cycle.						
<b>Igneous rocks:</b> Origin, classification (chemical and textural), mode of occurrence; Granite, Gabbro, syenite, Basalt						
<b>Sedimentary Rock:</b> Origin, classification, mode of occurrence Sandstones, Conglomerate, Breccia, Shale, Lime stones and Laterite.						
<b>Metamorphic rocks:</b> Kinds of metamorphism, description of Gneiss, Quartzite, Marble, Slate, Phyllite and Schists.						
<b>( 8 Hours)</b>						
<b>Module – 4</b>						
<b>ROCK MECHANICS AND ENGINEERING GEOLOGY:</b>						
Deformational effects on different rocks; Out crop, Dip, strike and escarpment, Clinometer-compass-Joints, faults, folds and unconformities their effects on civil engineering structures. Earthquakes-seismic waves, seismograph, causes, effects, seismic zones, shield areas and seismic resisting structures.						

Geotechnical investigations for civil engineering projects: Study of toposheets and geological maps, importance of lithological and structural features studies for the construction of Dams, Reservoirs, Tunnels, Bridges and Highways.

(5 Hours)

**Module – 5**

**HYDROGEOLOGY:** Hydrological cycle; distribution of ground water in the earth crust; properties of water bearing geological formation: Aquifers and their types; selection of sites for well locations and spacing of wells; geological, hydrological and geophysical investigations for ground water exploration; artificial recharge of groundwater methods and rainwater harvesting. Sea water intrusion and remedial measures.

(5 Hours)

**Course Outcomes:**

Students will be able to

1. Assess the knowledge of earth and its internal structure.
2. Explain Earth process and its effect on engineering construction.
3. Recognize good building materials and their properties.
4. Identify the earth Structure due to rock deformation and its impact on environment.

Assess the hydrological condition of the Geological terrain.

**Text Books:**

1. Text book of Geology by P.K. Mukerjee, World Press Pvt.Ltd.Kolkatta. ISBN-13 9788187567547
2. Foundations of Engineering Geology, by Tony Waltham (3rdEd.) Universities Press.ISBN 9780415469609
3. Principles of Engineering Geology and Geotechnics by Dimitri P. Krynine and William R. Judd.ISBN 13: 9788123906034
4. Text of Engineering and General Geology by Parbin Singh, Published by S. K. Kataria and Sons, New Delhi. ISBN: 8188458511, 9788188458516.
5. SatyanarayanaSwamy B.S. (1985) Engineering Geology Laboratory Manual, Eurasia Publishing House, New Delhi

**Reference Books:**

1. Rock Mechanics for Engineers by Dr. B. P. Verma, Khanna Publishers, New Delhi.
2. Ground water geology by Todd D.K. John Wiley and Sons, New York.
3. Physical Geology by Arthur Holmes, Thomson Nelson and Sons, London. Ground water assessment, development and management by K. R.

**Online Courses and Video Lectures**

1. <https://nptel.ac.in/courses/105105106>

POs & PSOs															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	2		1									1	3	1
CO2	2	3	1	2									1	3	1
CO3	3	2				1							1	3	1
CO4	2	3	1										2	3	1
CO5	3	2		1			1						1	3	3
C	2.6	2.4	1	1.33		1	1						1.2	3	1.4

## UNIVERSAL HUMAN VALUES

Course Code	L:T:P:S	Credits	Exam marks	Exam Duration	Course Type
22UHV48	0-2-0-0	1	50:50	3	HSMC

### Course Objectives:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- 2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- 3. Strengthening of self-reflection.
- 4. Development of commitment and courage to act.

### Syllabus

#### Module – I

#### **Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

#### Module – II

#### **Understanding Harmony in the Human Being - Harmony in Myself!**

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
11. Understanding the harmony of with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

#### Module – III

#### **Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship



14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self regulation in nature
20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
21. Holistic perception of harmony at all levels of existence. 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 – IV**

22. Natural acceptance of human values
23. Definitiveness of Ethical Human Conduct
24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
26. Case studies of typical holistic technologies, management models and production systems
27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

#### **Course Outcomes:**

This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as "H-102 Universal Human Values 2: Understanding Harmony" is designed which may be covered in their III or IV semester.

During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

#### **Text Books:**

- Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

**Reference Books:**

- JeevanVidya: EkParichaya, ANagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews
- Economy of Permanence - J C Kumarappa
- Bharat Mein Angreji Raj - PanditSunderlal
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)
- Gandhi - Romain Rolland (English)

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