BE SCHEME & SYLLABUS

Second Year
(III and IV Semester)

With effect from 2022-23

Civil Engineering

ST JOSEPH ENGINEERING COLLEGE

AN AUTONOMOUS INSTITUTION

Vamanjoor, Mangaluru - 575028

MOTTO

Service & Excellence

VISION

To be a global premier Institution of professional education and research.

MISSION

- Provide opportunities to deserving students of all communities, the Christian students in particular for quality professional education.
- Design and deliver curricula to meet the national and global changing needs through student-centric learning methodologies.
- Attract, nurture and retain the best faculty and technical manpower.
- Consolidate the state-of-art infrastructure and equipment for teaching and research activities.
- Promote all round personality development of the students through interaction with alumni, academia and industry.
- Strengthen the Educational Social Responsibilities (ESR) of the institution.

ST JOSEPH ENGINEERING COLLEGE

An Autonomous Institution
Vamanjoor, Mangaluru - 575028

Affiliated to VTU – Belagavi & Recognized by AICTE New Delhi
NBA – Accredited: B.E.(CSE,ECE,EEE, ME and CIV) & MBA
NAAC – Accredited with A+

B.E. SCHEME & SYLLABUS
(With effect from 2022-23)

Civil Engineering

SECOND YEAR

(III and IV Semester)

AUTONOMY AND ACCREDITATION

St Joseph Engineering College (SJEC) is an Autonomous Institute under Visvesvaraya Technological University (VTU), Belagavi, Karnataka State, and is recognized by the All-India Council for Technical Education (AICTE), New Delhi. SJEC is registered under the trust "Diocese of Mangalore, Social Action Department".

The SJEC has been conferred Fresh Autonomous Status from the Academic Year 2021-22. The college was granted autonomy by the University Grants Commission (UGC) under the UGC Scheme for Autonomous Colleges 2018 and conferred by VTU. The UGC Expert Team had visited the college on 28-29 November 2021 and rigorously assessed the college on multiple parameters. The fact that only a handful of engineering colleges in the state have attained Autonomous Status adds to the college's credibility that has been on a constant upswing. Autonomy will make it convenient for the college to design curricula by recognizing the needs of the industry, offering elective courses of choice and conducting the continuous assessment of its students.

At SJEC, the Outcome-Based Education (OBE) system has been implemented since 2011. Owing to OBE practised at the college, SJEC has already been accredited by the National Board of Accreditation (NBA). Five of the UG programs, namely Computer Science & Engineering, Mechanical Engineering, Electronics and Communication Engineering, Electrical & Electronics Engineering and Civil Engineering and MBA programs, have accreditation from the NBA.

Also, SJEC has been awarded the prestigious A+ grade by the National Assessment and Accreditation Council (NAAC) for five years. With a Cumulative Grade Point Average (CGPA) of 3.39 on a 4-point scale, SJEC has joined the elite list of colleges accredited with an A+ grade by NAAC in its first cycle. The fact that only a small percentage of the Higher Education Institutions in India have bagged A+ or higher grades by NAAC adds to the college's credibility that has been on a constant upswing.

The college is committed to offering quality education to all its students, and the accreditation by NAAC and NBA reassures this fact. True to its motto of "Service and Excellence", the college's hard work has resulted in getting this recognition, which has endorsed the academic framework and policies that the college has been practising since its inception. The college has been leveraging a flexible choice-based academic model that gives students the freedom to undergo learning in respective disciplines and a transparent and continuous evaluation process that helps in their holistic development.

CONTENTS

ABOUT THE DEPARTMENT

A vibrant Department, established in 2012, aims at contributing graduate engineers equipped for careers in the public and private sectors. The Department is NBA accredited and has got a highly qualified team of faculty members having rich experience within academia and industry. Spacious and well – equipped state-of-the-art-laboratories and computing facilities are the mainstays of the Department. Frequent visits by guest faculty and professionals from academia and industry help in sharing their valuable experiences and keep students abreast with the latest advancements. The Department also offers consultancy and testing services catering to the needs of the public in and around Mangaluru.

DEPARTMENT VISION

To impart technical education and nurture research in Civil Engineering to meet the needs of the society.

DEPARTMENT MISSION

- Deliver curricula for students to meet the local, national and global demands of industry, society and research.
- Strengthen the skills of students through interaction with industry.
- Promote research and consultancy in all aspects of Civil engineering.
- Provide skilled training in emerging aspects of design and construction.
- Develop in students and staff the spirit of innovation and professional ethics.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PE0 1: To impart to students in depth knowledge of Civil Engineering subjects to solve practical problems using modern techniques.

PE0 2: To develop in students the ability to plan, analyze, design and construct structures from the foundation to the superstructure level with cost-effective design methods.

PE0 3: To develop in students the ability for successful careers as entrepreneurs and to pursue research.

PE0 4: To enable in students the ability to identify issues related to the environment and find suitable solutions.

PE0 5: To train students to understand the ethical responsibility of Civil Engineering profession and apply relevant code for engineering practice while delivering service to the nation.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations on complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and the synthesis of information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

Graduates of the Civil Engineering program are able to

PSO1: Explore domain knowledge in order to solve real-time field challenges, and to pursue research in novel areas of Civil Engineering.
PSO2: Qualify in the competitive examinations and succeed in obtaining opportunities in the public and private sectors.

III Semester (B.E. - Civil Engineering)													
SI. No	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	PCC	22CIV31	Strength of Materials	CIV	CIV	2	2	-	03	50	50	100	3
2	IPCC	22CIV32	Building Construction and Material Testing (Integrated Course)	CIV	CIV	3	-	2	03	50	50	100	4
3	IPCC	22CIV33	Fluid Mechanics and Hydraulics (Integrated Course)	CIV	CIV	3	-	2	03	50	50	100	4
4	PCC	22CIV34	Transportation Engineering	CIV	CIV	3	-	-	03	50	50	100	3
5	ESC	22CIV35X	ESC/ETC/PLC	CIV	CIV	3	-	-	03	50	50	100	3
6	PCCL	22CIV36L	Building Planning and Drawing Lab	CIV	CIV	-	-	2	03	50	50	100	1
7	HSMC	22UHV37	Universal Human Values - II	COM	COM	2	-	-	02	50	50	100	2
		22BFE37	Biology for Engineers	COM	COM								
8	AEC/SDC	22IEP38	IoT Enabled Prototyping	COM	COM	-	-	2	02	50	50	100	1
9	MNCC	22ITB39A / 22ITC39B	Industry Oriented Training – Business Etiquettes/ Industry Oriented Training – Computing Skills	COM	COM	-	-	2	02	50	-	50	-
					Total	16	2	10	24	**450**	**400**	**850**	**21**

22CIV35X : Engineering Science Course/Emerging Technology Course/Programming Language Course			
22CIV351	Rural, Urban Planning and Architecture	22CIV353	Occupational Health and Safety
22CIV352	Sustainable Design Concepts and Building Services	22CIV354	Alternate Building Materials

IV Semester (B.E. - Civil Engineering)													
SI. No	**Course and Course Code**		**Course Title**	**Teaching Department**	**Paper Setting Board**	**Teaching Hours/Week**			**Examination**				**Credits**
						Theory Lecture	**Tutorial**	**Practical/ Drawing**	**Duration in hours**	**CIE Marks**	**SEE Marks**	**Total Marks**	
						L	**T**	**P**					
1	PCC	22CIV41	Analysis of Determinate Structures	CIV	CIV	2	2	-	03	50	50	100	3
2	IPCC	22CIV42	Water and Municipal Wastewater Engineering (Integrated Course)	CIV	CIV	3	-	2	03	50	50	100	4
3	IPCC	22CIV43	Engineering Survey Theory and Practice (Integrated Course)	CIV	CIV	3	-	2	03	50	50	100	4
4	PCC	22CIV44	Concrete Technology	CIV	CIV	3	-	-	03	50	50	100	3
5	ESC	22CIV45X	ESC/ETC/PLC	CIV	CIV	3	-	-	03	50	50	100	3
6	PCCL	22CIV46L	Concrete Lab	CIV	CIV	-	-	2	03	50	50	100	1
7	HSMC	22UHV47	Universal Human Values – II	COM	COM	2	-	-	02	50	50	100	2
	HSMC	22BFE47	Biology for Engineers	COM	COM								
8	AEC/SDC	22CTE48	Computational Tools for Engineers	COM	COM	-	-	2	02	50	50	100	1
9	AEC/SDC	22ITB49A / 22ITC49B	Industry Oriented Training – Business Etiquettes/ Industry Oriented Training – Computing Skills	COM	COM	-	-	2	02	50	-	50	-
					Total	16	2	10	24	**450**	**400**	**850**	**21**

22CIV45X : Engineering Science Course/Emerging Technology Course/Programming Language Course			
22CIV451	Building Information Modeling in Architecture, Engineering and Construction (BIM)	22CIV453	Construction Equipment, Plants and Machinery
22CIV452	Remote Sensing and Geographical Information System	22CIV454	Python Programming for Civil Engineering

III Semester

Strength of Materials			
Course Code	**22CIV31**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: This course will enable students.

- To understand the basic concepts of the stresses and strains for different materials and the strength of structural elements.
- To know the development of internal forces and resistance mechanisms for one-dimensional and two- dimensional structural elements.
- To analyze and understand different internal forces and stresses induced due to representative loads on structural elements.
- To determine the slope and deflections of beams.
- To evaluate the behavior of torsion members, columns and struts.

Module-1 Simple Stresses & Strains (8 Hours)

Simple Stresses and Strain: Introduction, Definition and concept of stress and strain. Hooke's law, Stress-Strain diagrams for ferrous and non-ferrous materials, factor of safety, Elongation of tapering bars of circular and rectangular cross sections, Elongation due to self- weight. Saint Venant's principle, Compound bars, Temperature stresses, Compound section subjected to temperature stresses, state of simple shear, Elastic constants and their relationship.

Module-2 Compound Stresses and Hoop stresses (8 Hours)

Compound Stresses: Introduction, state of stress at a point, General two-dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses**.** Theory of failures: Max. Shear stress theory and Max. principal stress theory.

Thin and Thick Cylinders: Introduction, Thin cylinders subjected to internal pressure; Hoop stresses, Longitudinal stress and change in volume. Thick cylinders subjected to both internal and external pressure; Lame's equation, radial and hoop stress distribution.

Module-3 Shear Force Diagram and Bending Moment Diagram (8 Hours)

Shear Force and Bending Moment in Beams: Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations.

Module 4 Bending, Shear & Torsional Stresses (8 Hours)

Bending and Shear Stresses in Beams: Introduction, pure bending theory, Assumptions, derivation of bending equation, modulus of rupture, section modulus, flexural rigidity. Expression for transverse shear stress in beams, Bending and shear stress distribution diagrams for circular, rectangular, 'I', and 'T' sections. Shear center (only concept).

Torsion in Circular Shaft: Introduction, pure torsion, Assumptions, derivation of torsion equation for circular shafts, torsional rigidity and polar modulus Power transmitted by a shaft.

Module-5 Deflection in Beams & Columns and Struts (8 Hours)

Deflection of Beams: Definition of slope, Deflection and curvature, Sign conventions, Derivation of moment- curvature equation. Double integration method and Macaulay's method: Slope and deflection for standard loading cases and for determinate prismatic beams subjected to point loads, UDL, UVL and couple.

Columns and Struts: Introduction, short and long columns. Euler's theory; Assumptions, Derivation for Euler's Buckling load for different end conditions, Limitations of Euler's theory. Rankine-Gordon's formula for columns.

Course Outcomes: At the end of the course the student will be able to:	
22CIV31.1	Evaluate the strength of various structural elements internal forces subjected to compression, tension.
22CIV31.2	Evaluate the strength of various structural elements internal forces subjected to temperature rise, volumetric strain.
22CIV31.3	Interpret the behavior and strength of structural elements under the action of compound stresses and internal fluid pressures.
22CIV31.4	Develop the Bending moment and Shear force Diagrams for various beams
22CIV31.5	To analyze of members subjected to torsion and to analyze the basic concepts of failure
22CIV31.6	To suggest cost effective cross sections and material from the available materials in the field of construction and manufacturing and to understand the basic concepts of load carrying capacity of columns.

Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Strength of Materials	B.S. Basavarajaiah, P. Mahadevappa	University Press (India) Pvt. Ltd.	3rd Edition, 2015
2	Mechanics of Materials	Ferdinand P. Beer, E. Russell Johnston and Jr. John T. De Wolf	Tata McGraw-Hill	8th Edition 2022
Reference Books				
1	Elements of Strength of Materials	D.H. Young S.P. Timoshenko	East West Press Pvt. Ltd.	5th Edition, 2014
2	A Textbook of Strength of Materials	R K Bansal	Laxmi Publications	4th Edition, 2015
3	Strength of Materials	S.S. Rattan	McGraw Hill Education (India) Pvt. Ltd	2nd Edition, 2011
4	Analysis of Structures Vol. I	Vazirani,V N, Ratwani M M., and S K Duggal	Khanna Publishers, New Delhi	17th Edition, 2015

Web links/Video Lectures/MOOCs/papers

- https://www.coursera.org/learn/mechanics-1
- https://nptel.ac.in/courses/105/105/105105108/
- https://ocw.mit.edu/courses/mechanical-engineering/2-001-mechanics-materials-i-fall-2006/index.htm
- https://nptel.ac.in/courses/112107146/

Course Articulation Matrix:

Course Outcomes	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
22CIV31.1	-	-	2	-	-	-	-	-	-	-	-	-	-	2
22CIV31.2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
22CIV31.3	-	-	-	-	2	-	-	-	-	-	-	-	-	2
22CIV31.4	-	-	2	-	-	-	-	-	-	-	-	-	-	2
22CIV31.5	-	-	-	-	2	-	-	-	-	-	-	-	-	2
22CIV31.6	-	-	2	-	-	-	-	-	-	-	-	-	-	2

1: Low 2: Medium 3: High

Building Construction and Material Testing			
Course Code	**22CIV32**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory & 10 Lab Slots	Credits	04

Course Learning Objectives:

1. To recognize the good building materials and required testing to be used for the construction work
2. To identify types of suitable foundation, masonry and walls for different structures
3. To gain knowledge of structural components like lintels, arches, floors and roofs in the building construction.
4. To select the suitable doors, windows and ventilators required for the construction work.
5. To apply the concepts of different form works and stairs required for the construction work.
6. To use finishes in construction like plastering, pointing and painting of various structures.

Module-1 **8 Hours**

Building Stone: Common building stones and their uses, quarrying, dressing of stones, deterioration and preservation.
Building/masonry blocks: Introduction, Types: clay blocks, cement concrete blocks, Autoclaved Aerated Concrete Blocks; Requirement of good blocks; Manufacture of clay blocks; Tests on blocks: compressive strength, water absorption, efflorescence, dimension and warpage; quality of blocks as per BIS and their uses.
Aggregates: definition: fine and coarse aggregate.
Self-learning: Timber: Varieties and uses, defects in timber, seasoning of timber, Requirements of a good quality timber

Module-2 **8 Hours**

Foundation: Introduction, function and requirements of a foundation; Types of foundation: shallow foundation- spread, combined , strap, mat, size-stone foundation; deep foundation – pile foundation.
Masonry: Definitions of terms used in masonry, bonds in brickwork: Header, Stretcher, English bond, Flemish bond, Stone masonry: Classification, characteristics of different stone masonry: rubble masonry, coursed rubble masonry, random rubble masonry, joints in stone masonry.
Types of walls: load-bearing, partition walls, cavity walls.

Module-3 **8 Hours**

Lintels and Arches: Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch. **Floors:** Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring, Cladding of tiles.
Roofs: Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof.

Module-4 **8 Hours**

Doors, Windows and Ventilators: Location of doors and windows, technical terms, Materials for doors and windows: PVC, CPVC and Aluminum. Types of Doors and Windows: Paneled, Flush, Collapsible, Rolling shutter, Paneled and glazed Window, Bay Window, French window. Steel windows, Ventilators. Sizes as per IS recommendations.
Stairs: Definitions, technical terms and types of stairs: Wood, RCC, Metal. Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs.
Formwork: Introduction to formwork, scaffolding, shoring, underpinning

Module-5	**8 Hours**
Plastering and Pointing : Purpose, materials and methods of plastering: plastering- Sand faced plastering, Stucco plastering, lathe plastering and pointing, defects in plastering **Damp proofing:** Causes, effects and methods. **Paints:** Purpose, types, ingredients and defects	

List of Laboratory Experiments – 2 hours each
Tests on Metals
1. Tension Test on Mild Steel Bar 2. Compression Test on Mild Steel 3. Single and Double Shear Test 4. Torsion Test on Mild Steel 5. Impact Tests – Izod and Charpy 6. Hardness Test (Brinell, Vickers and Rockwell)
Tests on Cement
1. Specific Gravity of Cement 2. Fineness of Cement
Tests on Aggregates
1. Specific Gravity Test on Fine and Coarse Aggregate 2. Bulk Density Test on Fine and Coarse Aggregate 3. Sieve Analysis of Fine and Coarse Aggregate 4. Moisture Content of Aggregates 5. Bulking of Sand
Tests on Burnt Clay Products
1. Test on Burnt Clay Building Bricks 2. Test on Burnt Clay Mangalore Roofing Tiles 3. Test on Cement Concrete Flooring Tiles. 4. Test on Laterite blocks

Course Outcomes: At the end of the course the student will be able to:	
22CIV32.1	Select suitable building materials and required testing methods for the construction work
22CIV32.2	Decide suitable type of foundation, masonry and walls based on requirement of construction
22CIV32.3	Apply the knowledge of using the structural components like lintels, arches, floors and roofs in the building construction.
22CIV32.4	Choose different types of doors, windows and ventilators suitable for the construction work.
22CIV32.5	Classify the various formworks and design suitable stairs required for the various buildings.
22CIV32.6	Exhibit the knowledge of building finishes required for the construction projects.

Sl No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Building Materials	P.C. Varghese	PHI Learning Pvt. Ltd. Publication	2nd Edition, 2015

2	Building Construction	Rangwala S.G	Charotar Publishing House, Anand, India	26th Edition, 2008
Reference Books				
1	Engineering Materials	Rangwala S.G	Charotar Publishing House, Anand, India.	39th Edition, 2012
2	Building Construction	B.C. Punmia, Ashok Kr. Jain, Arun Kr. Jain	Laxmi Publications Pvt. Limited	10th Edition, 2018
3	Building and construction materials-Testing and quality control	M L Gambhir and Neha Jamwal	McGraw Hill Education(India) Pvt. Ltd	2017
4	National Building Code – SP 7:2016	Bureau of Indian standards	Bureau of Indian standards	2016

Web links/Video Lectures/MOOCs/papers

1.https://sm-nitk.vlabs.ac.in/

2. https://archive.nptel.ac.in/courses/105/102/105102088/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
22CIV32.1	2											2	1	2
22CIV32.2	2											2	1	2
22CIV32.3	2								2			2	1	2
22CIV32.4	2											2	1	2
22CIV32.5			2									2	1	2
22CIV32.6	2											2	1	2

1: Low 2: Medium 3: High

Fluid Mechanics and Hydraulics			
Course Code	**22CIV33**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory and 10 Lab slots	Credits	04

Course Learning Objectives:

1. To describe the physical properties of the fluid and calculate fluid pressure.
2. To formulate the fundamental laws of fluid mechanics and Bernoulli's principle for practical applications.
3. To calculate the discharge over notches, weirs, orifice, mouthpiece and venturi meter.
4. To evaluate the energy loss through pipes by conducting studies on pipe networks.
5. To deduce the characteristics of turbines and jet of vanes.
6. To determine the efficiency of the centrifugal pumps and reaction turbines.

Module-1- Properties of Fluids (8 Hours)

Fluids & Their Properties: Concept of fluid, Systems of units. Properties of fluid; Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Newton's law of viscosity (theory & problems), Cohesion, Adhesion, Surface tension & Capillarity

Fluid Pressure and Its Measurements: Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth, Types of pressure.

Module-2- Hydraulic Forces (8 Hours)

Hydrostatic forces on Surfaces:

Definition, Total pressure, center of pressure, total pressure on horizontal, vertical and inclined plane surface, total pressure on curved surfaces, water pressure on gravity dams, Lock gates. Numerical Problems.

Buoyancy and Flotation:

Buoyancy, Force and Centre of Buoyancy, Meta centre and Meta centric height, Stability of submerged and floating bodies, Determination of Meta centric height, Experimental and theoretical method, Numerical problems.

Module-3 Open Channel Flow(8 Hours)

Dynamics of Fluid Flow: Introduction to fluid dynamics, Forces acting on the fluid in motion. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Modified Bernoulli's equation.

Notches and Weirs: Introduction, Classification, discharge o ver rectangular, triangular, trapezoidal notches, Cippoletti notch, broad crested weirs. Numerical problems. Ventilation of weirs, submerged weirs.

Orifice, Mouthpiece, and Venturimeter: Introduction, classification, flow through orifice, hydraulic coefficients and Numerical problems. Mouthpiece, classification, Borda's Mouthpiece (No Numerical problems).

Venturi meter, Orifice meter, Pitot tube. Numerical Problems.

Module-4- Flow through Pipes (8 Hours)

Flow-through Pipes: Introduction. Major and minor losses in pipe flow. Darcy- Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe problems. Minor losses in pipe flow, equation for head loss due to sudden expansion. Numerical problems. Hydraulic gradient line, energy gradient line, Pipe Networks.

Open Channel Flow Hydraulics: Uniform Flow: Introduction, Classification of flow through channels, Chezy's and Manning's equation for flow through open channel, Most economical channel sections, Uniform flow through Open channels, Numerical Problems.

Module-5 Turbines and Pumps (8 Hours)
Impact of jet on curved vanes, momentum equation, Impact of jet on stationary and moving curved vanes **Turbines** - Pelton wheel and components, Velocity triangle Reaction turbine - Francis turbine, Working proportions **Centrifugal Pumps** - Work done and efficiency, Multi-stage pumps

List of Laboratory Experiments related to above modules – 2 hours each
Determination of Discharge Coefficients
1. Determination of Cd and calibration of Venturimeter and Orifice meter. 2. Determination of hydraulic coefficients and calibration of small vertical orifice. 3. Determination of Cd and calibration of Rectangular and Triangular notch 4. Determination of Cd and calibration of Ogee and Broad crested weir
Determination of Efficiency of Turbines/Pumps
5. Determination of force exerted by a jet on flat and curved vanes. 6. Determination of efficiency of Pelton wheel turbine 7. Determination of efficiency of Francis turbine 8. Determination of efficiency of Kaplan turbine 9. Determination of efficiency of centrifugal pump
Losses in Pipes
10. Determination of Major Loss in Pipes and Minor losses

Course Outcomes: At the end of the course the student will be able to:	
22CIV33.1	Apply knowledge of fundamental properties of fluids and fluid continuum.
22CIV33.2	Examine fundamental laws of fluid mechanics and the Bernoulli's principle for practical applications.
22CIV33.3	Develop the discharge from orifice, mouthpiece and over notches and weirs.
22CIV33.4	Solve the energy loss through pipes by conducting investigations on pipe networks.
22CIV33.5	Interpret the characteristics of turbines and Jet of vanes.
22CIV33.6	Design the centrifugal pump and estimate the efficiency.

Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	A Textbook of Fluid Mechanics and Hydraulic Machines	Dr. R.K. Bansal	Laxmi Publications	Revised 9th Edition, 2017
2	Hydraulics and Fluid Mechanics, including Hydraulic Machines	P N Modi and S M Seth	Standard Book House	20th Edition, 2015
Reference Books				
1	Fluid Mechanics	Victor L Streeter, Benjamin Wylie E and Keith W Bedford	Tata McGraw Hill Publishing Co Ltd	2008

2	Fluid Mechanics and Hydraulic Machines	K Subramanya	Tata McGraw Hill Publishing Co. Ltd	2nd Edition 2018

Web links/Video Lectures/MOOCs/papers

1. https://nptel.ac.in/
2. https://youtu.be/TKk3Sqbsdbg
3. https://youtu.be/z9wsUWaN-oY
4. https://youtu.be/F_7OhKUYV5c
5. https://searchworks.stanford.edu/view/10496310
6. https://searchworks.stanford.edu/view/13576277
7. https://searchworks.stanford.edu/view/11842972

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
22CIV33.1	-	2	-	3	-	-	-	-	3	-	-	-	-	-
22CIV33.2	-	2	-	3	-	-	-	-	3					
22CIV33.3	-	2	-	3	-	-	-	-	3					
22CIV33.4	-	2	-	3	-	-	-	-	3					
22CIV33.5	-	2	-	3	-	-	-	-	3					
22CIV33.6	-	2	-	3	-	-	-	-	3					

1: Low 2: Medium 3: High

Transportation Engineering			
Course Code	**22CIV34**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives:

This course will enable students:

1. To gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
2. To understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).
3. To get insight to different aspects of geometric elements and train them to design geometric elements of a highway network.
4. To understand pavement and its components, pavement construction activities and its requirements.
5. To understand the components of Railway design & Railway Planning and Harbour Engineering
6. To gain knowledge of various components of tunnelling like size & shape of the tunnel and Air transport characteristics
7. To gain the skills of evaluating the highway economics by B/C, NPV, IRR methods and also introduce the students to highway financing concepts.

Module -1 (8 Hours)

Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute.

Highway Development and Planning: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals Salient Features of 3rd and 4thtwenty year road development plans and Policies, Present scenario of road development in India and in Karnataka, Road development plan - vision 2021

Module-2 (8 Hours)

Highway Alignment and Surveys: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects

Highway Geometric Design: Cross-sectional elements–width, surface, camber, Sight distances – Stopping Sight distance, Overtaking Sight Distance, Intermediate Sight distance, Design of horizontal and vertical alignment–curves, super-elevation, widening, gradients, summit and valley curves.

Module-3 (8 Hours)

Pavement Materials: Subgrade soil - desirable properties- Highway research board (HRB) soil classification - determination of California Bearing Ratio and modulus of subgrade reaction with Problems Aggregates- Desirable properties and tests, Bituminous materials- Explanation on Tar, bitumen, cutback and emulsion-tests on bituminous material Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, Equivalent Single Axle Load and its determination (Graphical method only)- Examples.

Pavement Construction: Design of soil aggregate mixes by Rothfuch's method. Uses and properties of bituminous mixes and cement concrete in pavement construction. Earthwork; cutting

and Filling, Preparation of subgrade, Specification, and construction of i) Granular Sub base, ii) Water bound macadam base, iii) Wet mix macadam base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and Pavement Quality Concrete viii) concrete roads. **Tests on Highway Materials:** Bitumen: Ductility, Penetration, and Softening
Module-4 (8 Hours)
Highway Drainage: Significance and requirements, Surface drainage system and design Examples, subsurface drainage system, design of filter materials, Types of cross drainage structures, their choice and location. **Highway Economics:** Highway user benefits, VOC using charts only-Examples, Economic analysis - annual cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts
Module-5 (8 Hours)
Traffic Engineering – Traffic characteristics, Traffic Engineering Studies and Analysis, Traffic Regulation and Control, safety mitigation in Traffic management. **Railway, Harbour, Tunnelling, Airport Planning:** Significance of Road, Rail, Air, and Water transports – Coordination of all modes to achieve sustainability – Elements of the permanent way – Rails, Sleepers, Ballast, rail fixtures, and fastenings. Planning and Design of Harbours: Requirements, Classification, Location and Design Principles. Introduction, size, and shape of the tunnel. Air transport characteristics, airport classification, and airport planning: objectives, components.

Course Outcomes: At the end of the course the student will be able to:	
22CIV34.1	Illustrate the knowledge of planning, design and the fundamental properties of highway materials & schemes
22CIV34.2	Identify the knowledge & use of geometric design and adopt appropriate suitable sight distance
22CIV34.3	Utilize and use the concept of different pavement materials in design, construction, inspection and maintenance of the pavement.
22CIV34.4	Understand pavement and its components, pavement construction activities
22CIV34.5	Identify the components of Railway design & Railway Planning and Harbor Engineering
22CIV34.6	Identify the components of tunnelling like size & shape of the tunnel and Air transport characteristics

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Highway Engineering	S K Khanna and C E G Justo	Nem Chand Bros, Roorkee	9th Edition, 2011
2	Highway Engineering	L R Kadiyali	Khanna Publishers, New Delhi,	6th Edition, 2013
3	Highway Engineering	R Srinivasa Kumar	University Press.,	1st Edition, 2010
4	Transportation Engineering	K.P.subramanium	SciTech Publications, Chennai.	6th Edition, 2010

Reference Books	
1	Relevant IRC Codes
2	Specifications for Roads and Bridges- MoRT&H, IRC, New Delhi

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
22CIV34.1	2	-	-	-	-	-	-	-	-	-	-	-	-	-
22CIV34.2	-	2	-	-	-	-	-	-	-	-	-	-	-	-
22CIV34.3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
22CIV34.4	2	-	-	-	-	-	-	-	-	2	-	-	-	-
22CIV34.5	-	2	-	-	-	-	-	-	-	2	-	-	-	-
22CIV34.6	-	2	-	-	-	-	-	-	-	-	-	-	-	-

1: Low 2: Medium 3: High

Rural, Urban Planning and Architecture			
Course Code	**22CIV351**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: This course will enable students to

1. Understand the unique challenges and opportunities associated with rural and urban planning in order to develop effective strategies.
2. Analyze the socio-economic and environmental factors influencing rural and urban areas, and their impact on planning and architecture.
3. Explore sustainable design principles and practices that promote efficient land use and resource management in rural and urban contexts.
4. Develop skills in site analysis, master planning, and zoning regulations to create well-designed and functional rural and urban spaces.

Module-1 History

Evolution, origins and growth of settlements:- Characteristics of Rural and Urban settlements; Urban form based on different determinants – Natural (climate, topography, resources, geography) and Man-made (cultural, economic, religious, administrative, political).

Planning efforts and impacts on historical cities - Ancient civilizations (Mesopotamia, China, Egypt, Indus Valley, Mayan); Classical cities (Greek, Roman, Medieval, Neoclassical, Renaissance, Baroque, City Beautiful); Indian cities – (Vedic/Indo-Aryan, Colonial, Dravidian, Mughal).

Module-2 Evolution of Cities (8 hours)

City Planning in Post-Industrial Revolution Era: - Responses to impacts of industrialization in cities: Legislative reforms to public health, work and living conditions; Spatial responses to Poor Living Conditions (Railroad tenements, Dumbbell plan); Utopian visions - Model Towns (Robert Owen, J.S. Buckingham, George Cadbury), Tony Garnier (Cité Industrielle).

Pioneers in planning theories - Ebenezer Howard (Garden City), Soria Y.Mata (The Linear City), Patrick Geddes (Outlook Tower, Valley Section, Folk-Work-Place, Civic Survey), Le Corbusier (Ville Contemporaine), Frank Lloyd Wright (Broadacre City), Ludwig Hilberseimer (Decentralized City), Constantinos A Doxiadis (Ekistics), Clarence Arthur Perry (Neighbourhood Unit); Clarence Stein (American Garden Cities).

Planned and Built Cities: - Brasilia (Oscar Niemeyer), Chandigarh (Le Corbusier), Islamabad (Constantinos A Doxiadis), Tel Aviv (Patrick Geddes).

Alternate visions for cities: – Arcosanti (Paolo Soleri), New Urbanism (Peter Calthorpe, Andres Duany, Elizabeth Plater-Zyberk).

Module-3 Urbanization and Urban Housing Typologies (8 hours)

Urbanization in India: - Trends in urbanization in post-independence India; Planned cities in Post-Independence India (Bhubaneswar, Gandhinagar, Jamshedpur); Census classification of Indian cities (based on population size); Growth, issues and management of Metropolitan cities; Slums (official definitions and slum statistics)

Urban housing typologies – City Development Authority layouts, Public Sector Townships, Affordable housing, Slum Rehabilitation Projects

Module-4 Urban structure, Land use and Zoning (8 hours)

Urban Structure: - Internal spatial structure of the city: Concentric Zone theory; Sector theory; Multiple Nuclei Theory; Characteristics of Central business district, Urban nodes (Origin and/or destination of trips, location of major transport nodes, interfaces of local/regional transport), Suburbs, Peri-urban areas.

Land use and Zoning: - Land use categories and representation; Relationship between Land use and Zoning; Zoning Types: Euclidean Zoning, Performance Zoning, Form-based Codes, Incentive Zoning, Height Zoning, Open Space Zoning.

Module-5 Planning process and tools (8 hours)
Planning Processes and Tools: - Urban Redevelopment: Renewal, Rehabilitation, Conservation; Scales of Planning: Masterplan/Comprehensive Development Plan, Area Plan, Regional Plan, Perspective Plan, URDPFI Guidelines; Steps of urban planning**..**

Course Outcomes: At the end of the course the student will be able to:	
22CIV351.1	Describe the history of rural and urban settlements in various parts of the world
22CIV351.2	Interpret the evolution of cities post- industrial era ,pioneers of planning theories
22CIV351.3	Evaluate different planned and built cities around the world and alternate vision for cities.
22CIV351.4	Demonstrate the urbanization post independent India and different urban housing typologies.
22CIV351.5	Develop different types of urban structure by effective utilization of land and zoning.
22CIV351.6	Design and develop plans using different modern tools and guidelines.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	The city assembled: The elements of urban form through history	Kostof, S., Castillo, G., & Tobias, R.-1992	Thames and Hudson	First edition reprinted in the year 2005
2	Introduction to Rural Planning: Economies, Communities, and Landscapes	Pete B. M. V. Larkham	Routledge	2nd Edition, 2015
Reference Books				
1	Urban and Regional Development Plans Formulation and Implementation Guidelines. MoUD Government of India.	Ministry of Urban Development, GoI.	-	2014
2	A Handbook of Urbanization in India: An Analysis of Trends and Processes	Sivaramakrishnan, K. C.; Amitabh Kundu; and B. N. Singh	Oxford University Press, New Delhi.	2005

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV351.1	3													
22CIV351.2	3	2												
22CIV351.3	3	2												
22CIV351.4	3													
22CIV351.5	3	2												
22CIV351.6	3	2			3									

1: Low 2: Medium 3: High

Sustainable Design Concepts and Building Services			
Course Code	**22CIV352**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: The objective of the course is to

- Develop a comprehensive understanding of sustainability, including its definition, principles, and the interplay between environmental, social, and economic aspects.
- Evaluate the challenges and barriers to sustainable development at both global and local levels, and explore potential solutions and strategies for addressing them.
- Gain knowledge of key environmental issues such as climate change, resource degradation, and pollution, and analyze their impacts on ecosystems and human well-being.
- Acquire a solid understanding of renewable energy sources, clean technologies, and sustainable design principles, and apply them to real-world scenarios to promote sustainable development and mitigate environmental impacts.

Module-1 Introduction to Sustainability (8 Hours)

Introduction to sustainability: Definition and importance, Three pillars of sustainability: Environmental, social, and economic aspects, Sustainable development: Principles and goals, Technology and sustainable development: Role and impact, Challenges for sustainable development: Global and local perspectives, Multilateral environmental agreements, and protocols: Overview and examples, Clean Development Mechanism (CDM): Concept and significance, Environmental legislations in India: Water Act and Air Act.

Applications: Applying sustainability principles, understanding technology's role in sustainable development, analyzing challenges, implementing environmental legislations.

Module-2 Climate Change and Resource Management (8 hours)

Climate change: Causes, impacts, and mitigation strategies, Resource degradation: Types and consequences, Carbon credits and carbon trading: Overview and importance Carbon footprint: Measurement and reduction techniques, Carbon sequestration: Focus on carbon capture and storage (CCS), Environmental management standards: Introduction to ISO 14000 series, Life Cycle Analysis (LCA): Scope, goals, and applications, Biomimicry: Learning from nature for sustainable solutions.

Applications:

Module-3 Sustainable Design and Green Buildings: (8 hours)

Sustainable habitat: Principles and elements, Green buildings: Concepts, benefits, and design strategies, Green materials for building construction: Selection and criteria, Sustainable material selection for design: Environmental considerations, Green building certifications: GRIHA and IGBC certifications, Energy-efficient building design: Passive solar techniques and strategies, Thermal storage and cooling strategies: Enhancing energy efficiency, High-performance insulation: Importance and options, Sustainable cities: Design principles and sustainable urban planning, Sustainable transport: Strategies for reducing environmental impact.

Applications: Designing green buildings, selecting sustainable materials, promoting energy-efficient building design.

Module-4 Renewable Energy and Clean Technology: (8 hours)

Energy sources: Conventional and non-conventional, Solar energy: Photovoltaic systems and solar thermal technology, Wind energy: Harnessing wind power for electricity generation, Small hydro plants: Utilizing water resources for clean energy, Biofuels: Types, production, and sustainability considerations, Energy derived from oceans: Tidal, wave, and thermal energy, Geothermal energy: Utilizing Earth's heat for power generation, Rainwater harvesting: Importance and techniques for water conservation

Applications: Utilizing renewable energy sources, implementing clean technologies, conserving water through rainwater harvesting.

Module- 5 Sustainable Industrial Processes and Green Engineering: (8 hours)
Green engineering concepts: Principles and applications, Sustainable urbanization: Balancing industrialization and poverty reduction, Social and technological change: Interactions and implications, Material selection for industrial processes: Environmental considerations, Pollution. prevention: Strategies for minimizing industrial pollution, Industrial ecology: Promoting resource efficiency and waste reduction, Industrial symbiosis: Collaborative approaches for sustainable production **Applications:** Minimizing industrial pollution, promoting resource efficiency, applying sustainable practices in industrial processes.

Course Outcomes: At the end of the course the student will be able to:	
22CIV352.1	Understand sustainability and its three pillars: environmental, social, and economic aspects.
22CIV352.2	Analyze global environmental issues and their impacts on ecosystems and societies.
22CIV352.3	Demonstrate knowledge of renewable energy sources and their role in sustainable development.
22CIV352.4	Apply sustainable design principles in habitat and building construction.
22CIV352.5	Evaluate carbon credits, carbon trading, and carbon footprint measurement for climate change mitigation.
22CIV352.6	Analyze the role of technology in sustainable development and green engineering concepts for resource efficiency.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Introduction to Sustainability for Engineers	Toolseeram Ramjeawon	CRC Press	1st Edition, 2020
2	System Analysis for Sustainable Engineering: Theory and applications.	Ni bin Chang	McGraw Hill Publications	1st Edition, 2010
Reference Books				
1	Engineering for Sustainable development: Delivery a sustainable development goals	UNESCO	International Centre for Engineering Education, France	1st Edition, 2021
2	Introduction to Sustainable Engineering	Rag. R.L. and Ramesh Lakshmi Dinachandran	PHI Learning Pvt. Ltd.	2nd Edition, 2016

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/127/105/127105018
- https://unesdoc.unesco.org/ark:/48223/pf0000375644.locale=en
- https://engineeringforoneplanet.org

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CIV352.1	2	1				2	2							
22CIV352.2	2	2				2	2							
22CIV352.3	1	2				2	3							
22CIV352.4	1	1				2	3							
22CIV352.5	1	2				2	3							
22CIV352.6	2	1				2	2							

1: Low 2: Medium 3: High

Occupational Health and Safety			
Course Code	**22CIV353**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: The objective of the course is to

- Gain historical, economical, and organizational perspective of occupational safety & health
- Investigate current occupational safety and health problems and solutions.
- Identify the forces that influence occupational safety and health.
- Demonstrate the knowledge and skills needed to identify work place problems and safe work practices

Module-1 Occupational Hazard and Control Principles (8 Hours)

Safety, History, and development, National Safety Policy. Occupational safety and Health Act (OSHA), Occupational Health and Safety administration - Laws governing OSHA and right to know. Accident causation, investigation, investigation plan, Methods of acquiring accident facts, Supervisory role in accident investigation. (Limits to exposure to hazardous wastes)

Applications: Promote workplace safety, investigate accidents, and hold employers responsible for informing and protecting their employees.

Module-2 Ergonomics at Work Place (8 hours)

Ergonomics Task analysis, Preventing Ergonomic Hazards, Work space Envelops, Visual Ergonomics, Ergonomic Standards, Ergonomic Programs. Hazard cognition and Analysis, Human Error Analysis Fault Tree Analysis Emergency Response - Decision for action purpose and considerations.

Applications: Help to create safe and comfortable workspaces, prevent ergonomic hazards, analyze hazards and human errors, and make informed decisions for emergency response**.**

Module-3 Fire and Electrical Safety (8 hours)

Fire Prevention and Protection: Fire Triangle, Fire Development and its severity, Effect of Enclosures, early detection of Fire, Classification of fire and Fire Extinguishers.

Electrical Safety, Product Safety: Technical Requirements of Product safety.

Applications: Fire protection engineering is the application of science and engineering principles to protect people and their environment from destructive fire.

Module-4 Health Considerations at Work Place (8 hours)

Types of diseases and their spread, Health Emergency. Personal Protective Equipment (PPE) types and advantages, effects of exposure and treatment for engineering industries, Hazardous/Industrial waste, Environment management plans (EMP) for safety and sustainability

Applications: PPEs can prevent unnecessary injury in the workplace, protect employees from excessive chemical exposure, prevent the spread of germs and infectious diseases.

Module- 5 Occupational Health and Safety Considerations (8 hours)

Water and wastewater treatment plants, Handling of chemical and safety measures in water and wastewater treatment plants and labs, Construction material manufacturing industries like cement plants, RMC Plants, precast plants and construction sites. Policies, roles and responsibilities of workers, managers, and supervisors.

Applications: The physical, chemical, biological, and radioactive pollutants are removed that are present in the wastewater

Course Outcomes: At the end of the course the student will be able to:	
22CIV353.1	Identify hazards in the work place that pose a danger or threat to their safety or health, or that of others.

22CIV353.2	Control unsafe or unhealthy hazards and propose methods to eliminate the hazard.
22CIV353.3	Present a coherent analysis of a potential safety or health hazard both verbally and in writing, citing the occupational Health and Safety Regulations as well as supported legislation.
22CIV353.4	Discuss the role of health and safety in the workplace pertaining to the responsibilities of workers, managers, supervisors.
22CIV353.5	Identify the decisions required to maintain protection of the environment, workplace and personal health.
22CIV353.6	Evaluating the effectiveness of the decisions made to maintain safety by monitoring their implementation and outcomes.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Occupational Safety and Health for Technologists, Engineers, and Managers	Goetsch D. L.	Prentice Hall	8th Edition 2014
2	Industrial Accident Prevention-A Scientific Approach	Heinrich H. W	McGraw-Hill Book Company	Edition 2007
Reference Books				
1	Industrial Safety Management and Technology	Colling D.A.	Prentice Hall, New Delhi.	Edition 1990
2	Safety and Environmental Management	Della D.E., and Giustina	Van Nostrand Reinhold International Thomson Publishing Inc	Edition 1996

Web links and Video Lectures (e-Resources):
https://nptel.ac.in/courses/110105094/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV353.1	3					2			2			1		
22CIV353.2	3					2			2			1		
22CIV353.3	3					2			2			1		
22CIV353.4	3					2			2			1		
22CIV353.5	3					2			2			1		
22CIV353.6	3					2			2			1		

1: Low 2: Medium 3: High

ALTERNATE BUILDING MATERIALS			
Course Code	**22CIV354**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 Hours	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand environmental issues due to building materials and the energy consumption in manufacturing building materials.
- Study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
- Study alternative building materials in the present context.
- Understand the alternative building technologies which are followed in the present construction field.

Module-1 Introduction to building energy and green concepts in buildings (8 hours)

Energy in building materials, Environmental issues concerned with building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions

Module-2 Masonry units and mortars (8 hours)

Requirements of masonry units, characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks, and Stabilized mud blocks. Manufacture of stabilized blocks.

Mortars, cementations materials, natural & manufactured sand, types of mortars, requirements of mortar, selection of mortar.

Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.

Module-3 Alternate building materials (8 hours)

Lime, Pozzolana cement, Raw materials, Manufacturing Process, Properties, and uses. Fibers-metal and synthetic, Properties and applications. Fiber-reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties, and Applications. Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties, and applications. Masonry blocks using industrial waste. Construction and demolition wastes

Module-4 Alternate Building Technologies (8 hours)

Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials, and specifications, Properties, Construction methods, and Applications. Top-down construction, Mivan Construction Technique, Alternate Roofing Systems, Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults, and domes.

Module-5 Equipment for production of alternative materials (8 hours)

Equipment for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design, and construction, Cost analysis: Case studies using alternatives.

Course Outcomes: At the end of the course, the student will be able to:	
22CIV354.1	Solve the problems of Environmental issues concerned to building materials and evaluate the environmental implications of green building ratings for the construction industry and society
22CIV354.2	Discover various kinds of masonry units employed in construction projects
22CIV354.3	Identify the different types of mortar and their appropriate uses in masonry construction
22CIV354.4	Evaluate the environmental impact of alternate building materials and their contribution to sustainable construction
22CIV354.5	Apply knowledge of alternate building technologies to design and construct sustainable buildings
22CIV354.6	Identify the components and processes involved in the production of alternative materials

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Alternative Building Materials and Technologies	KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao	New Age International Pvt Ltd.	2015
2	Structural Masonry	Arnold W Hendry	Macmillan Publishers	1998
Reference Books				
1	Building Materials	SK Duggal	Taylor and Francis	First Edition, 2017
2	Building Materials	Varghese PC	Prentice Hall of India	Second Edition, 2015
3	Environmentally – Benign Energy solutions	Ibrahim Dincer Can Ozgur Colpan Mehmet Akif Ezan	Springer Book Series	2020
4	LEED India, Green Building Rating System,	-	IGBC Publications	-
5	IGBC Green Homes Rating System,	-	CII publications	-
6	Relevant IS Codes on Alternative building materials and Technologies	-	-	-

Web links and Video Lectures (e-Resources):

- Climate and construction - Development alternatives: https://www.devalt.org/images/L2_ProjectPdfs/Climate_and_construction-an_impact_assessment(1).pdf
- Stabilized earth blocks using lime and cement first time in India: https://www.youtube.com/watch?v=-n4gLAggv3U
- Making of stabilized mud blocks: https://youtu.be/NFzmNSI7Dbk
- Wire cut bricks: https://www.youtube.com/watch?v=yu8C-Y6f-Jo
- Rat trap bond: https://youtu.be/HkMtPb5Dyq4
- Filler slab: https://youtu.be/NBZjGm55Nf8
- Ferrocement construction: https://youtu.be/E0M_zvx2Bpg
- Mivan formwork: https://youtu.be/RGAP_Zvo9ZY

- Confined masonry: https://youtu.be/fiT2vEOXsuw
- Confined masonry: https://youtu.be/zv_q8saRZfQ

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CIV354.1	3						2							
22CIV354.2	3	2												
22CIV354.3	3					2								
22CIV354.4	3						2							
22CIV354.5	3					2								
22CIV354.6	3					2								

1: Low 2: Medium 3: High

Building Planning and Drawing Lab			
Course Code	**22CIV36L**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE	3 Hours
Total Hours	13 Lab slots	Credits	01

Course Learning Objectives:

1. This course will enable students
2. Achieve skill sets to prepare computer-aided engineering drawings.
3. Understand the details of the construction of different building elements.
4. Achieve skill sets required to develop Building planning, sections, and elevations
5. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings.

Module-1

Drawing Basics: Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962.

Simple engineering drawings with CAD drawing tools : Lines, Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse, Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet, Using Text: Single line text, Multiline text, Spelling, Edit text, Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, Working with multiple drawings.

Module-2

Drawings Related to Different Building Elements:

Following drawings are to be prepared for the data given using CAD Software

a) Cross section of Foundation for masonry wall and partition wall.
b) Different types of bonds in brick masonry.
c) Different types of staircases – Dog legged, Open well.
d) Lintel and chajja
e) Plan, Side view of Structural steel members (I,C,T and Angle sections)
f) Septic Tank.
g) Cross section of Flexible and Rigid pavement
h) Cross sectional details of a road for a Residential area with provision for all services
i) Layout plan of Rainwater recharging and harvesting system.
J) Plan and section of Doors and Windows

Note: Students should sketch to dimension the above in a sketchbook before doing the computer drawing.

Module-3

Building Drawings: Principles of planning, planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, and design aspects for different public buildings, design aspects for different public buildings, Basic concepts of planning and regulatory bodies.

Drawing of Plan, elevation, and sectional elevation including electrical, plumbing and sanitary services using CAD software for:

1. Single-storey residential building.
2. Double-storey residential building
3. Hostel building
4. School Building

Self-Study:

Submission drawing (sanction drawing) of Hospital building/School building with access to terrace including all details and statements as per the local bye-laws.

Note: Students should sketch to dimension the above in a sketchbook before doing the computer drawing, Single line diagrams to be given in the examination.

Course Outcomes: At the end of the course the student will be able to:	
22CIV36L.1	Identify skill sets to prepare engineering drawings using different drawing and modifying tools.
22CIV36L.2	Develop plan, cross sections of different elements of the buildings
22CIV36L.3	Develop the cross sections of different roads, septic tank etc.,
22CIV36L.4	Design plan, section and elevation for Residential and Public buildings as per requirements.
22CIV36L.5	Create electrical and plumbing layout for Residential and Public Buildings
22CIV36L.6	Apply the procedures of submission of drawings and Develop working and submission drawings for building.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Building drawing with an integrated approach to Built Environment Drawing	MG Shah, CM Kale, SY Patki	Tata McGraw Hill Publishing co. Ltd., New Delhi	5th Edition, 2017
2	Building Construction	Gurucharan Singh Johnston and Jr. John T. De Wolf	Standard Publishers, & distributors, New Delhi.	17th Edition, 2019
3	Civil Engineering Drawing	Malik R S and Meo G S	Asian Publishers/ Computech Publications Pvt Ltd.	2023
Reference Books				
1	IS: 962-1989 (Code of practice for architectural and building drawing).		Bureau of Indian Standards	-
2	National Building Code, BIS, New Delhi		Bureau of Indian Standards	-

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
22CIV36L.1					3							2		
22CIV36L.2					3									
22CIV36L.3					3									
22CIV36L.4					3							2		
22CIV36L.5					3							2		
22CIV36L.6					3			1						

1: Low 2: Medium 3: High

Universal Human Values- II			
Course Code	**22UHV37**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives: This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Module-1 Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

Activities: Sharing about Oneself, Exploring Human Consciousness and Exploring Natural Acceptance. **5 Hours**

Module-2 – Harmony in the Human Being

Understanding Human beings as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Activities: Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body and Exploring the difference of Needs of Self and Body. **5 hours**

Module 3 – Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Activities: Exploring the Feeling of Trust, Exploring the Feeling of Respect and Exploring the Feeling systems to fulfil Human Goal. **5 hours**

Module-4 – Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Activities: Exploring the Four Orders of Nature and Co-existence in Existence. **5 hours**

Module-5 – Implications of the Holistic Understanding – a Look at Professional Ethics

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

Activities: Exploring Ethical Human Conduct**,** Humanistic Models in Education and steps of Transition towards Universal Human Order. **5 hours**

Course Outcomes: At the end of the course the student will be able to:	
22UHV37.1	Practice the method of self-exploration to understand the basic human aspiration.
22UHV37.2	Distinguish between needs of self and body.
22UHV37.3	Evolve a program for self-regulation and health.
22UHV37.4	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
22UHV37.5	Realize sustainable solutions to the problems in society and nature.
22UHV37.6	Develop competence in professional ethics and strategies for the transition towards a value-based life/profession.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books New Delhi	2nd Revised Edition, 2019
Reference Books				
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	Jeevan Vidya Prakashan Amarkantak	1999
2	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Additional Resources/Web links/Video Lectures

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
4. Economy of Permanence - J C Kumarappa
5. Bharat Mein Angreji Raj – Pandit Sunderlal
6. Rediscovering India - by Dharampal
7. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
8. India Wins Freedom - Maulana Abdul Kalam Azad
9. Vivekananda - Romain Rolland (English)
10. Gandhi - Romain Rolland (English)
11. UHV-I Teaching material (Presentations, Pre & Post Surveys etc.)
https://fdp-si.aicte-india.org/AicteSipUHV_download.php
12. Details of UHV-II: Universal Human Values – Understanding Harmony and Ethical Human Conduct
https://drive.google.com/file/d/1cznDaqDwKy__EKWmqJLWF94MeY4AXcsU/view?usp=sharing

13. Recorded FDP (Refresher 1 Part 1: Preparing to teach UHV-I in SIP)

https://www.youtube.com/watch?v=kejuD4faDDE&list=PLWDeKF97v9SOjS4RanhaYj4YLiImqm5pj&index=1

14. Resources, including the class notes and presentations
https://drive.google.com/drive/folders/1nh9m5ibEtvMyqekeiexAJtfbdNtmtt6-?usp=sharing

15. Hindi Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SMRfe5PK1HPYnEcrrJOL6K7

16. English Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22UHV37.1						3		2						
22UHV37.2						2			3					
22UHV37.3						2		3						
22UHV37.4							3							
22UHV37.5			3				2							
22UHV37.6								3				2		

1: Low 2: Medium 3: High

Biology for Engineers			
Course Code	**22BFE37**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

1. To bring awareness of biological concepts to engineering students
2. To introduce the building blocks of life and their complexity
3. To encourage interdisciplinary studies and projects
4. To appreciate the discoveries that mimic nature and its working
5. To inculcate nature-inspired design and operational principles

Module-1 **5 Hours**

Basic Cell Biology: Introduction to Biology, The cell: the basic unit of life, Expression of genetic information-protein structure and function, Cell metabolism; Cells respond to their external environments, Cells grow and reproduce, Cellular differentiation.

Module-2 **5 Hours**

Biochemistry and Molecular Aspects of Life: Biodiversity-Chemical bonds in Biochemistry; Biochemistry and Human biology, Protein synthesis -DNA; RNA, Transcription and translation factors play key roles in protein synthesis, Differences between eukaryotic and prokaryotic protein synthesis, Stem cells and their applications.

Module-3 **5 Hours**

Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network), Respiratory system, sensory system (electronic nose, electronic tongue), Visual and auditory prosthesis (Bionic eye and cochlear implant).

Module-4 **5 Hours**

Relevance of Biology as an interdisciplinary approach: Biological observation that led to major discoveries, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Bird flying (aircraft), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro).

Module-5 **5 Hours**

Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling, Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems, Dynamic Updating DNA Computing Algorithms, Bee-Hive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.

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

22BFE37.1	Discuss how the cell forms the basic building block of life
22BFE37.2	Distinguish between transcription and translation
22BFE37.3	Describe the role played by proteins within the cell
22BFE37.4	Analyze the role of bioinspired design in novel applications
22BFE37.5	Apply bioinspired design principles to other domains
22BFE37.6	Implement a simple genetic algorithm

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Text Books				
1	Biology for Engineers	Thyagarajan.S., Selvamurugan. N., Rajesh.MP, Nazeer RA, Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K	Tata McGraw Hill	2012
2	Molecular Biology	Robert Weaver	McGraw-Hill	5th Edition, 2012
Reference books				
1	Lewin's Genes XII	Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick	Jones and Bartlett Learning	2017
2	Bioinspired Engineering	Jenkins, C.H.	Momentum Press	2012
3	Bio mimetics: Nature-Based Innovation	Yoseph Bar-Cohen	CRC Press	1st Edition, 2016
4	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo	Springer	2019

Web links/Video Lectures/MOOCs

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22BFE37.1	2					1								
22BFE37.2		1				1								
22BFE37.3	2					2								
22BFE37.4		2										2		
22BFE37.5	2											2		
22BFE37.6		2										2		

1: Low 2: Medium 3: High

IOT ENABLED PROTOTYPING			
Course Code:	**22IEP38**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. Understand the IoT concepts such as sensing, actuation, and communication.
2. Development of Internet of Things (IoT) prototypes—including devices for sensing, actuation, processing, and communication and Protocols
3. Understand the significance of Project Management and the different techniques of planning
4. To introduce fundamental aspects of intellectual property rights, Govt. policies on IPR, and patentability search techniques.

Module 1

Internet of Things – Hardware / System Design

Introduction to IoT fundamentals, Introduction to sensors, Difference between analog and Digital sensors, Interfacing Temperature, Light and Humidity sensor with Arduino, Interfacing Motors with Arduino, A simple program to control actuator based on the analog sensor. **6 Hours**

Module 2

Internet of Things

Networking in IoT:

Introduction to wireless communication, Wifi Module ESP8266 interface with Arduino, Machine to Machine (M2M) communication using WiFi module. A simple demonstration of sensing temperature from one device and control actuator on a second device (M2M)

IoT in Web/ Cloud Platform:

Introduction to a web server - XAMPP(windows), A simple interactive web page using HTML5, Bootstrap (or CSS), and Javascript. Interfacing ESP8266 with webserver, ThingSpeak API, and MQTT protocol, A simple project to demonstrate the status of two IoT devices communicating with a Web Server. **6 Hours**

Module 3

Project Planning and Management

Project initiation, Project charter, Project planning, and implementation, Scheduling and costing, Project monitoring and control, Project closure and reports.

6 Hours

Module 4

Intellectual Property Rights

Introduction and the need for intellectual property right (IPR) – Kinds of Intellectual Property Rights, Elements of Patentability: Novelty, Non-Obviousness (Inventive Steps), Industrial Application, Non - Patentable Subject Matter, Registration Procedure, Patentability search methods, Patent landscape, Freedom-to-market, National IPR Policy, Govt. initiatives and scheme in promoting IPR. **6 Hours**

Course Project

Develop IoT-based prototypes (solutions) to solve any industrial or societal problems. The prototype building is teamwork of 3-5 students. The goals should be clearly defined and should use robust technologies and rigorous testing. **6 Hours**

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

22IEP38.1	Analyze the basics of IoT and protocols.
22IEP38.2	Develop IoT-based prototypes to solve industrial and societal problems.

22IEP38.3	Apply appropriate approaches to plan a new project and develop a project schedule.
22IEP38.4	Discuss the ethical aspects in IPR, Govt. policies on IPR, and conducting patentability searches.
22IEP38.5	Inculcate the teamwork and communication skills.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	Internet of Things (A Hands-on-Approach)	Vijay Madisetti and Arshdeep Bahga	Orient Blackswan Private Limited	1st Edition, 2015
2	Fundamentals of Intellectual Property	Dr. Kalyan C. Kankanala	Asia Law House	1st Edition, 2012
3	Project Management Absolute Beginner's Guide	Greg Horine	Pearson Education (US)	4th Edition, 2017

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22IEP38.1			**2**		**2**				**2**	**2**				
22IEP38.2			**2**								**3**			
22IEP38.3					**2**						**2**			
22IEP38.4								**1**		**2**				
22IEP38.5								**1**	**2**	**2**				

1: Low 2: Medium 3: High

Industry Oriented Training - Business Etiquettes			
Course Code	**22ITB39A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

- Know the components of self-introduction
- Develop a resume with the inclusion of core competencies
- Involve and contribute to group discussions
- Develop effective communication to succeed in the professional career
- Know the etiquettes of digital communication

Module-1

Self-Introduction &Essentials of grooming

Self-Introduction: Learn the secret to introducing Yourself, Things to avoid when introducing yourself. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed man wear? What does the well-dressed woman wear? Personal hygiene and habits. **4 Hours**

Module-2

Resume Writing

Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume. **4 Hours**

Module-3

Group Discussion

Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions. **4 Hours**

Module-4

Communicate effectively

Build a Story, Just a Minute, Group Activities, Team building activities, Role Play, Presentation Skills. **4 Hours**

Module-5

Digital right and wrong

Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITB39A.1	Articulate the essential components required for self-introduction in any business or a networking event and also recognize the need to dress appropriately for a successful career in the corporate
22ITB39A.2	Develop a resume inclusive of core competencies, and action verbs which are compatible with Applicant Tracking Systems
22ITB39A.3	Demonstrate the types, process and evaluation process of Group Discussion and carry out effective group discussions
22ITB39A.4	Develop skills required for effective communication
22ITB39A.5	Associate and be accustomed to the etiquette to be followed during online meetings

Sources
1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level 2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/ 3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette 4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus 5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/ 6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus
References
1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/ 2. https://www.udemy.com/course/group-discussion-strategies/ 3. https://www.educba.com/course/group-discussion/ 4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/ 5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/ 6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ITB39A.1									2	3		1		
22ITB39A.2										3		1		
22ITB39A.3									2	3	1	1		
22ITB39A.4									2	3	1	1		
22ITB39A.5									2	3	1	1		

1: Low 2: Medium 3: High

Industry Oriented Training - Computing Skills			
Course Code	**22ITC39B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

1. Use logical conditions for problem-solving and also introduce the concepts of arrays
2. Know functions, function calls, and parameter passing
3. Introduce algorithms and appreciate their importance in problem-solving
4. Introduce the core concepts of OOP's
5. Differentiate between front-end & back-end development and recognize the use of database management

Module-1

Introduction to computing constructs

Logical conditions: For Loops, Nested For Loops, While Loops, Do-While Loops, Nesting and Boxes, and combine/negate several logical conditions using logic operations AND, OR, and NOT.

Arrays & strings: Create arrays of characters (strings), use the null terminator, and manipulate strings. **4 Hours**

Module-2

Functions & Pointers

Introduction to Functions, Returning Data From a Function, Passing Data Into a Function, Getting Valid User Input, Changing Parameter Values, Pointer Basics, Changing the Pointed to Value, Walking an Array with Pointers, Dynamic Memory Allocation, Getting More Memory, Pointers to Structure. **4 Hours**

Module-3

Algorithm analysis

Introduction to Algorithm Analysis, Big-O, Big-O Examples, Dynamic Array Operations, Bubble Sort, Selection Sort, Insertion Sort, Recursion, Recursive Binary Search, Merge Sort. **4 Hours**

Module-4

Object-oriented programming

Designing for Object-Oriented Programming, Core Concepts of OO Programming: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object-oriented programming paradigm. **4 Hours**

Module-5

Frontend and backend development

UI, Database management: DBMS overview, Relational Data Model and the CREATE TABLE Statement, Basic Query Formulation with SQL. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITC39B.1	Illustrate the use of logical conditions, declare and manipulate data into arrays
22ITC39B.2	Implement functions, function calls, and parameter passing
22ITC39B.3	Design, implement, and evaluate an algorithm to meet desired needs
22ITC39B.4	Describe the core concepts of OOP's
22ITC39B.5	Recognize the concepts of front-end development and database management

Sources
1. Computational Thinking with Beginning C Programming Specialization: https://www.coursera.org/learn/simulation-algorithm-analysis-pointers?specialization=computational-thinking-c-programming#syllabus 2. Simulation, Algorithm Analysis, and Pointers: https://www.coursera.org/lecture/simulation-algorithm-analysis-pointers/big-o-examples-pdCan 3. Programming Fundamentals: https://www.coursera.org/learn/programming-fundamentals?specialization=c-programming#syllabus 4. Object-Oriented Programming Concepts: https://www.coursera.org/learn/concepts-of-object-oriented-programming#syllabus 5. Introduction to Back-End Development: https://www.coursera.org/learn/introduction-to-back-end-development

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITC39B.1	2	1	1											
22ITC39B.2	2	1	1											
22ITC39B.3	1	1	2											
22ITC39B.4	2		1											
22ITC39B.5	2	1	1											

1: Low 2: Medium 3: High

IV Semester

ANALYSIS OF DETERMINATE STRUCTURES			
Course Code	**22CIV41**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:2:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: The objective of the course is to

- Illustrate different forms of structures and evaluate their indeterminacy, and analyze determinate truss.
- Analyze the deflection of simple beams by different methods.
- Associate the concepts of Energy Principles and Energy Theorems
- Analyze parabolic and circular arches and determine the length of the cables under various load cases.
- Relate influence lines for long-span structures and describe the behavior of structural components subjected to rolling loads.

Module-1 Introduction and Analysis of Plane Trusses (8 hours)

Structural forms, Conditions of equilibrium, Compatibility conditions, Degree of freedom, Linear and non-linear analysis, Static and kinematic indeterminacies of structural systems, Types of trusses, Assumptions in analysis, Analysis of determinate trusses by method of joints and method of sections.

Applications: Classification of the structures, Analysis of trusses

Module-2 Deflection of Beams (8 hours)

Definition of slope, Deflection and curvature, Sign conventions, Derivation of the moment-curvature equation. Conjugate beam method- Introduction, support conditions for the conjugate beams Numerical on cantilever beams, simply supported beams. Moment area method - Introduction, equation for slope and deflection, Numerical on the cantilever, simply supported beams.

Applications: Calculation of deflection and slope for the determinate beams, problems using Staad pro

Module-3 Energy Principles and Energy Theorems (8 hours)

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

Deflection at the point of application of single load, Castigliano's theorems and its application to estimate the deflections of trusses, bent frames, Special applications - Dummy unit load method.

Applications: Calculation of deflection for the determinate beams, bent frames and trusses

Module-4 Arches and Cable Structures (8 hours)

Three hinged parabolic arches with supports at same and different levels. Determination of normal thrust, radial shear, and bending moment. Analysis of cables under point loads and UDL. Length of cables for supports at same and at different levels- Stiffening trusses for suspension.

Applications: Determination of forces developed in the arches and cables

Module-5 Influence Line Diagram and Rolling Loads (8 hours)

Introduction to influence line diagram (ILD), applications, difference between ILD and BMD, construction of ILD for support reactions, shear force, and bending moments in determinate beams- ILD for axial forces in determinate trusses. Reactions, BM, and SF in determinate beams using rolling loads concepts.

Applications: Determination of the stresses developed by moving loads using ILD

Course Outcomes: At the end of the course, the student will be able to:	
22CIV41.1	Apply the method of joints and sections to evaluate the reactions and forces in trusses

22CIV41.2	Apply the concept of moment area and conjugate beam method to determine deflection and slope at required points in a determinate structure
22CIV41.3	Develop strain energy expressions and calculate the deflection at points for determinate beams and trusses using the concept of strain energy
22CIV41.4	Calculate the deflections of beams and bent frames using the unit load and Castigliano's theorems
22CIV41.5	Compute the stress resultants in three hinged arches and cables
22CIV41.6	Make use of the concept of influence lines to construct the influence line diagram for analyzing the rolling loads

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Theory of Structures	GS Pandit, SP Gupta, R Gupta	Tata McGraw Hill, New Delhi.	2013
2	Basic structural analysis	CS Reddy	Tata McGraw Hill, New Delhi.	Second Edition, 2012
3	Theory of Structures	Punmia B. C., Ashok Kumar Jain, Arun Kumar Jain	Volume I & Volume II, Laxmi Publications (P) Ltd	Twelfth Edition, 2013
4	Structural Analysis – I	SS Bhavikatti	Vikas Publishing House Pvt. Ltd, New Delhi	Fourth Edition, 2013
Reference Books				
1	Structural Analysis	Hibbeler R C	Prentice Hall	Eigth Edition 2019
2	Structural Analysis	Devados Menon	Narosa Publishing House, New Delhi	Second Edition, 2018
3	Theory of Structures	Ramamrutham S, Narayan R	Dhanpat Rai & Sons, New Delhi	Ninth Edition, 2014
4	Structural Analysis	Thandavamoorthy T S	Oxford university press	Sixth Edition, 2015

Web links/Video Lectures/MOOCs

1. Structural analysis – I, IITB https://nptel.ac.in/courses/105101085/
2. Structural analysis – I, IITKH https://nptel.ac.in/courses/105105166/
3. Structural analysis – II, IITKH https://nptel.ac.in/courses/105105109/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV41.1	2	3												1
22CIV41.2	2	3			2									1
22CIV41.3	2	3												1
22CIV41.4	2	3												1
22CIV41.5		3												1
22CIV41.6	2	3												1

1: Low 2: Medium 3: High

Water and Municipal Wastewater Engineering			
Course Code	**22CIV42**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives: The objective of the course is to

- Define the characteristics of water and examine different approaches to population forecasting
- Illustrate the details of water treatment units
- Determine the goals of collecting wastewater and evaluate the attributes of wastewater.
- Depict details regarding wastewater treatment units.
- Discuss different approaches to the water distribution system and clarify the process of laying, testing, and sewer appurtenances.

Module-1 Quantity and Quality of Water (8 Hours)

Environmental pollution due to human activities, Types of water demands, Per capita consumption and factors for per capita demand, Population forecasting, Fire demand, design periods & factors governing the design period. Physical, chemical, and biological examinations using instrumental and analytical techniques.

Applications: Analysis of water quality, determination of water quantity.

Module-2 Treatment of Water (8 hours)

Flow diagram of municipal water treatment plant. Preliminary treatment. Primary treatment: sedimentation tanks, types, operations. Filtration: Mechanism, types of filters. Disinfection-methods of disinfection, Hardness removal: lime soda process and zeolite process, fluoridation and defluoridation. Design of rising main

Applications: Determination of water treatment units, application of treatment units.

Module-3 Measure and Examination of Sewage (8 hours)

Introduction: Necessity for sanitation, methods of domestic wastewater disposal, types of sewerage systems and their suitability.

Quantity of sewage: Dry weather flow (DWF) and wet weather flow (WWF), factors affecting DWF and WWF, estimation of storm flow, time of concentration. Self-cleansing and non-scouring velocities. Physical, chemical, and biological characteristics, BOD and COD.

Disposal of effluents — natural and artificial methods.

Applications: Determine various treatment techniques, determine types and characteristics of wastewater.

Module-4 Treatment of Wastewater (8 hours)

Flow diagram of municipal water and wastewater treatment plant, Preliminary treatment- Screening, grit chambers, skimming tanks, Primary treatment, Secondary treatment: Attached growth process-trickling filter, suspended growth process — Activated sludge process, SBR, MBBR, Aerated Lagoons, Oxidation Ditches.

Applications: Determination of wastewater treatment units, application of wastewater treatment units.

Module- 5 Collection systems and Testing of Sewers (8 hours)

Collection and conveyance of water from surface and subsurface sources, intake structures.
Methods of distribution systems- System of supply and Methods of layout distribution.
Laying, testing, ventilation of sewers. Sewer appurtenances: manholes, oil and grease traps, drainage traps.

Applications: Determination of various collection system of water, testing of sewers

PRACTICAL MODULE

A–Demonstration (offline/virtual):

A1. Air quality monitoring of the area
A2. Quantitative estimation of aluminum by precipitation method
A4. Determination of chloride content in the given water sample by Argentometric method

B–Exercise (compulsorily to be conducted):

B1. Determination of Alkalinity, Acidity, and pH.
B2. Determination of Chlorides.
B3. Determination of Calcium, Magnesium and Total Hardness.
B4. Determination of solids: Total solids, suspended solids, dissolved solids, and settleable solids.
B5. Determination of Optimum dosage of Alum by Jar test.

C–Structured Enquiry (compulsorily any 4 to be conducted):

C1. Determination of BOD.
C2. Determination of COD.
C3. Determination of Available Chlorine in bleaching powder.
C4. Determination of Chlorine Demand and Residual Chlorine.
C5. Determination of Iron.
C6. Determination of Sulphate and Nitrates.

D–Open Ended Experiments (any one):

D1. Gravimetric estimation of Fluorides in water
D2. E-coli in the given wastewater sample

Course Outcomes: At the end of the course the student will be able to:	
22CIV42.1	Identify the sources and characteristics of water.
22CIV42.2	Estimate the quantity of drinking water and design the various treatment units.
22CIV42.3	Identify the source and estimate quantity of wastewater generated.
22CIV42.4	Analyze characteristics of wastewater, explain the importance of disposal of sewage and design the various treatment units.
22CIV42.5	Understand the process of conveyance and distribution of water involving transportation of water and its distribution to users.
22CIV42.6	Evaluate the process of laying and testing of sewers involving the laying of pipes and testing for leakage.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Water Supply Engineering	S.K. Garg	Khanna Publishers	35th Edition 2016
2	Wastewater treatment	S. K. Garg	Khanna Publishers	41st Edition 2016
Reference Books				
1	Water Technology	Hammer and Hammer	Tata McGraw-Hill	17th Edition 2016
2	Wastewater Engineering: Treatment and Resource Recovery	Metcalf & Eddy Inc., George Tchobanoglous, H. David Stensel, RyujiroTsuchihashi, Franklin L. Burton	McGraw-Hill Education	5th Edition, 2013

3	Environmental Engineering	Howard Peavey, Donald Rowe, George Tchobanoglous	McGraw Hill Education	1st Edition, 2017

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/105/105/105105201/
- https://nptel.ac.in/courses/105/105/105105048/
- https:/nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce26/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV42.1	2	1				2	2						2	3
22CIV42.2	2	2				2	2						2	3
22CIV42.3	1	2				2	3						1	3
22CIV42.4	1	1				2	3						1	3
22CIV42.5	1	2				2	3						1	3
22CIV42.6	2	1				2	2						2	3

1: Low 2: Medium 3: High

Engineering Survey Theory and Practice			
Course Code	**22CIV43**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Integrated	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:2	SEE	3 Hours
Total Hours	40 hours Theory + 10 Lab slots	Credits	04

Course Learning Objectives:

1. To understand principles of basic surveying to measure linear measurements
2. To understand principles of basic surveying to measure angular measurements
3. To understand effectively field procedures required for a professional surveyor
4. To apply techniques and skills necessary for Engineering practices
5. To use the conventional surveying instruments necessary for Engineering practices
6. To use Total Station in surveying to evaluate earthwork involved in the construction works

Module-1 - Horizontal Distances **8 Hours**

Introduction: Definition of surveying, Objectives and importance of surveying. Classification of surveys. Principles of surveying. Units of measurements, Surveying measurements and errors, types of errors, precision and accuracy.

Measurement of Horizontal Distances: Measuring tape and types. Measurement using tapes, Taping on level ground and sloping ground. Errors and corrections in tape measurements, ranging of lines, direct and indirect methods of ranging, Electronic distance measurement, basic principle. Booking of tape survey work, Field book, entries, Conventional symbols, Obstacles in tape survey, Numerical problems.

Applications: Linear measurements

Module-2-Directions and Angles **8 Hours**

Measurement of Directions and Angles: Compass survey: Basic definitions; meridians, bearings, magnetic and True bearings. Prismatic and surveyor's compasses, temporary adjustments, declination. Quadrantal bearings, whole circle bearings, local attraction and related problems

Traversing: Traverse Survey and Computations: Latitudes and departures, rectangular coordinates, Traverse adjustments, Bowditch rule and transit rule, Numerical Problems.

Applications: Measurements in horizontal plane

Module-3-Leveling **8 Hours**

Leveling: Basic terms and definitions, Methods of leveling, Dumpy level, auto level. Curvature and refraction corrections. Booking and reduction of levels. Differential leveling, profile leveling, fly leveling, check leveling, reciprocal leveling.

Applications: Measurements in vertical plane

Module-4 Miscellaneous applications **8 Hours**

Areas and Volumes: Measurement of area by dividing the area into geometrical figures, area from offsets, mid ordinate rule, trapezoidal and Simpson's one third rule, area from coordinates. Measurement of volumes- trapezoidal and prismoidal formula.

Contouring: Contours, Methods of contouring, Interpolation of contours, contour gradient, characteristics of contours and uses.

Curve Surveying: Curves – Necessity – Types, Simple curves, Elements, Designation of curves, Setting out simple curves by linear methods (numerical problems on offsets from long chord & chord produced method), Setting out curves by Rankine's deflection angle method (numerical problems).

Applications: Topographic surveying/mapping

Module-5 -GIS and GPS	**8 Hours**
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. **Global Positioning System:** Definition, Principles of GPS, components of GIS, and applications. **Advanced instrumentation in surveying:** classification, measuring principles, Electronictheodolite, EDM, Total Station, Drones surveying - Introduction, definitions, basics principles, methods, Importance of scale **Applications:** Mapping/Location based information	
List of Laboratory Experiments related to above modules – 2 hours each	
1. Measurement of horizontal distances in plane and sloping land 2. Setting out the perpendicular distance by various methods 3. Measurement of bearing using prismatic compass 4. Construction of Pentagon and Hexagon using Prismatic compass 5. Determination of difference in elevation between given points by height of instrument method 6. Determination of difference in elevation between given points by rise and fall method 7. Determination of true difference in elevation between given points by reciprocal levelling 8. Measurement of horizontal angle by repetition and reiteration method 9. Construction of contour map using total station	

Course Outcomes: At the end of the course, the student will be able to:	
22CIV43.1	Apply the principles of basic surveying to measure linear measurements.
22CIV43.2	Comprehend the principles of basic surveying to measure angular measurements
22CIV43.3	Analyze the effective field procedures required for a professional surveyor
22CIV43.4	To apply techniques and skills necessary for Engineering practices
22CIV43.5	Demonstrate the use of conventional surveying instruments necessary for Engineering practices
22CIV43.6	Demonstrate the use of Total Station in surveying to evaluate earthwork involved in the construction works

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of Publisher**	**Edition and Year**
Textbooks				
1	Surveying	B.C. Punmia	Laxmi Publications pvt. Ltd., New Delhi	**Vol.1,** 2009
2	Surveying and Levelling	Kanetkar T P and S V Kulkarni	Pune Vidyarthi Griha Prakashan	**Part I**, 2006
Reference Books				
1	Surveying Vol.1	S.K. Duggal	Tata McGraw Hill Publishing Co. Ltd. New Delhi. –	3rd Edition, 2009
2	Surveying Vol. 1	K.R. Arora	Standard Book House, New Delhi. –	12th Edition, 2010

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
22CIV43.1		2		3										
22CIV43.2		2		3									2	
22CIV43.3		2		3										
22CIV43.4		2		3									2	
22CIV43.5					2							2		
22CIV43.6					2							2		

1:Low 2: Medium 3: High

Concrete Technology			
Course Code	**22CIV44**	CIE Marks	50
Course Type	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: The objective of the course is to

- Describe the basic Engineering Properties of the concrete.
- Demonstrate fresh properties of concrete.
- Demonstrate hardened properties of concrete.
- Design required grades of concrete using concrete mix design principles.
- Describe the different properties of special concrete.

Module - 1: Concrete Ingredients (8 hrs.)

Cement - Cement manufacturing process with flow charts. Steps to reduce carbon footprint, Bogue's compound and transition zone in cement paste, chemical composition and their importance, cement hydration, and cement types. Quality of mixing water.

Fine aggregate - Functions, requirement, Alternatives to River sand, M-sand introduction and manufacturing its significance and differences.

Coarse aggregate - Importance of size, shape, and texture. Grading and blending of aggregate, Recycled aggregates.

Chemical admixtures - plasticizers, accelerators, retarders, and air-entraining agents.

Mineral Admixtures – Fly ash, GGBS, and Silica fume (Basic concepts)

Testing of concrete ingredients as per ASTM standards

Module - 2: Fresh Concrete (8 hrs.)

Workability - Factors affecting workability. Segregation and Bleeding. Measurement of workability – Slump, Compacting factor, Vee - Bee Consistometer tests.

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. Testing as per BIS and ASTM standards .

Module - 3: Hardened Concrete (8 hrs.)

Strength - Factors influencing strength, W/C ratio, testing of hardened concrete,

Creep - Factors affecting creep.

Shrinkage of concrete - Factors affecting shrinkage, Types of Shrinkage.

Durability - Definition, and significance of durability. Durability requirements as per IS-456, Internal and external factors influencing durability, Mechanisms- Sulphate attack – chloride attack, carbonation, freezing, and thawing, Corrosion of reinforcement.

In situ testing of concrete - Penetration and pull-out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications, and limitations

Testing as per BIS and ASTM standards.

Module – 4: Concrete Mix Proportioning (8 hrs.)

Concept of Mix Design with and without admixtures, variables in proportioning, and Exposure conditions. Examples of Mix Proportioning using IS – 10262: 2019.

Module – 5: Special Concretes (8 Hrs.)

Ready Mixed Concrete - Manufacture, properties, advantages, and disadvantages.

Self-Compacting concrete - concept, materials, tests, properties, application, and typical mix.

Introduction to: High Strength Concrete, High-Performance Concrete, Fiber-reinforced concrete, and Lightweight concrete.

Course Outcomes: At the end of the course, the student will be able to:	
22CIV44.1	Explain material characteristics and their influence on the microstructure of concrete.
22CIV44.2	Examine the behaviour of concrete in the Fresh state.
22CIV44.3	Analyze the behaviour of hardened concrete.
22CIV44.4	Make use of professional codes to proportion different types of concrete mixes for required fresh and hardened properties.
22CIV44.5	Interpret knowledge of special concrete for different construction work based on the requirement.
22CIV44.6	Examine the physical properties of the concrete materials.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Concrete Technology - Theory and Practice	M.S. Shetty	Chand and Company, New Delhi,	2018
2	Concrete Technology	Gambhir B L	Tata McGraw Hill, New Delhi	2017
Reference Books				
1	Concrete Technology	Adam M. Neville and J. J. Brooks	Prentice-Hall.	2012
2	Concrete Technology	A. R Santhakumar	Oxford University Press India	2018
3	Concrete – Microstructure, properties, and materials	Mehta P, P Monteiro	Tata McGraw Hill Publications, New Delhi	2005
4	IS 10262 2019 Concrete Mix Design or latest.			

Web links/Video Lectures/MOOCs

1. Concrete technology: http://nptel.ac.in/courses/105102012/
2. Concrete Engineering and Technology: http://nptel.ac.in/courses/105104030/

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO 1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV44.1	3	-	-	-	-	-	2	-	-	-	-	-	-	-
22CIV44.2	3	-	-	-	-	-	-	-	-	-	-	-	2	-
22CIV44.3	3	-	-	-	-	-	-	-	-	-	-	-	2	-
22CIV44.4	-	-	3	-	-	-	-	-	-	-	-	2	-	-
22CIV44.5	3	-	-	-	-	-	-	-	-	-	-	2	-	-
22CIV44.6	-	-	-	3	-	-	-	-	2	-	-	2	-	-

1: Low 2: Medium 3: High

Building Information Modeling in Architecture, Engineering and Construction (BIM)			
Course Code	**22CIV451**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: The objective of the course is to

- Understand BIM fundamentals and its importance in the construction industry.
- Apply BIM for design integration and coordination in architectural, structural, and MEP disciplines.
- Utilize BIM for construction sequencing, quantity takeoff, and project coordination.
- Explore advanced applications of BIM in infrastructure, smart cities, and facility management.
- Foster collaboration skills and adaptability to emerging trends in the BIM field.

Module-1 Introduction to Building Information Modeling (8 hours)

Evolution of Engineering, Introduction to BIM Concepts and Design Authoring: Evolution of Engineering from 2D drawings to BIM Model, Isometric View, Limitation of Isometric views and concept of 3D-Modeling, Building Information Modelling – Introduction & Process, Design Authoring – Concepts and workflow, Fundamentals of Discipline Based Modelling, Introduction to stages of BIM Modelling process as per ISO 19650, Federated model- concepts and demonstrations, workflow of design coordination, Engineering Analysis – Concept and types of analysis, Process and workflow of Design Review in BIM.

Applications: To understand the basics of BIM

Module-2 BIM Fundamentals and Collaboration (8 hours)

Visualization and Interference/Clash check: Views in BIM Model, Visualization Modes, Walkthrough of the Model, Fly through the model, Layers & Properties, Concept of viewpoints, Sectioning and Visualization through Tablet and Mobile, Concept of BIM Kiosk & BIM Rooms, Visualization through Augment Reality (AR), Virtual Reality (VR) & Mixed Reality (MR) Clash Check – Types, Clash avoidance process, Clash Detection Process, Clash Detection Priority Matrix and Report generation, Clash Detection Rules, Report, Grouping, Clash Detection Process – Demo.

Applications: For the efficient building design, construction, and management through information sharing and teamwork.

Module-3 BIM Modeling and Design Integration (8 hours)

Documentation & CDE & Level of Development: Documentation and CDE (Common Data Environment) -2D drawings generation from BIM Model, Computer Network types, Concept of Cloud Computing, Concept and Application of CDE: Traditional Information Sharing, Definition, Reference, and Concept, Setting up the workflow and process for CDE- File naming convention, Roles and Responsibilities, Request for Information and Review Process Concept of LOD (Level of Development), preparation of LOD matrix and Progression matrixDefinition of LOD, Level of Detail and Information, LOD- Wall foundation, Precast Structural Inverted T-Beam, Domestic Water Piping, Plumbing Fixture, Packaged Generator Assembly, LOD- Chart, Matrix and Model Progression Matrix

Applications: For the creation of digital models and integrating design disciplines to enhance collaboration and coordination during the building design phase.

Module-4 BIM in Construction and Project Management(8 hours)

4D / Field BIM & Its Applications: Introduction to 4D / Field BIM: Concept of 4D, Introduction to construction sequence and project schedule, Project scheduling using Gantt Chart and its limitation, 4D BIM ModelingProject demo and workflow, Synchronization of 4D BIM Model with project schedule, Reviewing project progress w.r.t planned dates and actual dates, Generation of Reports Application of Field BIM/ 4D BIM: Understanding concept and usage of BIM in field for coordination- 3D Coordination and Visual Communication, Site utilization planning and Construction analysis, Application of wearables in coordination. 3D Control and planning Other

Applications of Field BIM/ 4D BIM: Concept and usages of BIM in field for safety, disaster and risk analysis, digital fabrication and scan to BIM, Existing Condition Modeling, Phase Planning, As-built/ Record Models **Applications:** To utilize digital models and information management to enhance efficiency and coordination throughout the construction process and project management activities.
Module-5 Advanced Topics in BIM (8 hours)
5D BIM, AIM & Beyond BIM - Emerging Trends: 5D BIM: Introduction concepts of 5D BIM, Quantity take off with UoM, Concept of QTO with UoM, 5D BIM with UoM with cost, Quantity take off exercise, Demo of Quantity take off: Understanding QTO for Wall, Plaster & Tile, BIM Maturity LOD and General Practice of QTO, Cost Breakup structures, 5D BIM and cost control AIM: Introduction to Asset Information Model (AIM), COBie structures and Asset Information Deliverables, Space Attributes and Asset Attributes- Examples with data, Asset requirement Discipline wise Infrastructure System, Classification code and Information Exchange, Information Exchange with Facility Management Beyond BIM: Emerging Trends- Concepts of Industrialization, IoT, Big Data, Data Analytics and their applications in BIM: Industrialization of Construction through BIM- DfMA, IoT in BIM, BIM and Big data, Data Analytics using AI & ML Future scope of BIM Applications: Smart Infrastructure and the need for connected infrastructure, Digital twins- Concepts and benefits, National Digital Twin or a City level Digital Twin in a Smart City, Fundamental requirements for the success of a Digital Twin and its uses, Digital Twin applications in diverse industries. **Applications:** In-depth exploration and application of advanced concepts and techniques within Building Information Modeling.

Course Outcomes: At the end of the course the student will be able to:	
22CIV451.1	Apply BIM concepts and principles to design and execute civil engineering projects effectively.
22CIV451.2	Demonstrate proficiency in utilizing BIM software and tools for data management and collaborative decision-making.
22CIV451.3	Integrate BIM methodologies into architectural, structural, and MEP design processes to enhance coordination and efficiency.
22CIV451.4	Utilize BIM techniques for construction sequencing, cost estimation, and project coordination, promoting effective project execution.
22CIV451.5	Analyze and evaluate the advanced applications of BIM in infrastructure, smart cities, and facility management contexts, assessing their benefits and limitations.
22CIV451.6	Evaluate emerging trends in BIM and assess their potential impact on the civil engineering industry, fostering adaptability and future-readiness.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Building Information Modeling	Arayiei Yusuf	Singapore	First Edition 2015
2	Building Information Modeling : Global & Indian Perspective	Dr. Adv. Harshul Savla , Dr. Chandrahauns Chavan, Ar. Pallavi Patil	Notion Press	November 2021
Reference Books				
1	Building Information Modeling: Planning and Managing Construction	Willem Kymmell	McGraw-Hill Education	First Edition 2008

	Projects with 4D CAD and Simulations			
2	BIM for Construction Health and Safety	Stefan Mordue, Roland Finch, and Ray Sheriff	Routledge	First Edition 2018

Web links and Video Lectures (e-Resources):
i)E-learning content on L&T EduTech Platform: https://lntedutech.com/building-information-modeling/
ii) "BIM Fundamentals for Engineers" by Coursera:
https://www.coursera.org/learn/bim-fundamentals?utm_source=gg&utm_medium=sem&utm_campaign=B2C_INDIA_google-cybersecurity-certificates_PMax-arte-NRL_within_14D&utm_content=B2C&campaignid=20361657342&adgroupid=&device=c&keyword=&matchtype=&network=x&devicemodel=&adpostion=&creativeid=&hide_mobile_promo&gclid=CjwKCAjw1t2pBhAFEiwA_-A-NHJDwFIqqpTBuLaf7PirmxKyz8yZjfR_YaNWaeqhAnig8yNllyEoYRoCpR4QAvD_BwE

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CIV451.1	2	-	-	-	-	-	-	-	-	-	-	2	-	-
22CIV451.2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
22CIV451.3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
22CIV451.4	3	-	-	-	-	-	-	-	-	-	-	-	2	-
22CIV451.5	-	-	-	-	2	-	-	-	-	-	-	-	2	-
22CIV451.6	3	-	-	-	-	-	-	-	-	-	-	-	2	-

1: Low 2: Medium 3: High

Remote Sensing and Geographical Information System			
Course Code	**22CIV452**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: This course will enable students to

- Understand the basic concepts of remote sensing.
- Analyze satellite imagery and extract the required units.
- Extract the GIS data and prepare the thematic maps.
- Use the thematic camps for various applications.

Module-1 Introduction to Remote Sensing (8 hours)

Remote Sensing: Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, and vegetation), Resolution, image registration and Image and False color composite, elements of visual interpretation techniques.

Application: Environmental monitoring, land resource management, infrastructure development, disaster management, and geospatial analysis.

Module-2 Sensor Characteristics and Digital Image Processing (8 hours)

Remote Sensing Platforms and Sensors: Indian Satellites and Sensors characteristics, Remote Sensing Platforms, Sensors and Properties of Digital Data.

Data Formats: Introduction, platforms IRS, Landsat, SPOT, Cartosat, Ikonos, Envisat etc. sensors, sensor resolutions (spatial, spectral, radiometric and temporal).

Basics of digital image processing: Introduction to digital data, systematic errors (Scan Skew, Mirror-Scan Velocity, Panoramic Distortion, Platform Velocity, Earth Rotation) and non-systematic [random] errors (Altitude, Attitude), Image enhancements (Gray Level Thresholding, level slicing, contrast stretching), Image filtering.

Application: Land surveying, infrastructure planning, monitoring and assessment, image processing and analysis.

Module-3 Introduction to GIS (8 hours)

Geographic Information System: Introduction to GIS; components of a GIS; Geographically Referenced Data, Spatial Data- Attribute data-Joining Spatial and attribute data.

GIS Operations: Spatial Data Input – Attribute data Management, Geographic coordinate System, Datum.

Map Projections: Types of Map Projections, Projected coordinate Systems. UTM Zones.

Application: To analyze and visualize geospatial data for applications such as urban planning, infrastructure design, environmental modeling, and transportation network analysis.

Module-4 GIS Data Models (8 hours)

Data Models:-

Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Relational Database.

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, and Data conversion.

Application: For analyzing continuous data, to perform spatial analysis, map generation, and infrastructure planning.

Module-5 Integrated Applications of RS & GIS (8 hours)

Integrated Applications of Remote sensing and GIS: Applications in land use land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management. Location Based Services and Its Applications.

Application: Engineering projects and decision-making process

Course Outcomes: At the end of the course the student will be able to:	
22CIV452.1	Collect data and delineate various elements from the satellite imagery using their spectral signature.
22CIV452.2	Analyze different features of ground information to create raster or vector data.
22CIV452.3	Perform digital classification and create different thematic maps for solving specific problems
22CIV452.4	Make decision based on the GIS analysis on thematic maps.
22CIV452.5	Use the Remotely sensed and GIS integrated data in various fields of application.
22CIV452.6	Know about the various satellite parameters to obtain a specific image for an application.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Remote Sensing and Image Interpretation	Lilles and Kiefer, Chipman	Wiley India	6th Edition, 2017
2	Geographical Information Science	Panigrahi Narayan	University Press	2013
3	Introduction to Geographic Information Systems	Chang Kang-Tsung	McGraw Hill, New Delhi	2016
Reference Books				
1	Remote Sensing of the Environment	Jensen John R	Pearson Education Pvt. Ltd.	2017
2	Textbook of Remote Sensing and Geographical Information Systems	Reddy M Anji	BSP BS Publications	2013

Web links and Video Lectures (e-Resources):

1. **NPTEL: Remote Sensing and GIS - https://nptel.ac.in/courses/105103193/**

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV452.1		2										2		
22CIV452.2		2										2		
22CIV452.3		2										2		
22CIV452.4		2										2		
22CIV452.5		2			2							2		
22CIV452.6		2			2							2		

1: Low 2: Medium 3: High

Construction Equipment, Plants and Machinery			
Course Code	**22CIV453**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	3:0:0	SEE	3 Hours
Total Hours	40 hours Theory	Credits	03

Course Learning Objectives: This course will enable students to

- Understand the role and significance of construction plants and machinery in construction projects.
- Familiarize with different types of construction plants and machinery and their applications.

Module-1. Introduction to Construction Equipment (8 hours)

Construction Equipment: Identification – Planning – Equipment Management in Projects.
Equipment for Earthwork: Fundamentals of Earth Work Operations – Earth Moving Operations – Types of Earth Work Equipment – Tractors, Motor Graders, Scrapers, Front end Waders, Earth Movers.
Application: Gain knowledge about Earthwork equipment and management.

Module-2. Other Construction Equipment (8 hours)

Other Construction Equipments: Equipment for Dredging, Trenching, Tunneling, Drilling, blasting – Equipment for Compaction – Erection Equipment – Types of pumps used in Construction – Equipment for Dewatering and Grouting – Foundation and Pile Driving Equipment.
Application: Utilization of other equipments in construction projects

Module-3 Materials handling Equipment (8 hours)

Materials handling Equipment: Forklifts and related equipment – Portable Material Bins – Conveyors – Hauling Equipment.
Application: Selection of Materials handling Equipment in construction

Module-4 Equipment for Production of aggregate and concreting (8 hours)

Equipment for Production of aggregate and concreting
Crushers – Feeders – Screening Equipment – Handling Equipment – Batching and Mixing Equipment – Hauling, Pouring and Pumping Equipment – Transporters.
Application: Types of Equipment for Production of aggregate and concreting

Module-5 Plants and Machinery (8 hours)

Introduction to Construction Plants and Machinery: Definition and importance of construction plants and machinery, Overview of common types of construction plants and machinery, Trends and advancements in plant and machinery technologies.
Application: Importance of Plants and Machinery for the construction projects

Course Outcomes: At the end of the course the student will be able to:	
22CIV453.1	Identify and classify different types of earthwork equipment, such as tractors, motor graders, scrapers, front-end loaders, and earth movers.
22CIV453.2	Gain knowledge about the equipment requirements and selection criteria for dredging, trenching, tunnelling, drilling, and blasting operations in construction projects.
22CIV453.3	Evaluate and select appropriate equipment based on project specifications, soil conditions, and operational requirements.
22CIV453.4	Identify different types of forklifts and related equipment, portable material bins, conveyors, and hauling equipment used in construction projects.
22CIV453.5	Select appropriate equipment for specific material processing, handling, mixing, and transportation requirements.
22CIV453.6	Make use of the importance of construction plants and machinery in construction projects.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Construction Planning, Equipment, and Methods	Robert L. Peurifoy, Clifford J. Schexnayder, Robert Schmitt, Aviad Shapira	Mcgraw Hill	Ninth Edition-October 2021
2	Construction Equipment and Management	S. C. Sharma	Khanna Publication	First Edition January 2019
3	Advance construction and equipments	R P Rethaliya,	Atul Prakashan	First edition January 2019
Reference books				
1	Construction equipment management	Johne. Schaufelberger, giovanni c. Migliaccio	Routledge	First edition March 2019
2	Construction Equipment Management for Engineers, Estimators, and Owners	Douglas D. Gransberg and Jorge A. Rueda-Benavides	CRC Press	Second Edition June 2020

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV453.1	3					2								
22CIV453.2	3					2								
22CIV453.3	3					2								
22CIV453.4	3					2								
22CIV453.5	3					2								
22CIV453.6	3					2			2	2				

1: Low 2: Medium 3: High

Python Programming for Civil Engineering			
Course Code	**22CIV454**	CIE Marks	50
Course Type (Theory/Practical/Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	2:0:2	SEE	3 Hours
Total Hours	26 hours Theory + 10 Lab slots	Credits	03

Course Learning Objectives: The objective of the course is to

- To describe the core syntax and semantics of Python programming language and need for working with functions and strings.
- To illustrate the process of structuring the data using Lists Dictionaries , Tuples and sets
- To understand the use files and Object-oriented Programming concepts in Python.
- To write on Civil Engineering application programs based on GUI Designs

Module-1 (8 Hours)
Identifiers, Keywords, Statements and Expressions, Variables, Operators, Type Conversions, Control Flow Statements, Catching Exceptions, Functions, Strings **Applications:** Supporting content in programme development.
Module-2 (8 hours)
Lists, Dictionaries, Tuples and Sets. **Applications:** Supporting content in programme development. **Arrays in Python,Slicing ,Numpy,operations on arrays**
Module-3 (8 hours)
Files ,Object-Oriented Programming, Classes and Objects , Constructor Method , Inheritance and Polymorphism ,overloading and overriding, abstract classes ,Exception handling **Applications:** Supporting content for programme development.
Module-4 (8 hours)
Introduction to Data science- Functional Programming, JSON and XML in python, NumPy and pandas. **Applications:** Supporting content for programme development.
Module- 5 (8 hours)
Graphical user interfaces; event-driven programming paradigm; tkinter module, creating simple GUI **Applications:** Overall programming skills development

PRACTICAL MODULE

A–Exercise/Demonstration

A1. Python variable, control structures, functions

A2. Python Iterative statements

B–Exercise

B1. Python String operations

B2 File Handling in Python

C–Exercise (C4 Compulsory)

C1. Lists, Tuples, Dictionaries

C2. Regular Expressions

C3. Socket Programming

C4. Object Oriented Concepts using Python in Civil Engineering

Course Outcomes: At the end of the course the student will be able to:	
22CIV454.1	Write the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements and express proficiency in using functions and strings.

22CIV454.2	Determine the methods to create and manipulate Python programs by utilizing the data structures like Lists Dictionaries ,Tuples and sets
22CIV454.3	Identify and use the commonly used operations involving file systems
22CIV454.4	Apply object-oriented programming concepts to Civil Engineering.
22CIV454.5	Implement exemplary applications related to network programming, web services and using data science libraries.

Sl. No.	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Introduction to Python Programming	Gowrishankar S, Veena A	CRC Press/Taylor & Francis	1st Edition 2018
2	Python Programming	Michael DAWSON	Course technology PTR	3rd Edition, 2010
Reference Books				
1	Automate the Boring Stuff with Python	Al Sweigart	No Starch Press	1st Edition 2015
2	Python Data Science Handbook: Essential Tools for Working with Data	Jake VanderPlas	O'Reilly Media	1st Edition 2016

Web links and Video Lectures (e-Resources):

- Learn Python Programming https://www.programiz.com/python-programming/tutorial
- Python Tutorial for Beginners https://www.guru99.com/python-tutorials.html
- #0 Python for Beginners | Programming Tutorial https://www.youtube.com/watch?v=QXeEoD0pB3E&list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3

Course Articulation Matrix

Course Outcomes (COs)	**Program Outcomes (POs)**													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV454.1			2			3					2			
22CIV454.2			2			3					2			
22CIV454.3			2			3					2			
22CIV454.4			2			2					2			
22CIV454.5			2			2					2			

1: Low 2: Medium 3: High

Concrete Lab			
Course Code	**22CIV46L**	CIE Marks	50
Course Type	Practical	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P)	0:0:2	SEE	3 Hours
Total Hours	13 Lab Slots	Credits	01

Course Learning Objectives: The objective of the course is to

- To learn the procedure for testing concrete ingredients as per standard code recommendations.
- To learn the properties and behaviour of the materials and their influence on concrete performance.
- To learn the process of proportioning concrete mixes to achieve desired strength and workability.
- To provide an overview of various non-destructive testing methods and focuses on the practical aspects of conducting non-destructive tests.

LIST OF EXPERIMENTS

1. Tests on Cement

a. Normal Consistency
b. Setting time
c. Compressive strength
d. Soundness
e. Fineness by air permeability test
f. Specific gravity

2. **Tests on Coarse aggregate:**

a. Aggregate crushing value
b. Aggregate impact value
c. Flakiness and Elongation index
d. Aggregate abrasion value

3. **Tests on Concrete:**

a. Design of concrete mix as per IS 10262: 2019
b. Tests on fresh concrete:
    i. Slump test,
    ii. Compaction factor and
    iii. Vee Bee test
c. Tests on hardened concrete:
    i. Compressive strength test,
    ii. Split tensile strength test,
    iii. Flexural strength test
d. NDT tests by rebound hammer and pulse velocity test.

4. Tests on Self-Compacting Concrete:

a. Slump flow test,
2. V-funnel test,
c. J-Ring test,
d. U-Box test and
f. L-Box test

Course Outcomes: At the end of the course, the student will be able to:	
22CIV46L.1	Evaluate the basic properties of cement to safeguard the quality of construction.
22CIV46L.2	Determine the properties of natural aggregates used in construction.
22CIV46L.3	Assess the properties of fresh concrete to control workability.

22CIV46L.4	Evaluate the properties of hardened concrete for strength requirements.
22CIV46L.5	Demonstrate the methods used for Non-destructive testing of concrete.
22CIV46L.6	Assess the properties of fresh concrete to self-compacting concrete.

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Concrete Technology - Theory and Practice	M.S. Shetty	Chand and Company, New Delhi,	2018
2	Concrete Technology	Gambhir B L	Tata McGraw Hill, New Delhi	2017
Reference Books				
1	Concrete Technology	Adam M. Neville and J. J. Brooks	Prentice-Hall.	2012
2	Concrete Technology	A. R Santhakumar	Oxford University Press India	2018
3	Concrete – Microstructure, properties, and materials	Mehta P, P Monteiro	Tata McGraw Hill Publications, New Delhi	2005

Web links/Video Lectures/MOOCs

1. Concrete Technology: http://nptel.ac.in/courses/105102012/
2. Concrete Engineering and Technology: http://nptel.ac.in/courses/105104030/
3. Consistency and setting time of cement: https://www.youtube.com/watch?v=sl0smPfvVAo
4. Compressive strength and soundness of cement: https://www.youtube.com/watch?v=EJVSxsCin3E
5. Fineness of cement: https://www.youtube.com/watch?v=vP2NFJk2G0w
6. Flakiness and Elongation index of aggregates: https://www.youtube.com/watch?v=acfJIG9o8iw
7. Aggregate impact value: https://www.youtube.com/watch?v=Mn7aeorMpTs
8. Aggregate crushing value: https://youtu.be/lE7LFOuGKyI
9. Aggregate abrasion value: https://www.youtube.com/watch?v=trOVxg9GYls
10. Compacting factor test: https://youtu.be/HuxfQ0lwXOI
11. Compressive strength of concrete: https://youtu.be/e8bH26-3PCw

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22CIV46L.1	-	-	-	2	-	-	-	-	1	-	-	2	2	-
22CIV46L.2	-	-	-	2	-	-	-	-	1	-	-	2	2	-
22CIV46L.3	-	-	-	2	-	-	-	-	1	-	-	2	2	-
22CIV46L.4	-	-	-	2	-	-	-	-	1	-	-	2	2	-
22CIV46L.5	-	-	-	2	-	-	-	-	1	-	-	2	2	-
22CIV46L.6	-	-	-	2	-	-	-	-	1	-	-	2	2	-

1: Low 2: Medium 3: High

Universal Human Values- II			
Course Code	**22UHV47**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

This introductory course input is intended:

1. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of Human reality and the rest of existence. Such a holistic perspective forms the basis of Universal Human Values and movement toward value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Module-1 Introduction to Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.

Activities: Sharing about Oneself, Exploring Human Consciousness and Exploring Natural Acceptance. **5 Hours**

Module-2 – Harmony in the Human Being

Understanding Human beings as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health.

Activities: Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body and Exploring the difference of Needs of Self and Body. **5 hours**

Module 3 – Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order.

Activities: Exploring the Feeling of Trust, Exploring the Feeling of Respect and Exploring the Feeling systems to fulfil Human Goal. **5 hours**

Module-4 – Harmony in the Nature/Existence

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence.

Activities: Exploring the Four Orders of Nature and Co-existence in Existence. **5 hours**

Module-5 – Implications of the Holistic Understanding – a Look at Professional Ethics

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

Activities: Exploring Ethical Human Conduct**,** Humanistic Models in Education and steps of Transition towards Universal Human Order. **5 hours**

Course Outcomes: At the end of the course the student will be able to:	
22UHV47.1	Practice the method of self-exploration to understand the basic human aspiration.
22UHV47.2	Distinguish between needs of self and body.
22UHV47.3	Evolve a program for self-regulation and health.
22UHV47.4	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them.
22UHV47.5	Realize sustainable solutions to the problems in society and nature.
22UHV47.6	Develop competence in professional ethics and strategies for the transition towards a value-based life/profession.

Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
Textbooks				
1	Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books, New Delhi	2nd Revised Edition, 2019
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	Excel Books New Delhi	2nd Revised Edition, 2019
Reference Books				
1	Jeevan Vidya: Ek Parichaya	A Nagaraj	Jeevan Vidya Prakashan Amarkantak	1999
2	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	2004

Additional Resources/Web links/Video Lectures

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
4. Economy of Permanence - J C Kumarappa
5. Bharat Mein Angreji Raj – Pandit Sunderlal
6. Rediscovering India - by Dharampal
7. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
8. India Wins Freedom - Maulana Abdul Kalam Azad
9. Vivekananda - Romain Rolland (English)
10. Gandhi - Romain Rolland (English)
11. UHV-I Teaching material (Presentations, Pre & Post Surveys etc.)
https://fdp-si.aicte-india.org/AicteSipUHV_download.php
12. Details of UHV-II: Universal Human Values – Understanding Harmony and Ethical Human Conduct
https://drive.google.com/file/d/1cznDaqDwKy__EKWmqJLWF94MeY4AXcsU/view?usp=sharing

13. Recorded FDP (Refresher 1 Part 1: Preparing to teach UHV-I in SIP)
https://www.youtube.com/watch?v=kejuD4faDDE&list=PLWDeKF97v9SOjS4RanhaYj4YLiImqm5pj&index=1

14. Resources, including the class notes and presentations
https://drive.google.com/drive/folders/1nh9m5ibEtvMyqekeiexAJtfbdNtmtt6-?usp=sharing

15. Hindi Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SMRfe5PK1HPYnEcrrJOL6K7

16. English Recording of 5-day UHV FDP
https://www.youtube.com/playlist?list=PLWDeKF97v9SP7wSlapZcQRrT7OH0ZlGC4

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22UHV47.1						3		2						
22UHV47.2						2			3					
22UHV47.3						2		3						
22UHV47.4							3							
22UHV47.5			3				2							
22UHV47.6								3				2		

1: Low 2: Medium 3: High

Biology for Engineers			
Course Code	**22BFE47**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(2:0:0)	SEE Marks	50
Credits	**02**	Exam Hours	02

Course Learning Objectives:

1. To bring awareness of biological concepts to engineering students
2. To introduce the building blocks of life and their complexity
3. To encourage interdisciplinary studies and projects
4. To appreciate the discoveries that mimic nature and its working
5. To inculcate nature-inspired design and operational principles

Module-1 **5 Hours**

Basic Cell Biology: Introduction to Biology, The cell: the basic unit of life, Expression of genetic information-protein structure and function, Cell metabolism; Cells respond to their external environments, Cells grow and reproduce, Cellular differentiation.

Module-2 **5 Hours**

Biochemistry and Molecular Aspects of Life: Biodiversity-Chemical bonds in Biochemistry; Biochemistry and Human biology, Protein synthesis -DNA; RNA, Transcription and translation factors play key roles in protein synthesis, Differences between eukaryotic and prokaryotic protein synthesis, Stem cells and their applications.

Module-3 **5 Hours**

Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network), Respiratory system, sensory system (electronic nose, electronic tongue), Visual and auditory prosthesis (Bionic eye and cochlear implant).

Module-4 **5 Hours**

Relevance of Biology as an interdisciplinary approach: Biological observation that led to major discoveries, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf), Bird flying (aircraft), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro).

Module-5 **5 Hours**

Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling, Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems, Dynamic Updating DNA Computing Algorithms, Bee-Hive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.

Course Outcomes: At the end of the course the student will be able to:	
22BFE47.1	Discuss how the cell forms the basic building block of life
22BFE47.2	Distinguish between transcription and translation
22BFE47.3	Describe the role played by proteins within the cell
22BFE47.4	Analyze the role of bioinspired design in novel applications
22BFE47.5	Apply bioinspired design principles to other domains
22BFE47.6	Implement a simple genetic algorithm

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Text Books				
1	Biology for Engineers	Thyagarajan.S., Selvamurugan. N., Rajesh.MP, Nazeer RA, Richard W. Thilagaraj, Barathi.S., and Jaganthan.M.K	Tata McGraw Hill	2012
2	Molecular Biology	Robert Weaver	McGraw-Hill	5th Edition, 2012
Reference books				
1	Lewin's Genes XII	Jocelyn E. Krebs, Elliott S. Goldstein, Stephen T. Kilpatrick	Jones and Bartlett Learning	2017
2	Bioinspired Engineering	Jenkins, C.H.	Momentum Press	2012
3	Bio mimetics: Nature-Based Innovation	Yoseph Bar-Cohen	CRC Press	1st Edition, 2016
4	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo	Springer	2019

Web links/Video Lectures/MOOCs

1. https://books.google.co.in/books?id=-2LNBQAAQBAJ&printsec=frontcover#v=onepage&q&f=false
2. https://www.aminotes.com/2017/02/biology-for-engineers-module-1-cocepts.html

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22BFE47.1	2					1								
22BFE47.2		1				1								
22BFE47.3	2					2								
22BFE47.4		2										2		
22BFE47.5	2											2		
22BFE47.6		2										2		

1: Low 2: Medium 3: High

COMPUTATIONAL TOOLS FOR ENGINEERS			
Course Code:	**22CTE48**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	50
Credits	**01**	Exam Hours	02

Course Learning Objectives:

1. Apply modeling and simulation tools for a wide range of engineering problems.
2. Understand the analysis of data in Excel with statistics.
3. Use MATLAB and Simulink to perform engineering system analysis.

The engineering design process heavily relies on modeling and simulation. Modern simulation techniques enable the development of multi-physical, holistic system models that account for all system interactions. These digital models speed up the design and testing processes, saving time and money.

Module 1

Engineering Design Analysis

Need for engineering design analysis. Product and system design. Introduction to analysis parameters – stress, deformation, acceleration, internal force and stability. Static structural analysis of engineering design using finite element method (case studies). Heat transfer and fluid dynamics modeling and simulation using CFD software (case studies).

10 Hours

Module 2

Data Analysis with EXCEL

Calculate Mean, Median, Mode, Minimum, Maximum, Quartiles, Variance and Standard Deviation from some numbers. Analyze a population using data samples. Group data, build XY charts, apply Logarithmic Scale and Trend Line on a chart, forecast from some data, and calculate running averages. Normal Distribution, Exponential Distribution, Uniform Probabilities, Binomial Distribution, and Poisson Distribution.

4 Hours

Module 3

MATLAB and Simulink for Engineers

Applications of MATLAB and Simulink in electrical engineering, electrical machines and power system projects, simulation of rectifiers, inverters, choppers, and cycloconverters.

10 Hours

Course Project

Solve complex engineering problems via modeling and simulation. The project work is teamwork of 3-5 students. The goals should be clearly defined, use any software tool, and rigorous validation of the mathematical model should be done (experimental or theoretical).

Course Outcomes: At the end of the course, the student will be able to:	
22CTE48.1	Apply the Finite Element Method to solve engineering problems
22CTE48.2	Solve statistical problems using Excel
22CTE48.3	Perform system-level analysis using MATLAB and Simulink
22CTE48.4	Build mathematical models for any given engineering problem.
22CTE48.5	Demonstrate teamwork and communication skills

Sl. No.	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Reference Books				
1	**MATLAB and Simulink for Engineers**	Agam Kumar Tyagi	Oxford University Press	2012
2	**Practical Finite Element Analysis**	Nitin S.Gokhale	Finite to Infinite	2020
3	**Excel Crash Course for Engineers**	Eklas Hossain	Springer	2021

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22CTE48.1	1				1	1								
22CTE48.2		1			2				2					
22CTE48.3		1			2									
22CTE48.4					2	2								
22CTE48.5	1								2					

1: Low 2: Medium 3: High

Industry Oriented Training - Business Etiquettes			
Course Code	**22ITB49A**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

- Know the components of self-introduction
- Develop a resume with the inclusion of core competencies
- Involve and contribute to group discussions
- Develop effective communication to succeed in the professional career
- Know the etiquettes of digital communication

Module-1

Self-Introduction &Essentials of grooming

Self-Introduction: Learn the secret to introducing Yourself, Things to avoid when introducing yourself. Activity: Video record the self-introduction. **Essentials of grooming:** Creating the first impression, what does the well-dressed man wear? What does the well-dressed woman wear? Personal hygiene and habits. **4 Hours**

Module-2

Resume Writing

Purpose, Identifying Relevant Competencies, Understanding Applicant Tracking Systems, Lists of Competencies, Writing Accomplishment/ Objective Statements, Finding the Right Words- Action verbs, The Most Popular Resume Format, Other Popular Resume Formats, Do's and Don'ts. Activity: Students have to submit a copy of their resume. **4 Hours**

Module-3

Group Discussion

Types, process, Evaluation criteria, Do's and Don'ts Activity: Group discussions have to be held during the training sessions. **4 Hours**

Module-4

Communicate effectively

Build a Story, Just a Minute, Group Activities, Team building activities, Role Play, Presentation Skills. **4 Hours**

Module-5

Digital right and wrong

Virtual Communication: Agenda, being prepared, Dressing appropriately, background, Use Microphone and camera the right way, restraining from off tasks during virtual meetings, protecting confidential data during online presentations, time management. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITB49A.1	Articulate the essential components required for self-introduction in any business or a networking event and also recognize the need to dress appropriately for a successful career in the corporate
22ITB49A.2	Develop a resume inclusive of core competencies, and action verbs which are compatible with Applicant Tracking Systems
22ITB49A.3	Demonstrate the types, process and evaluation process of Group Discussion and carry out effective group discussions
22ITB49A.4	Develop skills required for effective communication
22ITB49A.5	Associate and be accustomed to the etiquette to be followed during online meetings

Sources

1. English for Common Interactions in the Workplace: Basic Level: Coursera: https://www.coursera.org/learn/english-common-interactions-workplace-basic-level
2. Personal Communication-Introduce Yourself With Confidence: https://www.udemy.com/course/how-to-introduce-yourself/
3. Professionalism, Grooming and Etiquette: https://www.edx.org/course/professionalism-grooming-and-etiquette
4. How to Write a Resume: https://www.coursera.org/learn/how-to-write-a-resume#syllabus
5. Group Discussion Strategies: https://www.udemy.com/course/group-discussion-strategies/
6. Communication Strategies for a Virtual Age: https://www.coursera.org/learn/communication-strategies-virtual-age#syllabus

References

1. https://simplifytraining.com/course/personal-hygiene-and-good-grooming/
2. https://www.udemy.com/course/group-discussion-strategies/
3. https://www.educba.com/course/group-discussion/
4. https://getrafiki.ai/meetings/rules-of-virtual-meeting-etiquette-every-sales-professional-should-follow/
5. https://thedigitalworkplace.com/articles/online-meeting-etiquette-for-attendees/
6. https://rigorousthemes.com/blog/virtual-meeting-etiquette-guidelines-ground-rules/

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITB49A.1									2	3		1		
22ITB49A.2										3		1		
22ITB49A.3									2	3	1	1		
22ITB49A.4									2	3	1	1		
22ITB49A.5									2	3	1	1		

1: Low 2: Medium 3: High

Industry Oriented Training - Computing Skills			
Course Code	**22ITC49B**	CIE Marks	50
Teaching Hours/Week (L:T:P)	(0:0:2)	SEE Marks	-
Credits	-	Exam Hours	02

Course Learning Objectives:

- Use logical conditions for problem-solving and also introduce the concepts of arrays
- Know functions, function calls, and parameter passing
- Introduce algorithms and appreciate their importance in problem-solving
- Introduce the core concepts of OOP's
- Differentiate between front-end & back-end development and recognize the use of database management

Module-1

Introduction to computing constructs

Logical conditions: For Loops, Nested For Loops, While Loops, Do-While Loops, Nesting and Boxes, and combine/negate several logical conditions using logic operations AND, OR, and NOT.

Arrays & strings: Create arrays of characters (strings), use the null terminator, and manipulate strings. **4 Hours**

Module-2

Functions & Pointers

Introduction to Functions, Returning Data From a Function, Passing Data Into a Function, Getting Valid User Input, Changing Parameter Values, Pointer Basics, Changing the Pointed to Value, Walking an Array with Pointers, Dynamic Memory Allocation, Getting More Memory, Pointers to Structure. **4 Hours**

Module-3

Algorithm analysis

Introduction to Algorithm Analysis, Big-O, Big-O Examples, Dynamic Array Operations, Bubble Sort, Selection Sort, Insertion Sort, Recursion, Recursive Binary Search, Merge Sort. **4 Hours**

Module-4

Object-oriented programming

Designing for Object-Oriented Programming, Core Concepts of OO Programming: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object-oriented programming paradigm. **4 Hours**

Module-5

Frontend and backend development

UI, Database management: DBMS overview, Relational Data Model and the CREATE TABLE Statement, Basic Query Formulation with SQL. **4 Hours**

Course Outcomes: At the end of the course the student will be able to:	
22ITC49B.1	Illustrate the use of logical conditions, declare and manipulate data into arrays
22ITC49B.2	Implement functions, function calls, and parameter passing
22ITC49B.3	Design, implement, and evaluate an algorithm to meet desired needs
22ITC49B.4	Describe the core concepts of OOP's
22ITC49B.5	Recognize the concepts of front-end development and database management

Sources
1. Computational Thinking with Beginning C Programming Specialization: https://www.coursera.org/learn/simulation-algorithm-analysis-pointers?specialization=computational-thinking-c-programming#syllabus 2. Simulation, Algorithm Analysis, and Pointers: https://www.coursera.org/lecture/simulation-algorithm-analysis-pointers/big-o-examples-pdCan 3. Programming Fundamentals: https://www.coursera.org/learn/programming-fundamentals?specialization=c-programming#syllabus 4. Object-Oriented Programming Concepts: https://www.coursera.org/learn/concepts-of-object-oriented-programming#syllabus 5. Introduction to Back-End Development: https://www.coursera.org/learn/introduction-to-back-end-development

Course Articulation Matrix

Course Outcomes (COs)	Program Outcomes (POs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ITC49B.1	2	1	1											
22ITC49B.2	2	1	1											
22ITC49B.3	1	1	2											
22ITC49B.4	2		1											
22ITC49B.5	2	1	1											

1: Low 2: Medium 3: High

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Core Values of the Institution

SERVICE

A Josephite will keep service as the prime goal in everything that is undertaken. Meeting the needs of the stakeholders will be the prime focus of all our endeavors.

EXCELLENCE

A Josephite will not only endeavor to serve, but serve with excellence. Preparing rigorously to excel in whatever we do will be our hallmark.

ACCOUNTABILITY

Every member of the SJEC Family will be guided to deliver on assurances given within the constraints set. A Josephite will always keep budgets and deadlines in mind when delivering a service.

CONTINUOUS ADAPTATION

Every member of the SJEC Family will strive to provide reliable and continuous service by adapting to the changing environment.

COLLABORATION

A Josephite will always seek to collaborate with others and be a team-player in the service of the stakeholders.

Objectives

- Provide Quality Technical Education facilities to every student admitted to the College and facilitate the development of all round personality of the students.
- Provide most competent staff and excellent support facilities like laboratory, library and internet required for good education on a continuous basis.
- Encourage organizing and participation of staff and students in in-house and outside Training programmes, seminars, conferences and workshops on continuous basis.
- Provide incentives and encouragement to motivate staff and students to actively involve in research-innovative projects in collaboration with industry and R &D centres on continuous basis
- Invite more and more number of persons from industry from India and abroad for collaboration and promote Industry-Institute Partnership.
- Encourage consultancy and testing and respond to the needs of the immediate neighbourhood.

St Joseph Engineering College

AN AUTONOMOUS INSTITUTION

Affiliated to VTU, Belagavi | Recognised by AICTE, New Delhi
Accredited by NAAC with A+ Grade
B.E. (CSE, ECE, EEE, ME, CIV), MBA & MCA Accredited by NBA, New Delhi

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