गोंय विद्यापीठ
ताळगांव पठार,
गोंय – ४०३ २०६
फोन : +९१-८६६९६०९०४८

International Year of Cooperatives
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(Accredited by NAAC)

Goa University
Taleigao Plateau, Goa-403 206
Tel : +91-8669609048
Email : registrar@unigoa.ac.in
Website : www.unigoa.ac.in

GU/Acad –PG/BoS -NEP/2025/255 Date: 18.07.2025

CIRCULAR

In continuation to the Circular No. GU/Acad –PG/BoS -NEP/2024/495 dated: 10.09.2024, the syllabus for Semester III & IV of the **Bachelor of Engineering in Civil Engineering** Programme approved by the Standing Committee of the Academic Council meeting in its meeting held on 24th and 25th June 2025 is attached.

The Dean, Faculty of Engineering and Principals of affiliated Colleges offering the **Bachelor of Engineering in Civil Engineering** Programme are requested to take note of the above and bring the contents of the Circular to the notice of all concerned.

ASHWIN VYAS LAWANDE
Digitally signed by ASHWIN VYAS LAWANDE
Date: 2025.07.18 10:12:31 +05'30'

(Ashwin V. Lawande)
Deputy Registrar – Academic

To,

1. The Dean, Faculty of Engineering, Goa University.
2. The Principals of affiliated Engineering Colleges.

Copy to,

1. The Director, Directorate of Technical Education, Govt. of Goa
2. The Chairperson, BoS in Civil Engineering.
3. The Controller of Examinations, Goa University.
4. The Assistant Registrar, Prof. Examinations (Technical and Allied), Goa University.
5. Directorate of Internal Quality Assurance, Goa University for uploading the Syllabus on the University website.

CIVIL ENGINEERING SCHEME AY 2024-25

SEMESTER - III							
Sr No.	**Course Category**	**Course Code**	**Title of the Course**	**L**	**T**	**P**	**Credits**
1	**Major**	**CIV-200**	Strength of Materials	3	0	0	3
		CIV-201	Strength of Materials Laboratory	0	0	1	1
		CIV-202	Building Planning and Drawing	2	0	0	2
		CIV-203	Building Planning and Drawing Laboratory	0	0	2	2
2	**Professional Elective**	**CIV-221**	Building Materials and Construction	3	0	0	3
		CIV-222	Building Materials and Construction Laboratory	0	0	1	1
		OR					
		CIV-223	Engineering Geology	3	0	0	3
		CIV-224	Engineering Geology Laboratory	0	0	1	1
3	**MC**	**SHM-231**	Mathematics for Civil Engineering	3	0	0	3
4	**AEC**	**AEC-251**	*	2	0	0	2
5	**SEC**	**CIV-241**	Civil Engineering Skilling Workshop	0	0	3	3
			TOTAL	**13**	**0**	**7**	**20**

** AEC Courses shall be notified by the University based on the recommendations of respective Board of Studies in languages.*

SEMESTER - IV							
Sr. No.	**Course Category**	**Course Code**	**Title of the Course**	**L**	**T**	**P**	**Credits**
1	**Major**	**CIV-204**	Concrete Technology	3	0	0	3
		CIV-205	Concrete Laboratory	0	0	1	1
		CIV-206	Surveying	2	0	0	2
		CIV-207	Surveying Laboratory	0	0	2	2
		CIV-208	Structural Analysis	3	0	0	3
		CIV-209	Structures Laboratory	0	0	1	1
		CIV-210	Fluid Mechanics and Machines	3	0	0	3
		CIV-211	Fluid Mechanics and Machines Laboratory	0	0	1	1
2	**Professional Elective**	**CIV-225**	Renewable Energy Engineering	3	0	0	3
		CIV-226	Renewable Energy Laboratory	0	0	1	1
		OR					
		CIV-227	Occupational Safety and Health	3	0	0	3
		CIV-228	Occupational Safety and Health Laboratory	0	0	1	1
		OR					
		CIV-229	Green Building - Planning and Design	3	0	0	3
		CIV-230	Green Building - Laboratory	0	0	1	1
			TOTAL	**14**	**0**	**6**	**20**

SEMESTER-III

Major Courses

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-200
Title of the Course : Strength of Materials
Number of Credits : 03
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge of Engineering Mechanics	
Course Objectives:	The course will enable the students to: 1. Understand the fundamental concepts of stress, strain, and material properties under various loading conditions. 2. Apply principles of mechanics to analyze axial, torsional, bending, and shear stresses in structural elements. 3. Analyze internal forces and deformations in beams, shafts, and columns to determine their structural behavior under load. 4. Evaluate the safety and suitability of materials and structural members.	
Content:		**No. of hours**
Unit 1	**Simple Stresses and Strains**- Concept of stress and strain, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress-strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them –Bars of varying section – composite bars – Temperature stresses. **Compound Stresses and Strains**- Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress. Two-dimensional stress-strain systems, principal strains and principal axis of strain.	**11**
Unit 2	**Bending moment and Shear Force Diagrams**- Bending moment (BM) and shear force (SF) diagrams. BM and SF diagrams for cantilevers, simply supported beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments. **Flexural Stresses-Theory of simple bending** – Assumptions, Derivation of bending equation, Neutral axis, Determination of bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.	**11**

	Shear Stresses- Shear stress distribution across various beam sections like rectangular, circular, triangular, I-section, T-section and Angle sections.	
Unit 3	**Trusses**- Analysis of statically determinate trusses by method of joints and method of sections. **Strain Energy** Resilience Gradual, sudden, impact and shock loadings simple applications. **Slope and deflection**- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.	**12**
Unit 4	**Thin & Thick Cylinders** - Derivation of formulae and calculations of hoop stress and longitudinal stress in a cylinder subjected to internal pressures. **Springs:** Analysis of closely coiled helical springs. **Structural stability**-Stability of columns, Euler's and Rankine's Formula, end conditions and effective length factor, Columns with eccentric and lateral load**.**	**11**
Instructions	At least four (04) assignments shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Text Books** 1. Bhavikatti, S. S., ''Strength of Materials'', 4th ed., Vikas Publishing House Pvt. Ltd., New Delhi, 2013, ISBN-13: 978-9325971578. 2. Beer, F. P., Johnston, E. R., Jr., DeWolf, J. T., Mazurek, D. F., & Sanghi, S., ''Mechanics of Materials'', 8th ed., McGraw Hill Education, New Delhi, 2020, ISBN-13: 978-1260113273. **Reference Books** 3. Goodno, B. J., & Gere, J. M., ''Mechanics of Materials'', 9th ed., Cengage Learning India Pvt. Ltd., New Delhi, 2022, ISBN-13: 978-9355737847. 4. Hibbeler, R. C., ''Mechanics of Materials'', 6th ed., Pearson Prentice Hall, East Rutherford, NJ, 2004, ISBN-13: 978-0131482630. 5. Timoshenko, S., & Young, D. H., ''Elements of Strength of Materials'', DVNC, New York, NY, ISBN-13: 978-0486600535.	
Course Outcomes	**After taking this course, student will be able to:** CO 1. Explain the concepts of stress, strain, and mechanical properties of materials under various loading conditions CO 2. Solve problems related to axial, torsional, bending, and shear stresses and deformations in structural members. CO 3. Analyze the behavior of structural elements (beams, shafts, columns) under combined loading using appropriate methods. CO 4. Evaluate structural safety and performance by applying design principles to real-world engineering problems.	

Name of the Programme : B.E. CIVIL ENGINEERING
Course Code : CIV-201
Title of the Course : Strength of Materials Laboratory
Number of Credits : 01
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge of Engineering Mechanics	
Course Objectives:	**The course will enable the students to**: 1. *Demonstrate* the mechanical behaviour of different engineering materials under various loading conditions such as tension, compression, bending, torsion, and shear. 2. *Provide* hands-on experience in using testing equipment and instruments for measuring material properties like Young's modulus, yield strength, hardness, and toughness. 3. D*evelop* skills to interpret experimental data and compare it with theoretical predictions, understanding the reasons for discrepancies. 4. *Cultivate* a systematic approach to conducting experiments, recording observations, ensuring safety, and preparing detailed technical reports.	
Content:		**No. of hours**
Practical:	**List of Experiments** 1. To evaluate the tensile strength of a specimen using a Universal Testing Machine (UTM). 2. To measure the hardness of a material using Brinell or Rockwell hardness test. 3. To determine the impact strength of a material using the Charpy and Izod test. 4. To calculate the spring constant for given springs. 5. To perform bend and re-bend test on steel rod. 6. To perform flexure test on wooden beam. 7. To conduct bending tests on simply supported and cantilever beams. 8. To perform the double shear test on a mild steel bar and determine its shear strength. 9. To experimentally verify Maxwell's Reciprocal theorem and measure deflections for beams. 10. Develop spreadsheets by using MS EXCEL, TK Solver, MATLAB or equivalent software for various problems.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.	
References/ Readings:	**<u>Text Books</u>** 1. Bhavikatti, S. S., ''Strength of Materials'', 4th ed., Vikas Publishing House Pvt. Ltd., New Delhi, 2013, ISBN-13: 978-9325971578.	

	2. Beer, F. P., Johnston, E. R., Jr., DeWolf, J. T., Mazurek, D. F., & Sanghi, S., ''Mechanics of Materials'', 8th ed., McGraw Hill Education, New Delhi, 2020, ISBN-13: 978-1260113273. **Reference Books** 3. Goodno, B. J., & Gere, J. M., ''Mechanics of Materials'', 9th ed., Cengage Learning India Pvt. Ltd., New Delhi, 2022, ISBN-13: 978-9355737847. 4. Hibbeler, R. C., ''Mechanics of Materials'', 6th ed., Pearson Prentice Hall, East Rutherford, NJ, 2004, ISBN-13: 978-0131482630. 5. Anand Jayakumar A, "Strength of Materials Lab Manual", Notion Press, Chennai, TN, 2020, ISBN-13 : 978-1637140109.
Course Outcomes	**After taking this course, student will be able to:** CO 1. *Demonstrate* the ability to conduct standard material tests (tension, compression, hardness, impact, torsion, etc.) using appropriate equipment. CO 2. *Analyze* experimental data to determine mechanical properties of materials and compare with theoretical values. CO 3. *Interpret* stress-strain behavior and failure characteristics of materials under various loading conditions. CO 4. *Prepare* structured lab reports with clear documentation of procedures, observations, analysis, and conclusions.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-202
Title of the Course : Building Planning and Drawing
Number of Credits : 02
Effective from AY : 2024-25

Pre-requisites for the Course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The course will enable the students to:** 1. *Understand* the principles of building planning, orientation, and architectural design requirements based on functional needs and building byelaws. 2. *Apply* **s**tandard building codes for designing residential and public buildings. 3. *Develop* the ability to prepare and interpret architectural and structural drawings, including plans, elevations, and sections. 4. *Enhance* drafting skills using both manual drawing tools and computer-aided design (CAD) software.	
Content:		**No. of hours**
Unit 1	**INTRODUCTION:** Introduction to concept of drawings, Interpretation of typical drawings, layout of drawings and Scales; Principles of planning FAR, Coverage. Building Bye laws. Symbols and sign conventions. Review of Computer Aided Drawing Concepts: Co-ordinate systems and reference planes. Commands: Initial settings, drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks.	**10**
Unit 2	**RESIDENTIAL BUILDING:** Methods of making line drawing and detailed drawing. Site plan, Floor plan, Elevation and Section. Drawing of small residential buildings. Foundation and roof plan layout.	**10**
Unit 3	**PUBLIC BUILDING:** General, Necessary and minimum requirements of Public accommodations. Design of Buildings for Education, Commercial and Health. Zoning and Design aspects	**05**
Unit 4	**PICTORIAL VIEW:** Principles of perspective drawing. Rules corresponding to perspective drawing. Drawing a Perspective view of building.	**05**
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving	
References/ Readings:	**Text Books** 1. Chitawadagi, M. V., & Bhavikatti, S. S., "Building Planning and Drawing", 1st Edition, I K International Publishing House, New Delhi, 2014, ISBN-13: 978-9382332565. 2. Shah, M. G., Kale, C. M., & Patki, S. Y., "Building Drawing with an Integrated Approach to Built Environment", 5th Edition, McGraw-Hill Education India, New Delhi, 2011, ISBN-13: 978-0071077873.	

	Reference Books 3. Patil, S. M., "Building Services: Environmental and Electro Mechanical Services", 2nd Revised Edition, Nirali Prakashan, Pune, 2014, ISBN-13: 978-8175259805.
Course Outcomes:	**After taking this course, student will be able to:** CO 1. *Explain* the principles of planning, orientation, and design requirements for various types of buildings in accordance with building bye-laws. CO 2. *Apply* building codes to plan and design functional and safe building layouts CO 3. *Prepare* detailed architectural drawings including site plans, floor plans, elevations, and sections for residential and public buildings CO 4. *Use* computer-aided design (CAD) tools to draft building plans and interpret technical drawings effectively.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-203
Title of the Course : Building Planning and Drawing Laboratory
Number of Credits : 02
Effective from AY : 2024-25

Pre-requisites for the Course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The course will enable the students to:** 1. *Familiarize* students with the use of architectural symbols, conventions, and standards in building drawings. 2. *Develop* the ability to draft building components and complete building plans manually and using CAD tools. 3. *Apply* principles of building planning, orientation, and space utilization as per relevant building bye-laws and codes. 4. *Enhance* technical drawing skills and visualization ability necessary for planning residential and public buildings.	
Content:		**No. of hours**
Practical	**List of Drawing Assignments (At least 3 drawing sheets shall be carried out on AUTOCAD and printout/hardcopies to be submitted)** 1. To draw a complete floor plan, elevation, and section of a residential building as per building byelaws. 2. To draw a complete floor plan, elevation, and section of a public building as per building byelaws. 3. To prepare a perspective view drawing of a two-storey building. 4. To draft a detailed foundation plan of a building. 5. To prepare a building plan showing any two components such as North light, roof structures, trusses, interior design, or detailing of an RCC component. A field trip should be conducted to give students hands-on experience in studying building materials and construction layouts.	**60**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.	
References/ Readings:	**<u>Text Books</u>** 1. Chitawadagi, M. V., & Bhavikatti, S. S., "Building Planning and Drawing", 1st Edition, I K International Publishing House, New Delhi, 2014, ISBN-13: 978-9382332565. 2. Shah, M. G., Kale, C. M., & Patki, S. Y., "Building Drawing with an Integrated Approach to Built Environment", 5th Edition, McGraw-Hill Education India, New Delhi, 2011, ISBN-13: 978-0071077873. **<u>Reference Books</u>**	

	3. Patil, S. M., "Building Services: Environmental and Electro Mechanical Services", 2nd Revised Edition, Nirali Prakashan, Pune, 2014, ISBN-13: 978-8175259805.
Course Outcomes:	**After taking this course, student will be able to:** CO 1. *Interpret* architectural symbols, drawing standards, and building code requirements used in construction drawings. CO 2. *Draft* building components and complete layout plans (site plans, floor plans, elevations, and sections) using manual drawing techniques and CAD software. CO 3. *Apply* principles of building planning and bye-laws to design functional and space-efficient layouts for residential and public buildings. CO 4. *Develop* accurate and well-detailed working drawings suitable for construction purposes and demonstrating professional drafting skills.

Professional Electives

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-221
Title of the Course : Building Materials and Construction
Number of Credits : 03
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The course will enable the students to:** 1. *Understand* the properties, characteristics, and uses of various traditional and modern building materials such as stone, brick, cement, concrete, wood and steel. 2. *Apply* methods and techniques involved in various stages of building construction, including foundations, walls, floors, roofs, doors, and windows. 3. *Assess* suitable materials and construction methods based on structural requirements, durability, environmental conditions, and economic factors. 4. *Develop* the ability to integrate material knowledge and construction techniques into practical building design and site execution	
Content:		**No of hours**
Unit 1	**Building Materials:** Building Stones, Bricks, Cements, M-Sand, Aggregates, Chemical Admixtures, Ceramics, and Refractories, Bitumen and asphaltic materials, Glass and Plastics, Acoustical material and geo-textiles, rubber and asbestos, Timbers, laminates and adhesives, Carbon composites **Masonry:** Brick and stone masonry, Load bearing, cavity and partition walls, stages of masonry construction. Mortar and types of mortars, Construction Joints **Lintels and Arches:** Introduction, classification and types of lintel and arches.	**10**
Unit 2	**Floors and Roofs:** Floors - Introduction, essential requirements of a floor, factors affecting selection of flooring material, types of floors, Roofs - requirements of good roof technical terms, classification, types of roof coverings for flat and pitched roof. **Doors and Windows:** Doors - Location, technical terms, size, types, construction, suitability and varieties of materials for doors and Windows - Factors affecting selection of size, shape, location and no. of windows, types, construction, suitability, fixtures and fastenings Frames for exhaust fans, Air-conditioners and forced ventilation units etc.	**11**
Unit 3	**Formwork:** Formwork, Materials, Construction, Methods of	**12**

	removal, Period of removal, Principles of Design of Formwork. **Scaffolding**: Definition, Component parts, Types of scaffolds. **Stairs and Elevators:** Types and materials for staircase, Layout and design details of Dog legged staircase, Elevators, Types - Traction - Hydraulic operation - Design considerations of passenger elevators - Handling capacity , Arrangement of lifts. Escalators, Ramps: features, operation & arrangement.	
Unit 4	**Plastering, Pointing and Painting:** Plastering: Purpose, Materials, Methods of plastering, Surface preparation, Defects in plastering, Pointing –Preparation of surface for pointing, Types, Defects, Rectification. Introduction to Paintings and types of Painting, Constituents of paints & types, Purpose of Painting, Defects in Painting, Application of Paints to new and old surfaces. **Pre-cast and pre-fab Construction**- Precast and prefab components and fabrication, total and partial prefabrication, 3D printing. **Plumbing** - Essential requirements of plumbing systems. **Termite Proofing, Sound Insulation, Thermal Insulation**- Basic principles.	**12**
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving	
References/ Readings:	**Text Books** 1. *Kumar, Sushil*, "Building Construction", 20th Edition, Standard Publishers Distributors, Delhi, 2010, ISBN-13: 978-8180141683 2. *Varghese, P. C.*, "Building Construction", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2016, ISBN-13: 978-8120352841. **Reference Books** 3. *Jha, Kumar Neeraj*, "Formwork for Concrete Structures", 9th Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2017, ISBN-13: 978-1259007330. 4. .*Rangwala, S. C.*, "Building Construction", 33rd Edition, Charotar Publishing House Pvt. Ltd., Anand, 2016, ISBN-13: 978-9385039041. 5. *Sharma, S. K.*, "Building Construction", 16th Edition, S. Chand & Co. Ltd., New Delhi, 2013, ISBN-13: 978-8121904797.	
Course Outcomes	**After taking this course, student will be able to:** CO 1. *Identify* and classify different building materials based on their properties, applications, and suitability for construction works CO 2. *Explain* the manufacturing processes, characteristics, and standards of commonly used construction materials like cement, bricks, concrete, steel, and timber CO 3. *Analyse various* techniques of building construction, including foundations, masonry, flooring, roofing, and finishes CO 4. *Select* appropriate construction materials and techniques considering structural requirements, durability, climate, and economy	

Name of the Programme : **B.E CIVIL ENGINEERING**
Course Code : **CIV-222**
Title of the Course : **Building Materials and Construction Laboratory**
Number of Credits : **01**
Effective from AY : **2024-25**

Pre-requisites for the course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The student shall be able to:** 1. *Introduce* students to various building materials through hands-on experiments to understand their physical and mechanical properties 2. *Enable* students to perform standard tests on materials such as cement, bricks, aggregates, and concrete to assess their quality and suitability for construction. 3. *Familiarize* students with basic construction practices, tools, and techniques through demonstrations and small-scale construction tasks. 4. *Develop* the ability to interpret test results and make informed decisions about material selection and usage in building construction.	
Content:		**No. of hours**
	List of Experiments 1. To evaluate the compressive strength of bricks, blocks (AAC, concrete, hollow, fly ash), paver blocks, laterite, and timber. 2. To measure the dimensional accuracy and tolerance of bricks, concrete blocks, and AAC blocks. 3. To determine the water absorption capacity of bricks, concrete blocks, laterite stone, and paver blocks. 4. (a) To conduct an efflorescence test on clay bricks. 5. (b) To conduct field tests on bricks using the ringing sound method, dropping test and hardness test. 6. To determine the density of concrete blocks, paver blocks, and timber blocks. 7. (a) To identify and classify timber based on grain pattern, colour, and texture. (b) To determine the moisture content in timber samples. 8. (a) To identify and differentiate between natural stone tiles and manufactured tiles based on texture, appearance, and finish. 9. (b) To assess the flexural and impact strength of floor tiles. 10. To perform a hydrostatic pressure test on pipes. 11. (a) To evaluate the water absorption, flexural strength and dimensional tolerance for roofing tiles.	**30**

	(b) To determine the gauge of GI/aluminium roofing sheets.	
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.	
References/ Readings:	**Text Books** 1. *Kishore, K., & Kukreja, Ravi Chawla*, "Material Testing Laboratory Manual for Quality Control", 6th Edition, Standard Publishers Distributors, Delhi, 2021, ISBN-13: 978-8186308288. 2. *Komvopoulos, Kyriakos*, "Mechanical Testing of Engineering Materials", 2nd Edition, Cognella Academic Publishing, San Diego, 2017, ISBN-13: 978-1516513376. **Reference Books** 3. *Chudley, R., & Greeno, R.*, "Building Construction Handbook", 6th Edition, Butterworth-Heinemann, Oxford, 2006, ISBN-13: 978-0750668224. 4. *Gambhir, M. L., & Jamwal, Neha*, "Building and Construction Materials", 7th Edition, McGraw Hill Education India, New Delhi, 2014, ISBN-13: 978-1259029660. 5. *Varghese, P. C.*, "Building Materials", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2015, ISBN-13: 978-8120350915.	
Course Outcomes	**After taking this course, student will be able to:** CO 1. *Identify* and describe various building materials and their properties relevant to construction practices. CO 2. *Conduct* standard laboratory tests on building materials such as cement, aggregates, bricks, and concrete to determine their quality and suitability. CO 3. *Demonstrate* the use of construction tools and basic techniques involved in masonry, plastering, concreting, and other building works. CO 4. *Analyze* test results to assess compliance with relevant standards and make recommendations for appropriate material selection.	

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-223
Title of the Course : Engineering Geology
Number of Credits : 03
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The course will enable the students to:** 1. *Understand* the fundamentals of geology and its relevance to civil engineering, including rock and mineral identification and classification 2. *Apply* geological knowledge in site selection, design, and construction of civil engineering projects like dams, tunnels, roads, and foundations. 3. *Analyse* the impact of geological processes such as weathering, erosion, earthquakes and landslides on construction and site stability. 4. *Develop* the ability to interpret geological maps, cross-sections, and subsurface data for engineering decision-making.	
Content:		**No. of hours**
UNIT 1	**Introduction to Engineering Geology**: Introduction and scope of Geology, Internal structure of the earth, Classification of Rocks Weathering, erosion and denudations process on earth material and natural agencies, Geological work of wind, river underground water and glaciers. **Structural Geology**: Outcrop, stratification, dip and strike relation, Unconformity, joints their types and genesis Faults and folds with their types and causes, Engineering consideration of joints, folds and faults	**11**
UNIT 2	**Mineralogy and Petrology**: Study of physical properties of mineral and study of common rock forming minerals & way of formation of minerals, Study of three types of rocks with reference to their formation, identification, textural and structural features Rocks and natural materials as a construction material, Geothermal Energy and basics of Petroleum exploration. **Engineering Properties of Rocks**: Laboratory and field tests for determining the physical and mechanical properties of rocks. **Concepts of Rock Mass Classification**: Overview of rock mass classification systems; Rock Mass Rating (RMR) scheme and its utilities in rock mass classification, Rock Quality Designation (RQD), Q-rating.	**11**
UNIT 3	**Earthquakes:** Basics of earthquake, earthquake history, seismic activity, concept of intensity and magnitude of	**12**

	earthquake, causes of earthquake, influence on civil structures and engineering consideration, seismic zonation. **Dams**: Parts of a dam; Types of dams; Geological considerations for selecting dam sites; Forces acting on dams and their impact on design. **Tunnels**: Parts of a tunnel; Classification of tunnels (e.g., road, rail); Ground conditions affecting tunneling; Geological considerations in tunnel construction.	
UNIT 4	**River Valley Projects**: Overview of river valley projects; Importance of geological surveys in planning. **Highways, Buildings, Bridges, and Other Structures**: Site investigations for transportation infrastructure; Geological assessments for buildings and bridges **Landslides:** Classification, causes and effect of mass movements, Influence of dip and slope Precautionary measures and control of mass movements, Case studies	**11**
Instructions	*At least four (04) assignments* shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving	
References/ Readings:	**Text Books** 1. Gokhale, K. V. G. K. Principles of Engineering Geology. BS Publications. ISBN-13: 9788178002187, ISBN-10: 8178002183 2. Bell, F. G. Fundamentals of Engineering Geology. Elsevier. ISBN-13: 9788178000985, ISBN-10: 8178000989 **Reference Books** 3. Anbalagan, R., Singh, B., Chakraborty, D., & Kohli, A. A Field Manual for Landslide Investigations. DST, Government of India, New Delhi. 4. Johnson, R. B., & Degraft, J. V. Principles of Engineering Geology. Wiley. 5. Krynine, D. P., & Judd, W. R. Principles of Engineering Geology and Geotectonics. CBS Publications & Distributors. ISBN-13: 9780070355606, ISBN-10: 0070355606. 6. Singh, B., & Goel, R. K. Rock Mass Classification: A Practical Approach in Civil Engineering. Elsevier. ISBN-13: 9780080430133, ISBN-10: 0080430139.	
Course Outcomes	**After taking this course, student will be able to:** CO 1. *Identify* and classify common rocks and minerals based on their physical properties and engineering relevance CO 2. *Explain* geological processes such as weathering, earthquakes, and landslides, and assess their impact on civil engineering structures. CO 3. *Interpret* geological maps, cross-sections to evaluate site conditions for engineering projects. CO 4. *Apply* geological knowledge in the planning and construction of engineering structures like dams, tunnels, roads, and foundations.	

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-224
Title of the Course : Engineering Geology Laboratory
Number of Credits : 01
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge on Fundamentals of Civil Engineering	
Course Objectives:	**The student shall be able to:** 1. *Familiarize* students with the physical properties and identification methods of common rocks and minerals used in engineering applications. 2. *Apply* geological fieldwork techniques practically 3. *A*nalyze subsurface geological conditions using seismic sections and geotechnical profiles 4. *Inter*pret geological maps, cross-sections, and structural features for site analysis and project planning	
Content:		**No. of hours**
	List of Experiments 1. Megascopic Identification and Description including the petrogenesis of Igneous Rocks 2. Megascopic Identification and Description including the petrogenesis of Sedimentary Rocks 3. Megascopic Identification and Description including the petrogenesis of Metamorphic Rocks 4. Megascopic Identification and Description of Ores. 5. Exercises on topographical maps for calculating the bearings, trends and understanding the scale. 6. Exercises on geological maps and drawing sections for horizontal and dipping series of beds intruded by vertical dykes. 7. To analyze master plans for river valley projects and evaluate the significance of geological surveys in planning. 8. To conduct site investigations for highways, buildings, bridges, tunnels and other structures to assess geological suitability. 9. To understand and apply rock mass classification systems for engineering geological evaluations. 10. To study the causes, classifications, and risk assessment techniques related to landslides.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.	
References/ Readings:	**Text Books**	

	1. Bell, F. G., "Fundamentals of Engineering Geology", 2nd Edition, Elsevier, Oxford, 2007, ISBN-13: 978-8178000985 2. Singh, Parbin, "Engineering and General Geology", Reprint Edition, S.K. Kataria & Sons, New Delhi, 2013, ISBN-13: 978-9350142677. **Reference Books** 3. Harvey, J. C., "Geology for Geotechnical Engineers", Cambridge University Press, Cambridge, 1982, ISBN-13: 978-0521288620. 4. Kesavulu, N. Chenna, "Textbook of Engineering Geology", 2nd Edition, Macmillan Publishers India, 2009, ISBN-13: 978-0230638709.
Course Outcomes	**After taking this course, student will be able to:** CO 1. *Identify* common rocks and minerals based on their physical properties and understand their significance in construction and engineering. CO 2. *Interpret* geological maps, cross-sections, and structural features to evaluate ground conditions for civil engineering projects. CO 3. *Use* basic field data for identifying geological features in the field. CO 4. *Analyze* subsurface geological data to assess site suitability for foundations, tunnels, dams, and other structures.

Multidisciplinary Courses

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : SHM-231
Title of the Course : Mathematics for Civil Engineering
Number of Credits : 03
Effective from AY : 2024-2025

Pre-requisites for the course:	Knowledge of Engineering Mathematics - I	
Course Objectives:	**The course will enable the students to:** 1. Understand numerical integration Laplace transforms, Fourier Series, Probability theory. 2. Compute Laplace/ inverse transform of functions, Fourier Series of functions and Probability of events. 3. Apply Laplace transform and Fourier series to solve equations. 4. Estimate a parameter by using probabilistic distribution.	
Content:		**No. of hours**
Unit 1	**Numerical integration**: Trapezoidal, Simpson's 1/3 rule, 3/8th rule – Romberg's Method – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules, **Numerical Interpolation** – Forward and Backward.	**11**
Unit 2	**Laplace Transforms:** Definition. Existence conditions, properties, inverse Laplace transforms. Convolution theorem, Application of Laplace transforms in solving linear differential equations with initial conditions	**11**
Unit 3	**Fourier Series :** Periodic functions, Trigonometric series, Euler's formulae, Dirichlet's condition, Even and odd functions, Half range series.	**12**
Unit 4	**Probability:** Definition, properties,Axioms of probability, conditional probability, theorem on total probability, Baye's theorem; Random variables-discrete & continuous; Expectation and Variance, Standard deviation, , Standard distributions: discrete-Binomial, Poisson; Normal.	**11**
Instructions	*At least four (04) assignments* shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving	
References/ Readings:	**Text Books** 1. Chandrasekharaiah, D. S., "Engineering Mathematics – Part III", 6th Edition, Prism Books Pvt. Ltd., Bangalore, 2015, ISBN-13: 978-8172861834. 2. Kandasamy, P., "Engineering Mathematics", S. Chand & Co., New Delhi, 2009, ISBN-13: 978-8121905480. **Reference Books** 3. Kreyszig, Erwin, "Advanced Engineering Mathematics", 10th Edition,	

	Wiley India, New Delhi, 2011, ISBN-13: 978-8126554232. 4. Pal, Srimanta & Bhunia, Subodh C., "Engineering Mathematics", Oxford University Press, New Delhi, 2011, ISBN-13: 978-0198066540.
Course Outcomes	**After taking this course, student will be able to:** CO 1. Understand numerical integration Laplace transforms, Fourier Series, Probability theory CO 2. CO2: Compute Laplace/ inverse transform of functions, Fourier Series of functions and Probability of events. CO 3. Apply Laplace transform and Fourier series to solve equations. CO 4. Estimate a parameter by using probabilistic distribution.

Skill Enhancement Courses

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : SEC-241
Title of the Course : Civil Engineering Skilling Workshop
Number of Credits : 03
Effective from AY : 2024-25

Pre-requisites for the Course:	Knowledge of Fundamentals of Civil Engineering	
Course Objectives:	**The student shall be able to:** 1. Understand the major requirements for practice in Civil engineering 2. Equip participants with hands-on experience in civil engineering techniques, from construction methods to project management, so they can apply theoretical knowledge to real-world situations 3. Foster intricate detailing and problem-solving skills 4. Strengthen key competencies that will help students advance in their future career in Civil Engineering.	
Content:		**No. of hours**
	The following experiments, demonstrations, skilling activities shall be carried out in the Laboratories/ College campus/ Sites: 1. To learn the basic use of construction machinery like concrete mixers, vibrators, excavators, compactors and transit mixers. 2. To observe road construction and repair activities and present findings. 3. To learn how to use a plumb bob for checking vertical alignment and using a spirit level/tube level for horizontal alignment. 4. To measure distances accurately with a measuring tape, including thread risers, wall thicknesses, window measurements, door openings, floor-to-ceiling heights, room dimensions, and overall layout measurements on construction sites. 5. To practice making cement mortar and casting concrete cubes for testing. 7. To learn how to build formwork for concrete casting. 8. To understand and practice bar bending for reinforcing concrete. 9. To practice basic bricklaying and masonry techniques. 10. To learn plastering techniques for wall finishes. 11. To practice applying paint to surfaces. 12. To test and understand the properties of materials like GGBFS and fly ash etc. 13. To practice estimating quantities for construction tasks like excavation, plastering, and flooring.	**90**

	14. To explore and learn about safety practices in construction through case studies. 16. To practice drawing an existing structure using CAD software. 17. To create a column center line layout using CAD. 18. To learn how to draft RCC structural elements in CAD. 19. To practice drafting structural steel elements using CAD. 20. To understand the process of preparing documents for a construction license.	
Instructions:	A minimum of 14 experiments/ activities shall be completed from the above list. A Technical report of the above performed activities shall be submitted	
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.	
References/ Readings:	**Reference Books** 1. Shah, M. G., Kale, Patki, "Building Drawing with an Integrated Approach to Built Environment", 5th Edition, Tata McGraw-Hill Education India, New Delhi, 2011, ISBN-13: 978-0071077873. 2. Sushil Kumar, "Building Construction", 20th Edition, Standard Publication, New Delhi, 2010, ISBN-13: 978-8180141683. 3. Jha, Kumar Neeraj, "Formwork for Concrete Structures", 9th Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2017, ISBN-13: 978-1259007330. 4. Rangwala, S. C., "Building Construction", 33rd Edition, Charotar Publishing House Pvt. Ltd., Anand, 2016, ISBN-13: 978-9385039041. 5. Chitawadagi, M. V., & Bhavikatti, S. S., "Building Planning and Drawing", 1st Edition, I K International Publishing House, New Delhi, 2014, ISBN-13: 978-9382332565. 6. Kishore, K., & Kukreja, Ravi Chawla, "Material Testing Laboratory Manual for Quality Control", 6th Edition, Standard Publishers Distributors, Delhi, 2021, ISBN-13: 978-8186308288. 7. Bureau of Indian Standards (BIS), The National Building Code, Volumes I & II, Bureau of Indian Standards, New Delhi, 2016.	
Course Outcomes:	**After taking this course, student will be able to:** CO 1. *Identify* and handle basic civil engineering tools, materials, and equipment used in construction activities. CO 2. *Demonstrate* fundamental construction practices such as bricklaying, bar bending, concreting, plumbing, and surveying. CO 3. *Apply* safety protocols, teamwork, and effective communication in a simulated construction environment. CO 4. *Interpret* simple civil engineering drawings and execute layout marking and measurements on-site.	

SEMESTER IV

Major Courses

Name of the Programme	**: B.E CIVIL ENGINEERING**
Course Code	**: CIV-204**
Title of the Course	**: Concrete Technology**
Number of Credits	**: 3**
Effective from AY	**: 2024-25**

Pre-requisites for the Course:	Knowledge of Fundamentals of Civil Engineering and Building Materials & Construction	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the properties and roles of various ingredients of concrete such as cement, aggregates, water, and admixtures. 2. **Apply** standard codes and procedures to design concrete mixes and conduct tests on fresh and hardened concrete. 3. **Analyze** the influence of mix proportions, curing methods, and additives on concrete strength and durability 4. **Evaluate and develop** concrete mixes for different structural and environmental conditions, including the use of sustainable materials.	
Content:		**No. of hours**
Unit 1	**Materials for Concrete :** Importance of cement in preparation of concrete, Chemical compound of ordinary Portland cement, Bougue's compounds and its functions, Types and Grades of cement and its uses, Lime calcined clay cement. Physical properties- Fineness, consistency of Cement, IST & FST, Soundness & Compressive Strength of cement and its I.S. Requirements, Its Importance &their related Test as per Indian Standards, Role of Coarse & Fine Aggregates in Concrete, Classifications of aggregate on the basis of its size, shape, texture and weight Sieve Analysis, Water Absorption Specific Gravity of Fine Aggregate & Coarse Aggregate, Coarse Aggregate Impact Value, Crushing Value & Abrasion Value, Flakiness & Elongation Index, its importance & their related Test as per Indian Standards, Requirements of quality for water in concrete. Water quality tests and permissible limits of various parameters. **Fresh Concrete :**Fresh concrete and its properties - Workability, harshness, Segregation and bleeding, Factors affecting workability, water cement ratio, Methods of measurement of workability Slump Test & Compaction Factor Test, Relation between workability and strength of concrete, Methods of mixing of concrete – Hand & Machine Mixing and its Transportation and Placing, Methods of compaction of concrete	**12**

	and its suitability, Factors affecting compaction, Curing and its importance , its methods and suitability, Effect of curing on development of strength of concrete	
Unit 2	**Hardened Concrete :**Hardened Concrete and its Properties, Compressive Strength ,Tensile Strength, Bond Strength, Flexure Strength Durability, impermeability, Factors affecting Compressive Strength, Creep of Concrete & its effect , factors affecting Creep, IS Test Procedure to find Compressive & Tensile Strength of Concrete, Acceptance Criteria , Mean Strength & Standard Deviation, Durability of Concrete & factors affecting it, Economy of Concrete & factors affecting it, Methods of Non Destructive Test of Concrete Rebound Hammer Test, Ultrasonic Pulse Velocity Test, Importance of NDT. Plastic and drying shrinkage: causes and control measures. Microstructure of hardened concrete, role of hydration products and porosity.	**11**
Unit 3	**Special Concrete & Concreting Techniques:** Light weight concrete, Plum concrete, Fiber reinforced concrete, Polymer concrete, High density concrete, High performance concretes, No fines concrete, Ferro cement, Fly ash concrete, Pumpable Concrete, Ready mix concrete, Self-compacting concrete. **Reinforced Cement Concrete:** Fundamentals of RCC and its properties. **Admixtures and Construction Chemicals:** Admixtures and its benefits, Types of Admixtures - Accelerator and Retarder Plasticizer and Super Plasticizer Water roofing and Air entraining admixture, Utility of Admixtures, Possible construction chemicals to be covered	**12**
Unit 4	**Concrete Mix Design: Factors** affecting quality of concrete, Advantages of Quality control. Concrete Mix Design and its importance. Nominal Mix and Design Mix., Factors affecting concrete mix design. Different methods of Mix Design and its suitability. I.S. method to design a Concrete Mix As per IS 10262-2009, Example of Mix design as per I.S. method, Concept of design Mix of self-compacting concrete, pumpable concrete, high performance concrete and ultra high performance concrete.	**10**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Text Books** 1. Shetty, M. S., "Concrete Technology", S. Chand and Company Ltd., New Delhi, 2016, ISBN-13: 978-8121900034. 2. Neville, A. M., "Properties of Concrete", Pitman Publishing Limited, London, 1995, ISBN-13: 978-8131791073 **Reference Books** 3. Gambhir, M. L., "Concrete Technology", 3rd Edition, Tata McGraw Hill	

	Publishing Co. Ltd., New Delhi, 2007, ISBN-13: 978-1259062551 4. Gupta, B. L., & Gupta, Amit, "Concrete Technology", Jain Book Agency, New Delhi, 2010, ISBN-13: 978-8180141706. 5. Nayak, N. V., Gupta, K. G., & Savoikar, P. P. S., "A Textbook of Concrete Technology", Creative Books, New Delhi, 2021, ISBN-13: 978-8194863304.
Course Outcomes:	**After taking this course, student will be able to:** CO 1. **Understand** the properties and functions of concrete ingredients such as cement, aggregates, water, and admixtures. CO 2. **Apply** BIS/IS standards to perform tests on fresh and hardened concrete for assessing workability, strength, and durability CO 3. **Analyze** the effects of various parameters like water-cement ratio, aggregate grading, and curing methods on concrete performance CO 4. **Design** concrete mixes for different grades and environmental conditions, including the use of admixtures and sustainable materials

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-205
Title of the Course : Concrete Laboratory
Number of Credits : 1
Effective from AY : 2024-25

Pre-requisites for the Course:	Knowledge of Fundamentals of Civil Engineering and Building Materials & Construction	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the physical and mechanical properties of cement, aggregates, and fresh/hardened concrete through laboratory experiments 2. **Apply** standard testing procedures as per IS/BIS codes to evaluate concrete materials and mix performance 3. **Analyze** the influence of mix design parameters, workability, and curing methods on the quality and strength of concrete 4. **Develop** appropriate concrete mixes using conventional methods and admixtures to meet specific structural and environmental requirements	
Content:		**No. of hours**
	List of Experiments 1. To determine the physical properties of cement as per BIS Codes. 2. To determine the flakiness and elongation index of coarse aggregates. 3. To determine the silt content in fine aggregates. 4. To determine the specific gravity, water absorption, bulk density and voids of aggregates. 5. To perform particle size distribution of fine, coarse, and all-in aggregates by sieve analysis. 6. To determine the necessary adjustment for bulking of fine aggregates. 7. To determine workability of concrete by (a) Slump test (b) compaction factor test. 8. To perform non-destructive tests on concrete: a) Rebound hammer test. b) Ultrasonic pulse velocity test. c) Profometer/cover meter test. 9. To conduct mix design using admixtures and test for compressive strength of concrete cubes for various grades with normal and accelerated curing. 10. To develop spreadsheets for concrete mix design using MS Excel, TK Solver, or equivalent software.	**30**

Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving.
References/ Readings:	**Text Books** 1. Shetty, M. S., "Concrete Technology", S. Chand and Company Ltd., New Delhi, 2016, ISBN-13: 978-8121900034. 2. Neville, A. M., "Properties of Concrete", Pitman Publishing Limited, London, 1995, ISBN-13: 978-8131791073. **Reference Books** 3. Gambhir, M. L., "Concrete Technology", 3rd Edition, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 2007, ISBN-13: 978-1259062551 4. Gupta, B. L., & Gupta, Amit, "Concrete Technology", Jain Book Agency, New Delhi, 2010, ISBN-13: 978-8180141706. 5. Nayak, N. V., Gupta, K. G., & Savoikar, P. P. S., "A Textbook of Concrete Technology", Creative Books, New Delhi, 2021, ISBN-13: 978-8194863304.
Course Outcomes:	**After taking this course, student will be able to:** CO 1. Identify and explain the properties of cement, aggregates, and concrete through lab testing CO 2. Perform standardized tests on fresh and hardened concrete as per IS/BIS codes. CO 3. Analyze the results of concrete tests to assess the impact of mix proportions and materials CO 4. Design and prepare concrete mixes incorporating admixtures and alternative materials.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV- 206
Title of the Course : Surveying
Number of Credits : 2
Effective from AY : 2024-25

Pre-requisites for the Course:	Knowledge of Building Planning and Design	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the fundamental principles and concepts of surveying, including types, methods, and instruments. 2. **Apply** standard field procedures and use various surveying instruments such as theodolite, total station, and leveling equipment. 3. **Analyze** field data and measurement errors for accurate computation of distances, angles, elevations, and areas. 4. **Develop** surveying plans, maps, and layouts for engineering projects using both manual and digital techniques. (e.g., AutoCAD, GIS).	
Content:		**No. of hours**
Unit 1	**Introduction to Surveying**: Introduction to Surveying, Classification of surveys, Sources and types of errors in survey, accuracy, precision and relative precision of measurements, Principles of Surveying **Levelling:** Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections. **Contouring:** Characteristics, methods, uses.	**08**
Unit 2	**Tacheometric Surveying** - Introduction, purpose, principle & use of tacheometry, Instrument used & stadia hairs & Fixed hair methods of tacheometry, Tacheometry constant & Problems Anallatic lens theory, subtense bar, Field work in tacheometry. Reduction of readings, errors and precisions. Difference between Theodolite & Tacheometer **Curves :** Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves **Setting out works:** General horizontal and vertical control, setting out of Foundation plan for load bearing and framed structure, Setting out of sewer line, culvert. Setting out center line for tunnel.	**07**
Unit 3	**Photogrammetric Surveying**: Introduction, principle, uses Aerial camera, aerial photographs Definitions, scale of vertical and tilted photograph Ground coordinates, ground control,. **Hydrographic Surveying**: Basic concepts& Applications	**08**

	Remote Sensing & Geographical Information System: Introduction, principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global positioning system,Types, Applications of GPS, Method of operation, System Segmentation, Concept of GIS and Spatial analysis (such as Raster and vector images, digitization, topology and their attributes, overlays and analysis; Map generation and composition) Integration of remote sensing and GIS, applications in civil engineering.	
Unit 4	**GPS -**Overview of satellite-based navigation systems , History and development of GPS , Basic principles of GPS ,Structure of GPS: Space, Control, and User segments , GPS signals and frequencies , GPS satellites and orbits GPS receivers. **Modern Field Survey Systems**: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, **Total Station** , Parts of a Total Station, Accessories, Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey	**07**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving. .	
References/ Readings:	**Text Books** 1. Punmia, B. C., Jain, Ashok Kumar, & Jain, Arun Kumar, "Surveying" – Volumes I & II, 17th Edition, Laxmi Publications, New Delhi, 2020, ISBN-13: 978-9387788280 (Vol. I), ISBN-13: 978-8131807637 (Vol. II). 2. Duggal, S. K., "Surveying" – Volumes I & II, 5th Edition, McGraw Hill Education, New Delhi, 2017, ISBN-13: 978-9352607616 (Vol. I), ISBN-13: 978-9352607630 (Vol. II). **Reference Books** 3. Arora, K. R., "Surveying" – Volumes I & II, 17th Edition, Standard Book House, New Delhi, 2020, ISBN-13: 978-8195452019 (Vol. I), ISBN-13: 978-8189401290 (Vol. II). 4. Bhavikatti, S. S., "Surveying Theory and Practice", 2nd Edition, Dreamtech Press, Bangalore, 2019, ISBN-13: 978-9389447071. 5. Roy, Madhu Sudan & Roy, S. K., "Fundamentals of Surveying", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2010, ISBN-13: 978-8120341982. 6. Subramanian, R., "Surveying and Levelling", 2nd Edition, Oxford University Press, New Delhi, 2014, ISBN-13: 978-0199455394..	
Course Outcomes:	**After taking this course, student will be able to:** CO 1. **Understand** the fundamental principles and types of surveying and instruments used. CO 2. **Apply** surveying techniques and operate instruments to collect accurate field data.	

	CO 3. **Analyze** survey measurements to compute distances, angles, elevations, and areas. CO 4. **Create** survey maps, plans, and layouts using manual methods and digital tools.

Name of the Programme : **B.E CIVIL ENGINEERING**
Course Code : **CIV- 207**
Title of the Course : **Surveying Laboratory**
Number of Credits : **2**
Effective from AY : **2024-25**

Pre-requisites for the Course:	Knowledge of Building Planning and Design	
Course Objectives:	**The student shall be able to:** 1. **Understand** the basic principles, types, and working of surveying instruments used in the laboratory. 2. **Apply** standard field procedures for measuring distances, angles, and elevations using surveying equipment. 3. **Analyze** field data to calculate areas, contours, and leveling measurements accurately. 4. **Develop** skills in preparing survey maps, layouts, and plots using both manual drafting and digital tools.	
Content:		**No. of hours**
	List of Experiments Expt 1,2, 9, 10 is intended for students to get more time to work with the Instrument. 1. To work with theodolite for angle measurement and levelling. 2. To work with total station for angle and distance measurement, including horizontal distance and R.L determination. 3. To determine the gradient using a tacheometer or total station. 4. To measure angles and horizontal distance using a total station. 5. To determine the Reduced Level (R.L) using a total station. 6. To set out building plans and foundation plans in the field using surveying instruments. 7. To set out a simple curve using the linear method. 8. To set out a simple curve using the angular method. 9. To work with a dumpy level for levelling tasks. 10. To work with an auto level for precision levelling. 11. To perform profile levelling and cross-sectioning using a dumpy level or auto level. 12. To determine area and length using GPS for mapping and surveying applications. 13. To operate drones for surveying and geospatial data collection. 14. To perform drone surveying for determination of areas and land mapping.	**60**

	15. To calculate volume using a total station for accurate volume measurements in surveying. 16. To perform radial contouring using a total station for terrain mapping. 17. To perform grid contouring using a total station for detailed surface mapping. 18. To develop spreadsheets for calculating Reduced Levels (R.L.) and interpolation using MS Excel, TK Solver, or equivalent software. 19. To generate maps using GPS data in software like QGIS, ArcGIS, or equivalent. 20. To study remote sensing images for analysis of land features and changes.	
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	
References/ Readings:	**Text Books** 1. Punmia, B. C., Jain, Ashok Kumar, & Jain, Arun Kumar, "Surveying" – Volumes I & II, 17th Edition, Laxmi Publications, New Delhi, 2020, ISBN-13: 978-9387788280 (Vol. I), ISBN-13: 978-8131807637 (Vol. II). 2. Duggal, S. K., "Surveying" – Volumes I & II, 5th Edition, McGraw Hill Education, New Delhi, 2017, ISBN-13: 978-9352607616 (Vol. I), ISBN-13: 978-9352607630 (Vol. II). **Reference Books** 3. Arora, K. R., "Surveying" – Volumes I & II, 17th Edition, Standard Book House, New Delhi, 2020, ISBN-13: 978-8195452019 (Vol. I), ISBN-13: 978-8189401290 (Vol. II). 4. Bhavikatti, S. S., "Surveying Theory and Practice", 2nd Edition, Dreamtech Press, Bangalore, 2019, ISBN-13: 978-9389447071. 5. Roy, Madhu Sudan & Roy, S. K., "Fundamentals of Surveying", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2010, ISBN-13: 978-8120341982. 6. Subramanian, R., "Surveying and Levelling", 2nd Edition, Oxford University Press, New Delhi, 2014, ISBN-13: 978-0199455394.	
Course Outcomes:	**After taking this course, student will be able to:** CO 1. Explain the principles and functions of various surveying instruments used in the laboratory CO 2. Perform accurate measurements of distances, angles, and elevations using conventional and modern surveying instruments CO 3. Analyze the collected field data to compute areas, contours, and levels with precision CO 4. Prepare and present survey maps and layouts using manual techniques and digital tools.	

Name of the Programme : **B.E Civil Engineering**
Course Code : **CIV-208**
Title of the Course : **Structural Analysis**
Number of Credits : **03**
Effective from AY : **2024-25**

Pre-requisites for the Course:	Knowledge of Strength of Materials	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the fundamental concepts of structural systems and internal forces in statically determinate and indeterminate structures. 2. **Apply** various analytical methods such as equilibrium equations, moment distribution, slope-deflection to solve structural problems. 3. **Analyze** the behavior of beams, frames, and trusses under various loading and support conditions. 4. **Evaluate** structural responses like shear force, bending moment, slope, and deflection for different types of structures.	
Content:		**No. of Hours**
Unit 1	Structural Elements: Forms of structures, conditions of stability, structural determinacy. Analysis of truss systems. Analysis of Indeterminate Beams: SFD and BMD for fixed beams; Effect of sinking of supports. SFD, BMD and Deflection diagrams for continuous beams. Force Methods: Strain energy, Castigliano's theorem, reciprocal deflection, deflection of beams using strain energy method and deflection of trusses using unit load method.	**12**
Unit 2	Displacement Methods: Moment Distribution Method, Application for continuous beams and multi storey frames, including sway analysis.	**10**
Unit 3	Displacement Methods: Slope-Deflection; Kani's Method. Application for continuous beams and frames (excluding sway.)	**13**
Unit 4	Influence Lines & Rolling loads: concept of influence lines and rolling loads, influence lines for reaction, shear force and bending moment in simply supported beams. Cables & suspension bridges. Three hinged Arches. Radial shear and normal thrust in arches. Introduction to Matrix methods of analysis. Stiffness and Flexibility matrices.	**10**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Text Books** 1. Bhavikatti, S. S., "Structural Analysis", Volume I, 4th Edition, Vikas Publishing House, New Delhi, 2011, ISBN-13: 978-8125942696. 2. Reddy, C. S., "Basic Structural Analysis", 3rd Edition, Tata McGraw-Hill, New Delhi, 2017, ISBN-13: 978-0070702769.	

	Reference Books 3. Hibbeler, R. C., "Structural Analysis", 9th Edition, Prentice Hall International, New Delhi, 2017, ISBN-13: 978-9332586147. 4. Kinney, J. S., "Indeterminate Structural Analysis", Oxford & IBH Publishing Co., New Delhi, 1957. 5. Negi, L. S., & Jangid, R. S., "Structural Analysis", Tata McGraw-Hill, New Delhi.
Course Outcomes	**After taking this course, student will be able to:** CO 1. **Understand** the behavior and internal force distribution in statically determinate and indeterminate structures. CO 2. **Apply** various methods to analyze beams, trusses, and frames. CO 3. **Analyze** the influence of various loading and support conditions on structural response parameters like bending moment, shear force, and deflection. CO 4. **Evaluate** and compare different structural analysis methods to determine the most suitable approach for solving engineering problems.

Name of the Programme : **B.E Civil Engineering**
Course Code : **CIV-209**
Title of the Course : **Structures Laboratory**
Number of Credits : **01**
Effective from AY : **2024-25**

Pre-requisites for the Course:	Knowledge of Strength of Materials	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the fundamental concepts of structural elements such as beams, trusses, arches, cables, and their responses under different support and loading conditions. 2. **Apply** analytical techniques to evaluate reactions, shear forces, bending moments, deflections, and influence lines in various structures. 3. **Analyze** the behavior of statically determinate and indeterminate structures under conditions like sinking supports and moving loads. 4. **Develop** computational tools and spreadsheets for solving structural problems using software like Excel, TK Solver, MATLAB or equivalent.	
Content:		**No. of Hours**
	List of Experiments 1. To analyze the deflections, shear force, and bending moments in simple beams. 2. To analyze the reactions and deflections of simple determinate trusses. 3. To analyze structural behavior under various types of fixities. 4. To analyze structures under different loading conditions. 5. To analyze the effects of sinking supports on structural behavior. 6. To analyze the impact of rolling loads using influence line diagrams. 7. To analyze cable structures and suspension bridge problems. 8. To analyze arch problems in structural design. 9. To develop stiffness and flexibility matrix for various types of structural elements 10. To develop spreadsheets for the analysis of beams and frames using software tools such as MS Excel, TK Solver, MATLAB, or equivalent.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	
References/ Readings:	**<u>Text Books</u>** 1. Bhavikatti, S. S., "Structural Analysis", Volume I, 4th Edition, Vikas Publishing House, New Delhi, 2011, ISBN-13: 978-8125942696.	

	2. Reddy, C. S., "Basic Structural Analysis", 3rd Edition, Tata McGraw-Hill, New Delhi, 2017, ISBN-13: 978-0070702769. **Reference Books** 3. Hibbeler, R. C., "Structural Analysis", 9th Edition, Prentice Hall International, New Delhi, 2017, ISBN-13: 978-9332586147. 4. Kinney, J. S., "Indeterminate Structural Analysis", Oxford & IBH Publishing Co., New Delhi, 1957. 5. Negi, L. S., & Jangid, R. S., "Structural Analysis", Tata McGraw-Hill, New Delhi.
Course Outcomes	**After taking this course, student will be able to:** CO 1. Understand the behavior of structural elements like beams, trusses, arches, and cables under various conditions. CO 2. Apply analytical methods to determine shear force, bending moment, deflection, and reactions CO 3. Analyze the influence of fixities, moving loads, and support settlements on structural behavior CO 4. Develop spreadsheet or software-based tools for structural analysis using MS Excel, TK Solver, MATLAB, or equivalent.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-210
Title of the Course: : Fluid Mechanics and Machines
Number of Credits : 03
Effective from AY : 2024-25

Pre-requisites for the course:	Knowledge of Engineering Mechanics	
Course Objectives:	**The course will enable the students to:** 1. **Understand t**he fundamental properties and behavior of fluids, including fluid statics, dynamics, and kinematics. 2. **Apply** governing equations like Bernoulli's, Euler's, and continuity equations to solve practical problems in fluid flow, pipe systems, and open channel flow. 3. **Analyze** fluid flow phenomena through experiments and theoretical modeling including pipe networks, hydraulic jumps, and impact of jets. 4. **Evaluate** the performance and design aspects of hydraulic turbines and pumps, incorporating efficiency, specific speed, and energy losses.	
Content:		**No. of hours**
Unit 1	**Properties of fluids –**Density, Specific weight, Specific Gravity, Kinematic and Dynamic Viscosity, Newton's law of viscosity, Distinction between Real and Ideal fluid- vapor pressure, cavitation, surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics**- Fluid Pressure: Pascal's law, Piezometer, U-Tube Manometer, Total pressure and center of pressure on submerged plane surfaces; horizontal, vertical and inclined plane surfaces, curved surface submerged in liquid Buoyancy- metacentric height, conditions of equilibrium of floating and submerged bodies, determination of Metacentric height **Fluid Kinematics**- Types of fluid flows, continuity equation in 2D and 3D considering cartesian co-ordinates, velocity and acceleration, stream and velocity potential function, Flow nets.	**12**
Unit 2	**Fluid Dynamics-** Equations of motion, Euler's equation; Bernoulli's equation and its applications, Fluid Flow Measurements- Venturimeter, orifice, rectangular and triangular notches. **Flow through Pipes**- Loss of head through pipes, Major and minor losses, Hydraulic gradient line, and total energy line -its applications Pipes in series and Parallel, Equivalent Pipe, Flow through siphons , Pipe Networks -Hardy Cross method.	**11**

Unit 3	**Open Channel Flow**- classification -Flow Analysis- Chezys equation , Design of most economical section- Rectangular, trapezoidal, and Circular-Specific Energy Curve-Hydraulic Jump- Gradually Varied flow-Channel slopes and flow profiles. **Impact of jets**: Impulse -momentum principle, Force exerted by a jet at centre and tangentially of stationary and moving plates, Introduction to hydraulic machines -Effective Head, Available power and Efficiency- Impulse and Reaction turbines-Specific Speed, Surge Tanks, Draft tubes-design aspects of Impulse turbine.	**12**
Unit 4	**Hydraulic Pumps**: Pump Classification and selection criteria, Centrifugal pumps -Classification and components. Specific speed of a centrifugal pump Pump losses and Efficiencies, Minimum speed of the pump to deliver the liquid, Design considerations **Dimensional Analysis** - Buckingham's π-Theorem, Dimensionless numbers and their significance, Model studies –Objectives and Applications, Similitude-Similarity Laws .	**10**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment. At least one site visit related to the course content shall be conducted**.**	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Text Books** 1. Modi, P. M., & Seth, S. M., "Hydraulics and Fluid Mechanics", 23rd Edition, Standard Book House, New Delhi, 2022, ISBN-13: 978-8189401269. 2. Subramanya, K., "Fluid Mechanics and Hydraulic Machines", 2nd Edition, Tata McGraw Hill, New Delhi, 2018, ISBN-13: 978-9353163426. **Reference Books** 3. Ojha, C. S. P., Berndtsson, R., & Chandramouli, P. N., "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2010, ISBN-13: 978-0195699630. 4. Rajput, R. K., "Fluid Mechanics and Hydraulic Machines", 2012th Edition, S. Chand & Company Ltd., New Delhi, 1998, ISBN-13: 978-8121916660. 5. Bansal, R. K., "Fluid Mechanics", 2nd Edition, Laxmi Publications, New Delhi, 2020, ISBN-13: 978-8131802946.	
Course Outcomes	After going through this course, student will be able to: CO 1. Understand the fundamental properties and principles governing fluid behavior in static and dynamic conditions CO 2. Apply fluid mechanics equations to solve problems involving flow through pipes, channels, and nozzles CO 3. Analyze the performance and flow characteristics in hydraulic systems including turbines and pumps	

	CO 4. Develop models using dimensional analysis and evaluate the applicability of similarity laws in fluid systems.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-211
Title of the Course : Fluid Mechanics and Machines Laboratory
Number of Credits : 01
Effective from AY : 2024-2025

Pre-requisites for the course:	Knowledge of Engineering Mechanics	
Course Objectives:	**The student shall be able to:** 1. Understand the fluid behaviour in pipes and channels 2. Conduct experiments related to fluid properties and flow rates. 3. Analyse and interpret results from experiments. 4. Understand the working and performance of pumps and turbines.	
Content:		**No. of hours**
Experiments	**List of Experiments** 1. To measure the metacentric height of a ship model. 2. To verify Bernoulli's theorem. 3. To calibrate a Venturi meter/rotameter. 4. To determine the coefficient of discharge of a notch/venturi flume. 5. **To determine major and minor losses losses in pipes** (due to bends, nozzles, and pipe friction). 6. To demonstrate Reynolds's experiment. 7. To determine Chezy's and Manning's constants for a given channel section. 8. To determine the force exerted by jet on different vanes (minimum two) 9. To determine the performance and plot characteristic curves for any hydraulic machine (Pelton wheel/ Francis turbine/ Kaplan turbine). 10. To determine the performance and plot characteristic curves for a centrifugal pump/ reciprocating pump.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	
References/ Readings:	**<u>Text Books</u>** 1. Modi, P. M., & Seth, S. M., "Hydraulics and Fluid Mechanics", 23rd Edition, Standard Book House, New Delhi, 2022, ISBN-13: 978-8189401269. 2. Subramanya, K., "Fluid Mechanics and Hydraulic Machines", 2nd Edition, Tata McGraw Hill, New Delhi, 2018, ISBN-13: 978-9353163426. **<u>Reference Books</u>**	

	3. Ojha, C. S. P., Berndtsson, R., & Chandramouli, P. N., "Fluid Mechanics and Machinery", Oxford University Press, New Delhi, 2010, ISBN-13: 978-0195699630. 4. Rajput, R. K., "Fluid Mechanics and Hydraulic Machines", 2012th Edition, S. Chand & Company Ltd., New Delhi, 1998, ISBN-13: 978-8121916660. 5. Bansal, R. K., "Fluid Mechanics", 2nd Edition, Laxmi Publications, New Delhi, 2020, ISBN-13: 978-8131802946.
Course Outcomes	After going through this course, students will be able to: CO 1. Conduct experiments related to fluid properties and flow rates. CO 2. Correlate between theory and practice. CO 3. Analyse and interpret results from experiments. CO 4. Interpret the working and performance of pumps and turbines

Professional Electives

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-225
Title of the Course : Renewable Energy Engineering
Number of Credits : 03
Effective from AY : 2024-2025

Pre-requisites for the course:	Physics	
Course Objectives:	**The course will enable the students to:** 1. Understand the fundamental principles of renewable energy systems. 2. Analyse and design renewable energy systems 3. Assess the environmental and economic impacts of renewable energy sources. 4. Explore the technological, social, and policy aspects of renewable energy implementation	
Content:		**No. of hours**
Unit 1	**Overview of Energy Resources -** Global energy demand and consumption trends, Conventional vs. renewable energy, Key environmental issues related to energy generation, Energy security and sustainability, Concept of renewable vs. non-renewable energy. Various sources of energy **Solar Energy -** Solar spectrum and its measurement, Solar energy resources and estimation, Introduction to solar energy systems. Basics of Solar Photovoltaic Systems and Solar Thermal Systems, Case studies. **Hydrogen Energy** – Green and grey hydrogen, Methods of extraction, storage and distribution	**12**
Unit 2	**Wind Energy -** Wind resources and turbine siting, Aerodynamics of wind turbines, Power generation from wind energy. Types of wind turbines (horizontal and vertical axis), Wind turbine components: rotor, generator, tower, and control systems, Basics of Wind Farm Design. **Biomass and Bioenergy -** Types of biomass resources: wood, agricultural residues, waste materials, Biomass conversion processes: combustion, gasification, fermentation, Biofuels (ethanol, biodiesel, biogas). Basics of Biomass Power Generation	**11**
Unit 3	**Hydropower Technology -** Types of hydropower systems: run-of-river, reservoir, pumped storage, Hydraulic turbines and generators. Site assessment and environmental impact. **Ocean Energy -** Tidal energy: principles and technology, Wave energy: principles and technology, Ocean thermal energy conversion (OTEC).	**12**

Unit 4	**Geothermal Resources -** Geothermal energy sources: hydrothermal, hot dry rock, and geothermal heat pumps, Methods of geothermal energy extraction, Basics of Geothermal power plants, Geothermal Applications **Basics of energy Storage and Grid Integration -** Types of energy storage: batteries, pumped storage, compressed air, thermal storage, Smart grids and microgrids.	**10**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Text Books** 1. Kishore, V. V. N., "Renewable Energy Engineering and Technology: A Knowledge-based Approach", 1st Edition, Routledge, New Delhi, 2019, ISBN-13: 978-1138866980. 2. Kothari, D. P., Singal, K. C., & Ranjan, Rakesh, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, ISBN-13: 978-9389347890. **Reference Books** 3. Boyle, Godfrey, "Renewable Energy: Power for a Sustainable Future", 3rd Edition, Oxford University Press, Oxford, 2012, ISBN-13: 978-0199681273. 4. Hagen, Kirk, "Introduction to Renewable Energy for Engineers", 1st Edition, Pearson, New Jersey, 2015, ISBN-13: 978-0133360868.	
Course Outcomes	**After going through this course, student will be able to:** CO 1. Understand global energy trends and distinguish between renewable and non-renewable energy sources. CO 2. Apply principles of renewable energy systems. CO 3. Analyze energy storage systems and smart grid integration for renewable energy. CO 4. Evaluate feasibility, efficiency, and environmental impacts of different energy technologies.	

Name of the Programme : **B.E CIVIL ENGINEERING**
Course Code : **CIV-226**
Title of the Course : **Renewable Energy Laboratory**
Number of Credits : **1**
Effective from AY : **2024-2025**

Pre-requisites for the Course:	**Physics**	
Course Objectives:	**The student shall be able to:** 1. **Understand** the fundamental principles and technologies of renewable energy sources such as solar, wind, biomass, geothermal, and tidal. 2. **Analyze** the efficiency, cost-effectiveness, and environmental impact of different renewable energy systems. 3. **Evaluate** the technical and economic feasibility of renewable energy solutions in various scenarios 4. **Design and develop** basic experiments and models to improve the performance of renewable energy technologies.	
Content:		**No. of hours**
	List of Experiments 1. To perform a study on the cost of solar power generation and its economic viability. 2. To investigate methods for enhancing the efficiency of common PV solar panels by optimizing orientation. 3. To study the use of ethanol in gasoline blends and its commercial impact on the agricultural sector. 4. To explore the methanation processes in sewage and municipal organic wastes for energy production. 5. To compare the effectiveness and feasibility of battery storage systems and pumped storage systems for energy storage. 6. To study the aspects and parameters affecting wind energy production. 7. To evaluate the uses and efficiencies of direct solar thermal water heaters in different climates. 8. To explore the potential and applications of geothermal energy as an alternative power source. 9. To analyze the potential of tidal power generation in coastal regions. 10. To study the utilization of bio-wastes for energy production and its sustainability.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	

References/ Readings:	**Text Books** 1. Kishore, V. V. N., "Renewable Energy Engineering and Technology: A Knowledge-based Approach", 1st Edition, Routledge, New Delhi, 2019, ISBN-13: 978-1138866980. 2. Kothari, D. P., Singal, K. C., & Ranjan, Rakesh, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, ISBN-13: 978-9389347890. **Reference Books** 3. Boyle, Godfrey, "Renewable Energy: Power for a Sustainable Future", 3rd Edition, Oxford University Press, Oxford, 2012, ISBN-13: 978-0199681273. 4. Hagen, Kirk, "Introduction to Renewable Energy for Engineers", 1st Edition, Pearson, New Jersey, 2015, ISBN-13: 978-0133360868.
Course Outcomes:	**After going through this course, student will be able to:** CO 1. Demonstrate understanding of techniques used in evaluating various renewable energy systems. CO 2. Conduct study experiments to measure efficiency, performance, and feasibility of solar, wind, biomass, and other energy systems. CO 3. Analyze data to compare energy technologies in terms of economic viability and environmental sustainability. CO 4. Prepare technical reports and presentations of feasible solutions.

Name of the Programme : **B.E CIVIL ENGINEERING**
Course Code : **CIV-227**
Title of the Course : **Occupational Safety and Health**
Number of Credits : **03**
Effective from AY : **2024-25**

Pre-requisites for the course:	Knowledge of Fundamentals of Civil Engineering	
Course Objectives:	**The course will enable the students to:** 1. Understand fundamentals of occupational health, common construction-related illnesses, accident investigation, reporting procedures and relevant safety legislation. 2. Identify physical, environmental, and fire hazards at construction sites and recommend control measures. 3. Apply safe construction practices, including equipment use, site layout, and demolition safety. 4. Perform risk assessments and select appropriate personal protective equipment (PPE) for civil engineering works.	
Content:		**No. of hours**
Unit 1	**Occupational Health:** Concept and scope of occupational health; History of occupational health; Occupational and work-related diseases; Characteristics of occupational illnesses. **Physical and Environmental Health Hazards:** Effects of noise, vibration, cold, heat stress, poor illumination, and thermal radiation on construction workers. **Fire Hazards and Safety:** Fire hazards in construction; Fire prevention strategies; Firefighting equipment and methods; Classification of fires and extinguishing techniques.	**11**
Unit 2	**Accident and Incident Investigation:** Definitions – accident, incident, injury, unsafe act, unsafe condition, hazard, error, oversight; Accident causation models and analysis methods. **Accident Reporting and Documentation:** Elements of construction accident reports; Standard classification of accident-related factors; Report writing techniques; IS 3786 guidelines. **Legal Framework**: Overview of Factories Act, BOCW Act, ESI Act, Workmen's Compensation Act, Contract Labour (Regulation & Abolition) Act. **Compensation and Insurance:** ESI schemes, construction site insurance practices; Legal entitlements in case of injury or death.	**11**
Unit 3	**Construction Safety in Practice:** Safety in scaffolding and shuttering/formwork; Working at heights and elevated platforms; Use of ladders, ramps, and other safe access	**12**

	systems; Good housekeeping practices and systematic waste removal to prevent tripping and fire hazards; Site layout planning for equipment movement and material storage; Hazard zoning and segregation of work areas to reduce risk; Safety protocols for the use of construction machinery, earth-moving equipment, and vehicles. **Construction Site Signage and Barricading:** Application of safety signs as per IS codes; Effective communication through visual symbols and multilingual signage; Placement and maintenance of barricades for restricted and hazardous zones. **Demolition and Deconstruction Safety:** Planning and execution of controlled demolition activities; Structural assessment prior to dismantling; Identification and safe handling of hazardous materials; Implementation of exclusion zones and debris containment measures.	
Unit 4	**Risk Assessment and Hazard Identification:** Preliminary hazard analysis, What-if analysis, Failure Mode and Effect Analysis (FMEA), Hazard and Operability (HAZOP) studies, Hazard analysis techniques, Fault tree analysis, and Event tree analysis. **Personal Protective Equipment (PPE):** Importance and need for PPE in civil construction; BIS standards for selection and application; Care and maintenance of PPE. **Types of PPE for Civil Engineering Works:** Head, ear, eye, face, hand, foot, and body protection; Respiratory PPE for confined spaces, dust exposure, welding, and chemical handling.	**11**
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Reference Books** 1. Bureau of Indian Standards, IS 13367 (Part 1):1992, "Safe Use of Cranes – Code of Practice", BIS, New Delhi, India, 1992. 2. Bureau of Indian Standards, IS 2190:2010, "Selection, Installation and Maintenance of First-Aid Fire Extinguishers – Code of Practice", BIS, New Delhi, India, 2010. 3. Bureau of Indian Standards, IS 3786:1983, "Methods for Computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents", BIS, New Delhi, India, 1983. 4. Directorate General Factory Advice Service & Labour Institutes (DGFASLI), "Construction Safety Manual", Ministry of Labour & Employment, Government of India, Mumbai, [Year Not Available]. 5. Goetsch, D. L., "Construction Safety and Health", Pearson Education, USA, [Year Not Available], ISBN-13: 978-0132374699. 6. Hinze, J., "Construction Safety", Prentice Hall, New Jersey, USA, [Year Not Available], ISBN-13: 978-0133779127.	

Course Outcomes	After going through the course, student will be able to: CO 1. Describe occupational health concepts and common construction-related hazards. CO 2. Apply safety practices in construction activities and site management. CO 3. Analyze causes of accidents and interpret reporting procedures. CO 4. Assess site risks, suggest preventive measures and prepare a basic safety plan for construction projects.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-228
Title of the Course : Occupational Safety and Health Laboratory
Number of Credits : 01
Effective from AY : 2024-2025

Pre-requisites for the course:	Knowledge of Fundamentals of Civil Engineering	
Course Objectives:	**The student shall be able to:** 1. Understand and apply appropriate personal protective equipment (PPE) in construction activities. 2. Assess hazards at a construction site. 3. Propose suitable fire safety measures and operate fire extinguishers correctly and document construction accidents using standard reporting procedures. 4. Develop basic safety layouts, signage placement, and hazard analysis for site activities.	
Content:		**No. of hours**
	List of Experiments 1. To identify and classify types of personal protective equipment (PPE) used in construction as per IS and BIS standards. 2. To measure ambient noise levels at a construction site and compare them with permissible exposure limits. 3. To evaluate the adequacy of illumination levels in workspaces using a lux meter. 4. To classify types of fires and demonstrate the use of appropriate fire extinguishers. 5. To prepare an accident report using standard formats and procedures. 6. To interpret construction safety signs and their appropriate placement. 7. To develop a safe construction site layout incorporating hazard zones, access paths and storage areas. 8. To prepare a Job Hazard Analysis (JHA) worksheet for a selected civil engineering activity. 9. To analyze a real-world construction accident case study and identify causes and preventive actions. 10. To evaluate workplace safety practices in an industry or organization.	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	
References/ Readings:	**<u>Reference Books</u>**	

	1. Bureau of Indian Standards, IS 13367 (Part 1):1992, "Safe Use of Cranes – Code of Practice", BIS, New Delhi, India, 1992. 2. Bureau of Indian Standards, IS 2190:2010, "Selection, Installation and Maintenance of First-Aid Fire Extinguishers – Code of Practice", BIS, New Delhi, India, 2010. 3. Bureau of Indian Standards, IS 3786:1983, "Methods for Computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Accidents", BIS, New Delhi, India, 1983. 4. Directorate General Factory Advice Service & Labour Institutes (DGFASLI), "Construction Safety Manual", Ministry of Labour & Employment, Government of India, Mumbai. 5. Goetsch, D. L., "Construction Safety and Health", Pearson Education, USA, [Year Not Available], ISBN-13: 978-0132374699. 6. Hinze, J., "Construction Safety", Prentice Hall, New Jersey, USA, [Year Not Available], ISBN-13: 978-0133779127.
Course Outcomes	After going through the course, students will be able to: CO 1. Identify and use PPE in construction activities CO 2. Measure environmental parameters and assess compliance with safety norms. CO 3. Classify fire types and demonstrate the correct use of extinguishers. CO 4. Investigate, prepare accident reports, create safety layouts, interpret signage, and perform basic job hazard analysis.

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-229
Title of the Course : Green Building – Planning and Design
Number of Credits : 03
Effective from AY : 2024-2025

Pre-requisites for the course:	Knowledge of Fundamentals of Civil Engineering and Building Materials & Construction	
Course Objectives:	**The course will enable the students to:** 1. **Understand** the concept, need, and evolution of green buildings and associated terminology. 2. **Apply** principles of climate-responsive architecture and thermal comfort in green building design 3. **Analyze** water, material, and energy conservation strategies applicable to sustainable building design. 4. **Evaluate** building performance using national and international green building assessment systems like LEED, GRIHA, and IGBC.	
Content:		**No. of hours**
Unit 1	**Introduction of green building:** Concept of green building, History of green building, Need of green building in present scenario, Importance of green building, Merits and demerits, Classification of green building, Terminologies associated with green building. **Water conservation:** 3 R's for water conservation, rain water harvesting, low flow fixtures, grey water recycling. **Material conservation:** concept of embodied energy, low energy materials, sustainable materials, alternative materials Concept of carbon emission and its reduction.	**11**
Unit 2	**Assessment methods and criteria's for rating** - Global assessment and certification, Local assessment, LEED, GRIHA, IGBC. Principles and elements of design of green building based on assessment criteria's	**12**
Unit 3	**Climate responsive process of design:** Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form. **Thermal comfort inside the building:** Factors affecting, indices, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U value and insulation thickness, Day lighting stimulation, Ventilation.	**11**
Unit 4	**Electricity conservation:** Bureau of energy efficiency - Functions, policies, guidelines, Energy Conservation Building Code.	**11**

	Energy Modelling of building: Importance, Overview of building systems, types of modelling, basics of building physics and thermal comfort, building envelope and passive design **Case study:** Study of existing green buildings, carbon calculators	
Instructions	**At least four (04) assignments** shall be submitted based on the course content. These shall be graded as a part of internal assessment.	
Pedagogy:	The teaching–learning pedagogy will emphasize on interactive learning, reflective thinking, critical analysis, and problem-solving.	
References/ Readings:	**Reference Books** 1. Floyd, Anthony, "Green Buildings: Professional Guide to Concepts, Codes and Innovations", Cengage Learning India Pvt. Ltd., New Delhi, ISBN-13: 978-1111035112. 2. Fowler, J. M., "Energy and the Environment", McGraw Hill, New York. 3. Indian Green Building Council (IGBC), "Introduction to Green Buildings & Built Environment", 2nd Edition, BS Publications / BSP Books, Hyderabad, 2024. 4. Jain, A. K., "The Idea of Green Building", 1st Edition, Khanna Publishers, New Delhi, 2014, ISBN-13: 978-8174092564. 5. Spiegel, Ross & Meadows, Dru, "Green Building Materials: A Guide to Product Selection and Specification", John Wiley and Sons, New York, ISBN-13: 978-0471291336.	
Course Outcomes	**After going through this course, student will be able to:** CO 1. **Explain** the concept, history, importance, and classification of green buildings. CO 2. **Apply** strategies for conservation of water, materials, and energy in building construction CO 3. **Analyze** and compare green building rating systems (LEED, GRIHA, IGBC) and their assessment criteria CO 4. **Evaluate** climate-responsive design approaches for thermal comfort, energy modeling, and environmental performance	

Name of the Programme : B.E CIVIL ENGINEERING
Course Code : CIV-230
Title of the Course : Green Building Laboratory
Number of Credits : 01
Effective from AY : 2024-2025

Pre-requisites for the course:	Knowledge of Fundamentals of Civil Engineering and Building Materials & Construction	
Course Objectives:	**The student shall be able to:** 1. **Understand** the fundamentals of energy modeling, water and material conservation techniques, and green building elements. 2. **Apply** design strategies for sustainable systems like rainwater harvesting, passive cooling, and efficient lighting. 3. **Analyze** the impact of orientation, insulation, reflective materials, and green technologies on energy demand and comfort. 4. **Evaluate** different green building rating systems and assess the performance of sustainable technologies in real-world scenarios.	
Content:		**No. of hours**
	List of Experiments 1. Study of E-Quest (or equivalent software) software and familiarity with Input parameters. 2. Energy modelling of a simple building structure 3. Calculation of embodied energy of readily available building materials like bricks, laterite stones, tiles, and cement. 4. Comparative studies on heat pumps and resistance-based water heaters. 5. Study of efficiencies of various lighting systems. 6. Plan a rain water harvesting and domestic filtration system. 7. Study the effects of orientation and sun shade in air conditioning demands. 8. Study the efficiency achieved in reflective paints on thermal cooling of residential buildings. 9. Study on water efficient plumbing fixtures. 10. Comparative study of various green building rating systems	**30**
Pedagogy:	The teaching–learning pedagogy will emphasize on Instructional learning, Inquiry based learning, Constructive learning, Collaborative learning and problem solving	
References/ Readings:	**Reference Books** 1. Floyd, Anthony, "Green Buildings: Professional Guide to Concepts, Codes and Innovations", Cengage Learning India Pvt. Ltd., New Delhi, ISBN-13: 978-1111035112. 2. Fowler, J. M., "Energy and the Environment", McGraw Hill, New York.	

	3. Indian Green Building Council (IGBC), "Introduction to Green Buildings & Built Environment", 2nd Edition, BS Publications / BSP Books, Hyderabad, 2024. 4. Jain, A. K., "The Idea of Green Building", 1st Edition, Khanna Publishers, New Delhi, 2014, ISBN-13: 978-8174092564. 5. Spiegel, Ross & Meadows, Dru, "Green Building Materials: A Guide to Product Selection and Specification", John Wiley and Sons, New York, ISBN-13: 978-0471291336.
Course Outcomes	**After going through this course, student will be able to:** CO 1. Understand the principles of green buildings and sustainability through modeling tools and experimental setups. CO 2. Apply simulation techniques to optimize energy use and improve water/lighting efficiency. CO 3. Analyze the effect of design variables (orientation, materials, vegetation) on building performance. CO 4. Evaluate green building certification systems and recommend sustainable design practices.