ANNEXURE-III

DETAILED SYLLABUS

B.TECH CIVIL ENGINEERING

MULTIDISCIPLINARY OPEN ELECTIVE COURSES

(Batch 2024 & Onwards)

MULTIDISCIPLINARY OPEN ELECTIVE COURSES

S. NO	COURSE TITLE	COURSE CODE	CREDITS	COURSE BASKET
1.	Environmental Health and Safety	CIV-001	3	Value Added Courses
2.	Traditional Construction Technology in India	CIV-002	2	Value Added Courses
3.	Repair and Maintenance of Structures	CIV-003	3	Skill Enhancement Courses
4.	Energy Management of Buildings, Housings and Communities	CIV-004	2	Skill Enhancement Courses
5.	Basics of Estimation and Costing	CIV-005	3	Ability Enhancement Courses
6.	Basic Land Surveying	CIV-006	2	Ability Enhancement Courses
7.	AutoCAD & Building Drawing	CIV-007	2	Entrepreneurship/Employability Courses
8.	Entrepreneurship in Civil Engineering	CIV-008	3	Entrepreneurship/Employability Courses

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Environmental Health and Safety**
COURSE CODE	CIV-001
COURSE CATEGORY	MOPEC
COURSE BASKET	Value Added Course (VAC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To understand the basic principles and scope of Environment Health and Safety (EHS).
2.	To learn about major environmental health hazards and occupational risks.
3.	To develop knowledge on hazard identification, safety protocols, and emergency preparedness.
4.	To introduce fundamentals of industrial hygiene and exposure monitoring.
5.	To understand hazardous materials handling and waste management.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to Environment Health and Safety (EHS) Importance and scope of EHS in civil engineering Key terminologies and global EHS trends	8
2.	Environmental hazards: air, water, soil, and noise pollution Occupational hazards: chemical, physical, biological Sources, effects, and mitigation strategies	8
3.	Hazard identification and risk assessment Personal Protective Equipment (PPE) Emergency preparedness and response planning	10
4.	Industrial hygiene principles Workplace exposure monitoring techniques Case studies on EHS lapses and prevention	10
5.	Hazardous materials handling Waste management techniques Environmental Management Systems and sustainability (ISO 14001)	9

COURSE OUTCOMES	
CO 1.	Understand core principles of EHS and its importance in civil engineering.
CO 2.	Identify environmental and occupational health hazards.
CO 3.	Apply appropriate control measures and PPE usage in workplace scenarios.

CO 4.	Demonstrate proficiency in industrial hygiene practices and monitoring.
CO 5.	Evaluate and handle hazardous materials and waste disposal processes.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Safety, Health and Environmental Auditing: A Practical Guide (2nd Ed.)	Simon Watson
2.	Environmental Engineering: Environmental Health and Safety for Infrastructure and Planning (6th Ed.)	Nemerow, Agardy, Sullivan, Salvato
3.	Occupational and Environmental Safety and Health	Pedro Arezes et al.
4.	Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards	National Research Council (US)

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Traditional Construction Technology in India**
COURSE CODE	CIV-002
COURSE CATEGORY	MOPEC
COURSE BASKET	Value Added Course (VAC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
2	2	0	0	0	30

COURSE OBJECTIVES	
1.	To introduce students to the history, importance, and typologies of traditional construction in India.
2.	To understand region-specific techniques, materials, and sustainability aspects of traditional practices.
3.	To encourage appreciation and documentation of local construction wisdom relevant to modern-day challenges.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to traditional construction in India Importance of vernacular architecture Historical context and cultural significance Common elements in traditional Indian buildings	10
2.	Materials used in traditional construction: mud, lime, timber, stone Regional variations: Himalayan, desert, coastal, and plains architecture Load-bearing vs. frame structures	10
3.	Construction methods: stone masonry, mud walling, timber joinery, lime plastering Traditional roofing systems: bamboo, thatch, tile, and wooden trusses. Contemporary relevance of traditional techniques Integration with modern construction Preservation and documentation strategies	10

COURSE OUTCOMES	
CO 1.	Explain the historical relevance and development of traditional construction systems in India.
CO 2.	Describe various indigenous construction techniques and materials across different Indian regions.
CO 3.	Evaluate the ecological and architectural value of traditional practices for sustainable development.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Architecture of the Indian Subcontinent	Takeo Kamiya
2.	Vernacular Architecture in the 21st Century	Lindsay Asquith & Marcel Vellinga
3.	Traditional Building Materials and Techniques	Satish Chandra
4.	Handbook of Traditional Construction	Laurie Baker
5.	Mud Architecture	Anil Laul

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Repair and Maintenance of Structures**
COURSE CODE	CIV-003
COURSE CATEGORY	MOPEC
COURSE BASKET	Skill Enhancement Courses (SEC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To introduce the fundamental concepts and importance of maintenance and repair in civil engineering structures.
2.	To develop an understanding of the serviceability and durability aspects of concrete, including degradation mechanisms and construction/design errors.
3.	To familiarize students with advanced materials and techniques used for structural repair and rehabilitation.
4.	To impart knowledge of various strengthening and stabilization methods, especially in structures damaged due to natural calamities like earthquakes.
5.	To expose students to Non-Destructive Testing (NDT) methods used in assessing steel structures and coatings.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Maintenance work, Necessity of maintenance, Facets & Importance of Maintenance, Various aspects Inspection, Repair: Stages, Procedure & Techniques, Deterioration of structures.	**10**
2.	Quality assurances for concrete construction, Need for Quality Assurance, Concrete Properties: Strength, Permeability, Thermal Properties, Cracking, Durability, Degradation Mechanism, Design Errors and Construction Errors.	**10**
3.	Special Mortar, Concrete chemicals, Expansion cement, Polymer Concrete: Advantages & Disadvantages, Sulphur-Infiltrated concrete, Ferro Cement, FRC, Aspect ratio, Polymer Resin based Coating, Vacuum Concrete, Gunite or shotcrete, Epoxy Injection.	**10**
4.	**Introduction, Structures damage due to earthquake, Materials for strengthening of structures, Repair of Structural failures in concrete structures.**	**10**
5.	**NDT test Methods, MPI, Use of coating gauges for metallic and non-metallic coating, How to measure Dry Film Thickness, NDE methods, Liquid penetration test, PT Techniques.**	**5**

COURSE OUTCOMES	
CO 1.	Knowledge regarding maintenance of Buildings.
CO 2.	Knowledge of various Repair and retrofitting techniques for Structures.
CO 3.	Knowledge regarding Various Stabilization Techniques.

TEXT BOOKS/REFERENCES	
S. No	**Book/Text Title**
1.	Emmons, P.H., Concrete Repair and Maintenance, Galgotia Publication. 2001
2.	FEMA 273; NEHRP Guidelines for the Seismic Rehabilitation of Buildings. 1997
3.	ATC- 40: Seismic Evaluation and Retrofit of Concrete Buildings, Vol. 1 & 2. 1997
4.	M.J.N., Seible, F. and Calvi, G.M., Seismic Design and Retrofit of Bridges by Priestley,John Wiley. 1996
5.	Building Maintenance Management-R.LEE
6.	Developments In Building Maintenance -I.EJ. GIBSON
7.	Concrete Structures: materials, Maintenance And Repair D.CAMPBELL,ALLE

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Energy Management of Buildings, Housings and Communities**
COURSE CODE	CIV-004
COURSE CATEGORY	MOPEC
COURSE BASKET	Skill Enhancement Courses (SEC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
2	2	0	0	0	30

COURSE OBJECTIVES	
1.	To develop an understanding of global energy challenges and their implications on building design and operation.
2.	To introduce concepts of thermal comfort and heat balance in buildings, including ventilation and insulation techniques.
3.	To familiarize students with passive design strategies and their application in energy-efficient building construction.
4.	To explore energy management techniques at both housing and community levels, with a focus on integrated and net-zero energy systems.

COURSE CONTENT		
Units	**Experiments**	**Cont. Hours**
1.	Energy Problems in the world. Millennium Development Goals. Building architecture and Heat balance of buildings. Heat balance of building rooms. Concept of thermal conductivity, thermal radiation, thermal convection. Concept of thermal comfort of buildings and housings. Ventilation and heating and cooling of housings. Concept of thermal insulation of buildings.	**8**
2.	Passive Energy buildings. Passive Solar, South facing glass, thermal mass, orientation of buildings. Site planning for solar access. Interior space planning. Provision of sun-spaces, direct solar gain and combined systems. Natural cooling of spaces.	**8**
3.	Housings and Communities. Heating and cooling needs of housings and communities. Climatology and comfort. Active heating and cooling techniques. Cooling requirements and effective cooling techniques. Radiant cooling and heating of spaces and housings. Integrated energy systems for housings. Community energy systems. Net zero energy buildings. Feasibility of HVAC systems in buildings and housings.	**7**
4.	Carbon foot-print, net-zero carbon buildings. Renewable energy sources and their effective utilization in building houses. Solar energy. Wind-energy. Geo-thermal energy. Use in buildings and housings. Concept of green buildings. Energy requirements for future for building houses.	**7**

COURSE OUTCOMES	
CO 1.	Knowledge about the energy aspects of a building and housings.
CO 2.	Knowledge about the passive building design for comfortable living.
CO 3.	Proper energy utilization in a building.
CO 4.	Future energy requirements and prospects.

TEXT BOOKS/REFERENCES	
S. No	**Book/Text Title**
1.	ASHRAE Standards and Guidelines.
2.	Thermal Comfort and Energy: Efficient cooling of non-residential buildings, Kalz, Pfafferott.
3.	Human Thermal Comfort, Ken Parsons, Taylor and Francis.

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Basics of Estimation and Costing**
COURSE CODE	CIV-005
COURSE CATEGORY	MOPEC
COURSE BASKET	Ability Enhancement Courses (AEC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To introduce the basics and importance of estimation and costing for civil works.
2.	To understand the various types and formats of estimates used in construction.
3.	To learn methods of quantity estimation and unit measurement.
4.	To explore the components of rate analysis and how to prepare Bill of Quantities.
5.	To understand tendering, valuation, and modern software tools for estimation.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to estimation and costing Relevance in construction projects Basic terminology and general principles Objectives of estimating and costing Units of measurement used in civil works	12
2.	Different types of estimates: preliminary, detailed, revised, supplementary Approximate methods of estimating (plinth area, cubic rate, etc.)	8
3.	Methods of taking out quantities Centerline method and long wall-short wall method Detailed measurement and quantity sheet preparation	8
4.	Rate analysis of common items (earthwork, concrete, brickwork, plastering) Factors affecting rates Preparing a simple Bill of Quantities (BOQ)	10
5.	Tendering and contracts: process and types Valuation, depreciation, rent fixation basics Overview of e-tendering and estimation software tools	7

COURSE OUTCOMES	
CO 1.	Explain the purpose and scope of estimation and costing in civil engineering.
CO 2.	Identify and differentiate types of estimates and their applications.

CO 3.	Apply measurement techniques and estimate quantities for basic civil works.
CO 4.	Prepare basic rate analysis and develop BOQ for simple projects.
CO 5.	Understand and describe tendering, valuation, and digital estimation practices.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Estimating and Costing in Civil Engineering	B.N. Dutta
2.	Civil Engineering Estimating & Costing	Birdie G.S.
3.	Construction Planning Equipment and Methods	R.L. Peurifoy
4.	Construction Estimating	Steven Peterson
5.	Quantity Surveying and Valuation	Gurcharan Singh

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Basic Land Surveying**
COURSE CODE	CIV-006
COURSE CATEGORY	MOPEC
COURSE BASKET	Ability Enhancement Courses (AEC)

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
2	2	0	0	0	30

COURSE OBJECTIVES	
1.	To introduce the basic principles of land surveying to students from non-civil backgrounds.
2.	To develop a fundamental understanding of various types of surveying methods and tools.
3.	To provide hands-on awareness of simple survey instruments and their real-world applications.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to Surveying – definition, objectives, and classification of surveys. Understanding land features and map scales. Units of measurements, types of plans and maps. Chain surveying – instruments, methods and practical importance.	10
2.	Compass surveying – principle, types of compasses and their uses. Bearing systems and angle measurements. Errors in compass surveying.	10
3.	Levelling – purpose, types and classification of levels. Introduction to Dumpy level, Auto level and levelling staff. Booking and reducing levels – rise and fall method.	10

COURSE OUTCOMES	
CO 1.	Understand basic surveying concepts and importance in real life.
CO 2.	Identify and differentiate various types of land surveys and instruments.
CO 3.	Apply basic techniques in measuring distances and angles using traditional tools.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Surveying Vol. 1	B.C. Punmia
2.	Basic Surveying	J. Uren & B. Price
3.	Textbook of Surveying	C. Venkatramaiah

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**AutoCAD & Building Drawing**
COURSE CODE	CIV-007
COURSE CATEGORY	MOPEC
COURSE BASKET	Entrepreneurship/Employability Courses

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
2	2	0	0	0	30

COURSE OBJECTIVES	
1.	To introduce students to basic AutoCAD tools and commands.
2.	To provide knowledge about 2D drafting and building plan layouts.
3.	To develop skills in interpreting and drawing residential buildings using AutoCAD.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to CAD: Need and advantages of using CAD in civil engineering. Introduction to AutoCAD interface, toolbars, command line, drawing tools. Basic commands: LINE, CIRCLE, RECTANGLE, ERASE, COPY, MOVE, ROTATE, etc. Saving, opening, and printing drawings.	10
2.	Working with layers, hatching, dimensioning, and text commands. Concepts of object properties, line types, and thickness. Orthographic projections and sectional views. Drawing of basic geometrical 2D shapes and dimensioning practices.	10
3.	Preparation of simple building plans: Floor plan, elevation, and sectional view. Preparation of residential building layout using AutoCAD. Reading building drawings and interpreting symbols. Hands-on sessions for complete house plan drafting.	10

COURSE OUTCOMES	
CO 1.	Understand basic AutoCAD interface and drawing commands.
CO 2.	Create simple 2D architectural plans and layouts.
CO 3.	Interpret building drawings and prepare basic residential plans.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	AutoCAD 2023 for Engineers and Designers	Sham Tickoo
2.	Engineering Drawing	N.D. Bhatt
3.	Building Planning and Drawing	M. Chakraborti

PROGRAMME	B.Tech Civil Engineering
COURSE TITLE	**Entrepreneurship in Civil Engineering**
COURSE CODE	CIV-008
COURSE CATEGORY	MOPEC
COURSE BASKET	Entrepreneurship/Employability Courses

CREDITS AND CONTACT HOURS					
CREDITS	**L**	**T**	**P**	**S**	**TOTAL NO. OF CONTACT HOURS**
3	2	1	0	0	45

COURSE OBJECTIVES	
1.	To understand the basic concepts of entrepreneurship and its significance in civil engineering.
2.	To explore various entrepreneurial opportunities within the civil engineering sector.
3.	To develop knowledge about business planning, market research, and legal considerations.
4.	To learn about financing, budgeting, and project management for start-ups.
5.	To promote innovation, sustainability, and social entrepreneurship in civil infrastructure.

COURSE CONTENT		
Units	**Description**	**Cont. Hours**
1.	Introduction to entrepreneurship: definition, types, and importance Role of civil engineers in entrepreneurship Characteristics of successful entrepreneurs Entrepreneurial ecosystem in India	10
2.	Identifying opportunities in construction and infrastructure sector Case studies of civil engineering start-ups Idea generation techniques Market analysis and customer profiling	8
3.	Business model and business plan preparation Legal structures of enterprises (sole proprietorship, partnership, LLP, etc.) Licensing and regulatory compliances	8
4.	Financial planning: capital requirement, budgeting, break-even analysis Sources of finance: banks, venture capital, government schemes Basics of project management for start-ups	10
5.	Innovation and sustainability in construction Green businesses and social entrepreneurship Ethics and professional responsibility Digital tools and start-up incubators	9

COURSE OUTCOMES

CO 1.	Define entrepreneurship and recognize its relevance to civil engineering and society.
CO 2.	Identify business ideas and opportunities related to construction and infrastructure.
CO 3.	Develop a basic business plan with feasibility analysis and marketing strategies.
CO 4.	Demonstrate understanding of budgeting, funding sources, and business operations.
CO 5.	Appreciate the importance of innovation, ethics, and sustainability in entrepreneurship.

TEXT BOOKS/REFERENCES		
S. No	**Book/Text Title**	**Author**
1.	Entrepreneurship Development	S.S. Khanka
2.	Entrepreneurship	Rajeev Roy
3.	Innovation and Entrepreneurship	Peter F. Drucker
4.	Small Scale Industries and Entrepreneurship	Vasant Desai
5.	Civil Engineering Contracts and Estimates	B.S. Patil