

**Course Name: Recent Trends in Civil Engineering**

**Course Code: RCW-4-3**

L	T	P	Cr
3	1	0	4

**COURSE OBJECTIVES**

CO1: To understand advanced structural engineering, including materials, Structural health monitoring and seismic retrofitting.

CO2: To evaluate Sustainable and Green Infrastructure.

CO3: To determine Geotechnical and Foundation Engineering parameters.

CO4: To understand mechanisms of Water Resources and Environmental Engineering.

CO5: To design Emerging Technologies in Civil Engineering.

UNITS	CONTENTS	Contact Hrs.
I	<b>Unit 1: Advanced Structural Engineering</b> 1.1. High-Performance Concrete and Advanced Materials <ul style="list-style-type: none"><li>Nanotechnology in construction materials</li><li>Self-healing concrete</li><li>Sustainable and high-strength materials</li></ul> 1.2. Structural Health Monitoring and Assessment <ul style="list-style-type: none"><li>Sensors and data acquisition</li><li>Non-destructive testing techniques</li><li>Structural reliability and risk assessment</li></ul> 1.3. Seismic Retrofitting and Resilience <ul style="list-style-type: none"><li>Seismic hazard assessment</li><li>Retrofitting techniques and case studies</li><li>Earthquake-resistant design</li></ul>	5
II	Unit 2: Sustainable and Green Infrastructure  2.1. Sustainable Building Design and Construction  Green building practices and certifications Energy-efficient design Sustainable construction materials 2.2. Environmental Impact and Assessment  Life cycle assessment (LCA) Carbon footprint analysis Environmental regulations and standards 2.3. Urban Planning and Transportation  Sustainable urban development Public transportation systems Urban sustainability indicators	5

<p style="text-align: center;"><b>III</b></p>	<p>Unit 3: Geotechnical and Foundation Engineering</p> <p>3.1. Advanced Soil Mechanics</p> <p>Soil behavior and modeling Soil-structure interaction Ground improvement techniques</p> <p>3.2. Geotechnical Engineering in Challenging Environments</p> <p>Geotechnical challenges in arid regions Coastal and marine geotechnics Geotechnical aspects of mining and tunnels</p> <p>3.3. Foundation Design and Innovations</p> <p>Deep foundation systems Shallow foundation innovations Foundation design in difficult soil conditions</p>	<p style="text-align: center;"><b>5</b></p>
<p style="text-align: center;"><b>IV</b></p>	<p>Unit 4: Water Resources and Environmental Engineering</p> <p>4.1. Water Quality Management</p> <p>Water treatment technologies Water quality modeling Environmental regulations</p> <p>4.2. Sustainable Water Resource Management</p> <p>Integrated water resources management Water scarcity and desalination Climate change and water resources</p> <p>4.3. Environmental Impact Assessment and Management</p> <p>EIA and its components Environmental management systems Environmental policy and regulations</p>	<p style="text-align: center;"><b>5</b></p>
<p style="text-align: center;"><b>V</b></p>	<p>Unit 5: Emerging Technologies in Civil Engineering</p> <p>5.1. Building Information Modeling (BIM)</p> <p>BIM principles and applications BIM software and tools BIM for project management</p> <p>5.2. Artificial Intelligence and Machine Learning in Civil Engineering</p> <p>AI applications in design and construction Predictive modeling and optimization Case studies of AI in civil engineering</p> <p>5.3. Smart Cities and Infrastructure</p> <p>IoT and smart sensors Data analytics for urban planning Case studies of smart city projects</p>	<p style="text-align: center;"><b>5</b></p>

**REFERENCE BOOKS :**

1.	"Advanced Structural Analysis" by Devdas Menon "Structural Dynamics: Theory and Computation" by Mario Paz and William Leigh "Advanced Concrete Technology" by Zongjin Li "High-Performance Concrete" by Pierre-Claude Aitcin and Robert J. Flatt
2.	"Sustainable Construction: Green Building Design and Delivery" by Charles J. Kibert "Sustainable Urban Development Reader" by Stephen M. Wheeler and Timothy Beatley "Green Building: Principles and Practices in Residential Construction" by Abe Kruger and Carl Seville
3.	"Principles of Geotechnical Engineering" by Braja M. Das "Foundation Analysis and Design" by Joseph E. Bowles "Geotechnical Engineering: Principles and Practices" by Donald P. Coduto, Man-Chu Ronald Yeung, and William A. Kitch
4.	"Water Resources Engineering" by Larry W. Mays "Environmental Engineering: Fundamentals, Sustainability, Design" by James R. Mihelcic and Julie B. Zimmerman "Water Quality and Treatment: A Handbook of Community Water Supplies" by American Water Works Association
5.	"Building Information Modeling: A Strategic Implementation Guide" by Michael Tardif and R. Thomas Riley "Artificial Intelligence in Civil and Structural Engineering" by Jerome F. Hajjar "Smart Cities: Foundations, Principles, and Applications" by Houbing Song, et al.