



National University of Engineering (UNI)

School of Civil Engineering
Syllabus 2026-II

1. COURSE

CE3C14. Sustainable and Resilient Infrastructure (Elective)

2. GENERAL INFORMATION

- 2.1 Course : CE3C14. Sustainable and Resilient Infrastructure
- 2.2 Semester : 10th Semester.
- 2.3 Credits : 3
- 2.4 Hours : 2 HT; 1 HP;
- 2.5 Duration of the period : 16 weeks
- 2.6 Type of course : Elective
- 2.7 Learning modality : Face to face
 - CE2C1. Materials Technology. (7th Sem)
- 2.8 Prerequisites :
 - CE2C2. Construction Technology I. (7th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Sustainable Infrastructure covers the principles, planning, design, materials, and management of sustainable infrastructure: the triple bottom line, life-cycle thinking, resource efficiency, the circular economy, and the social, economic, and governance dimensions of sustainable infrastructure projects.

5. GOALS

- Apply the principles of sustainable infrastructure to the planning, design, materials, and operation of construction projects.
- Evaluate the sustainable performance of an infrastructure project and its governance.

6. COMPETENCES

ABET-1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics. (Usage)

7. TOPICS

Unit 1: Foundational Sustainability Principles and Triple Bottom Line (15 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Triple bottom line (TBL) framework and sustainability metrics • Life-cycle thinking and stage-gate analysis for infrastructure projects • Regenerative design and net-positive impact goals	• Define the three pillars of the triple bottom line and give an infrastructure-related example for each [Familiarity] • Apply life-cycle thinking to compare the long-term impacts of two alternative paving materials [Assessment] • Develop a project goal for achieving a net-positive environmental impact [Assessment]
Readings : [Kib16]	

Unit 2: Resource Efficiency and Circular Economy (15 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Resource efficiency: energy, water, and material consumption minimization • Circular economy principles: reduce, reuse, recycle, recover (R4) • Sustainable procurement and supply chain management	• Calculate the embodied energy or water footprint of a simple structural component [Usage] • Explain how circular economy principles can be applied to construction and demolition waste [Familiarity]
Readings : [Kib16]	

Unit 3: Social, Economic, and Governance Dimensions of Sustainable Infrastructure (16 hours)	
Competences Expected: ABET-1	
Topics	Learning Outcomes
• Social sustainability: equity, accessibility, and community well-being • Economic sustainability: life-cycle costing and total cost of ownership • Policy frameworks and green rating systems (e.g., Envision, LEED for Infrastructure)	• Evaluate the social equity implications of a proposed transportation project [Assessment] • Perform a life-cycle cost analysis to justify a higher initial investment in a durable material [Usage] • Use a green infrastructure rating system checklist to assess a project's sustainability performance [Familiarity]
Readings : [Kib16]	

8. WORKPLAN

8.1 Methodology

Individual and team participation is encouraged to present their ideas, motivating them with additional points in the different stages of the course evaluation.

8.2 Theory Sessions

The theory sessions are held in master classes with activities including active learning and roleplay to allow students to internalize the concepts.

8.3 Practical Sessions

The practical sessions are held in class where a series of exercises and/or practical concepts are developed through problem solving, problem solving, specific exercises and/or in application contexts.

9. EVALUATION SYSTEM

***** EVALUATION MISSING *****

10. BASIC BIBLIOGRAPHY

[Kib16] Charles J. Kibert. *Sustainable Construction: Green Building Design and Delivery*. 5th. Wiley, 2016.