



**National University of Engineering (UNI)**  
School of Civil Engineering  
Syllabus 2026-II

**1. COURSE**

CE3C13. Project Planning and Control (Elective) (Elective)

**2. GENERAL INFORMATION**

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| <b>2.1 Course</b>                 | : CE3C13. Project Planning and Control (Elective)                  |
| <b>2.2 Semester</b>               | : 10 <sup>th</sup> Semester.                                       |
| <b>2.3 Credits</b>                | : 4                                                                |
| <b>2.4 Hours</b>                  | : 2 HT; 2 HP;                                                      |
| <b>2.5 Duration of the period</b> | : 16 weeks                                                         |
| <b>2.6 Type of course</b>         | : Elective                                                         |
| <b>2.7 Learning modality</b>      | : Face to face                                                     |
| <b>2.8 Prerequisites</b>          | : CE3C5. Construction Project Management II. (8 <sup>th</sup> Sem) |

**3. PROFESSORS**

Meetings after coordination with the professor

**4. INTRODUCTION TO THE COURSE**

Project Planning and Control introduces strategic planning and management plans according to the PMBOK guide, project planning, scheduling, and control using the Critical Path Method (CPM) and 4D/5D modeling, project management and control philosophies, and the soft and managerial skills necessary to lead project teams.

**5. GOALS**

- Apply strategic planning and management plans according to the PMBOK guide to a construction project.
- Plan, schedule, and control a project using the Critical Path Method (CPM) and 4D/5D modeling tools.
- Apply management philosophies to the control of construction projects.
- Develop soft and managerial skills in communication, leadership, teamwork, and conflict resolution.

**6. COMPETENCES**

**ABET-2)** An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (Usage)

**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: Planning Principles (16 hours)                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| Competences Expected: ABET-2                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Topics                                                                                                                                                                                                                                                                                                                                                                                                         | Learning Outcomes                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Planning as an ongoing and iterative activity throughout the project life cycle</li> <li>• Just-enough planning: balancing detail with flexibility based on uncertainty</li> <li>• Relationship between planning depth and the selected development approach</li> <li>• Adaptive planning: rolling wave, progressive elaboration, and iterative refinement</li> </ul> | <ul style="list-style-type: none"> <li>• Describe the principles of iterative and just-enough planning in PMBoK 7th edition [Familiarity]</li> <li>• Apply adaptive planning principles to a project with high uncertainty and evolving requirements [Assessment]</li> <li>• Evaluate whether a project's planning approach provides sufficient detail and flexibility for its uncertainty level [Assessment]</li> </ul> |
| Readings : [Ins21]                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                          |

| Unit 2: Project Planning, Scheduling, and Control (CPM, 4D/5D) (16 hours)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| Competences Expected: ABET-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Learning Outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>• Work breakdown structure (WBS) development and activity definition</li> <li>• Network diagramming: activity-on-node (AON) and precedence diagramming method (PDM)</li> <li>• Critical Path Method (CPM) for schedule calculation: forward/backward pass, floats</li> <li>• Resource allocation, loading, and leveling techniques</li> <li>• Schedule updating, monitoring, and control using earned value management (EVM)</li> <li>• Program Evaluation and Review Technique (PERT) for schedule risk analysis</li> <li>• Line of balance (LOB) scheduling for repetitive projects</li> <li>• 4D scheduling (time + 3D model) for visualization and clash detection</li> <li>• 5D scheduling (time + cost + 3D model) for integrated cost control</li> </ul> | <ul style="list-style-type: none"> <li>• Develop a Work Breakdown Structure (WBS) for a medium-scale construction project [Usage]</li> <li>• Construct a CPM network diagram and calculate the critical path and activity floats [Assessment]</li> <li>• Perform resource leveling on a simple project schedule to minimize resource fluctuations [Usage]</li> <li>• Monitor project progress using schedule variance (SV) and cost variance (CV) from earned value data [Assessment]</li> <li>• Apply PERT to estimate project duration probabilities and identify schedule risks [Assessment]</li> <li>• Create a Line of Balance (LOB) schedule for a repetitive housing project [Usage]</li> <li>• Generate a 4D simulation to visualize the construction sequence and identify spatial conflicts [Usage]</li> <li>• Integrate cost data with a 3D model to perform a 5D analysis for budget tracking [Assessment]</li> </ul> |
| Readings : [CQR92]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| <b>Unit 3: Lean Construction and Integrated Project Delivery (IPD) (12 hours)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <b>Competences Expected: ABET-1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Learning Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• Lean thinking principles: value, value stream, flow, pull, perfection</li> <li>• Identification and elimination of the eight wastes in construction</li> <li>• Last Planner System (LPS) for production planning and control</li> <li>• Visual management tools: 5S, Kanban, and Andon</li> <li>• Integrated Project Delivery (IPD) principles and multi-party agreements</li> <li>• Target Value Delivery (TVD) and Set-Based Design</li> <li>• Collaboration technologies and Big Room co-location</li> <li>• Performance measurement: Percent Plan Complete (PPC), Takt time</li> <li>• Culture change and implementation strategies for lean transformation</li> </ul> | <ul style="list-style-type: none"> <li>• Define the seven (or eight) types of waste (Muda) in a construction context [Familiarity]</li> <li>• Apply the Last Planner System to develop a reliable weekly work plan [Usage]</li> <li>• Identify opportunities to apply visual management (5S) on a construction site [Assessment]</li> <li>• Explain how Integrated Project Delivery (IPD) aligns goals and shares risk among project stakeholders [Familiarity]</li> <li>• Use Target Value Delivery principles to guide design decisions within a cost target [Assessment]</li> <li>• Facilitate a collaborative pull planning session with multiple trades [Usage]</li> <li>• Calculate and interpret Percent Plan Complete (PPC) as a lean performance metric [Assessment]</li> <li>• Develop a basic implementation plan for introducing lean practices to a project team [Assessment]</li> </ul> |
| <b>Readings :</b> [Bal00]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| <b>Unit 4: Leadership, Team Dynamics, and Stakeholder Management (12 hours)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <b>Competences Expected: ABET-1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Topics</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Learning Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>• Leadership styles, traits, and the difference between leadership and management</li> <li>• Team dynamics: forming, storming, norming, performing stages and roles</li> <li>• Conflict resolution strategies and negotiation</li> <li>• Stakeholder identification, analysis, and engagement planning</li> <li>• Motivation theories and their application to engineering teams</li> <li>• Cultural intelligence and leading diverse, global teams</li> <li>• Change management and leading organizational transformation</li> <li>• Emotional intelligence and its role in effective leadership</li> <li>• Ethical leadership and creating an ethical organizational culture</li> </ul> | <ul style="list-style-type: none"> <li>• Describe different leadership styles and identify situations where each might be effective [Familiarity]</li> <li>• Diagnose the stage of development of a project team and propose appropriate interventions [Assessment]</li> <li>• Resolve a simulated interpersonal conflict within a project team using a structured approach [Usage]</li> <li>• Develop a stakeholder engagement plan for a project with community opposition [Assessment]</li> <li>• Adapt communication and leadership approach when working with a team from a different cultural background [Assessment]</li> <li>• Explain the key steps in a change management process for implementing a new technology [Familiarity]</li> <li>• Evaluate one's own emotional intelligence and identify areas for development [Assessment]</li> <li>• Model ethical leadership behavior in a team-based project simulation [Usage]</li> </ul> |
| <b>Readings :</b> [RC17]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## 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

- [CQR92] Michael T. Callahan, Daniel G. Quackenbush, and James E. Rowings. *Construction Project Scheduling*. McGraw-Hill, 1992.
- [Bal00] Glenn Ballard. “The Last Planner System of Production Control”. In: *PhD Thesis, University of Birmingham* (2000).
- [RC17] Stephen P. Robbins and Mary Coulter. *Management*. 14th. Pearson, 2017.
- [Ins21] Project Management Institute. *A Guide to the Project Management Body of Knowledge (PMBOK Guide)*. 7th. Project Management Institute, 2021.