



National University of Engineering (UNI)
School of Civil Engineering
Syllabus 2027-I

1. COURSE

CE2C5. Construction planning and scheduling (Mandatory)

2. GENERAL INFORMATION

2.1 Course	: CE2C5. Construction planning and scheduling
2.2 Semester	: 9 th Semester.
2.3 Credits	: 3
2.4 Hours	: 4 HT; 2 HP;
2.5 Duration of the period	: 16 weeks
2.6 Type of course	: Mandatory
2.7 Learning modality	: Face to face
2.8 Prerequisites	: CE2C2. Construction Technology I. (8 th Sem)

3. PROFESSORS

Meetings after coordination with the professor

4. INTRODUCTION TO THE COURSE

Construction Project Management I covers the planning, scheduling, and management of construction works, including the use of Critical Path Method (CPM) and 4D/5D modeling tools for project control, construction cost estimating and financial management, and the day-to-day management of construction site execution.

5. GOALS

- Plan a construction project by defining its scope and work breakdown structure.
- Schedule a construction project using the Critical Path Method (CPM) and 4D/5D modeling tools.
- Estimate construction costs and manage the financial control of a construction project.
- Manage and control the execution of a construction project at the site level.

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-5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives. (Usage)

7. TOPICS

Unit 1: Project Planning, Scheduling, and Control (CPM, 4D/5D) (42 hours)	
Competences Expected: ABET-2	
Topics	Learning Outcomes
• Work breakdown structure (WBS) development and activity definition • Network diagramming: activity-on-node (AON) and precedence diagramming method (PDM) • Critical Path Method (CPM) for schedule calculation: forward/backward pass, floats • Resource allocation, loading, and leveling techniques • Schedule updating, monitoring, and control using earned value management (EVM) • Program Evaluation and Review Technique (PERT) for schedule risk analysis • Line of balance (LOB) scheduling for repetitive projects • 4D scheduling (time + 3D model) for visualization and clash detection • 5D scheduling (time + cost + 3D model) for integrated cost control	• Develop a Work Breakdown Structure (WBS) for a medium-scale construction project [Usage] • Construct a CPM network diagram and calculate the critical path and activity floats [Assessment] • Perform resource leveling on a simple project schedule to minimize resource fluctuations [Usage] • Monitor project progress using schedule variance (SV) and cost variance (CV) from earned value data [Assessment] • Apply PERT to estimate project duration probabilities and identify schedule risks [Assessment] • Create a Line of Balance (LOB) schedule for a repetitive housing project [Usage] • Generate a 4D simulation to visualize the construction sequence and identify spatial conflicts [Usage] • Integrate cost data with a 3D model to perform a 5D analysis for budget tracking [Assessment]
Readings : [Callahan1992], [PMI2021]	

Unit 2: Construction Cost Estimating and Quantification (10 hours)	
Competences Expected: ABET-5	
Topics	Learning Outcomes
• Estimating types: conceptual, preliminary, and detailed • Quantity takeoff methods from drawings and digital models • Pricing components: labor, material, equipment, and overhead • Parametric and probabilistic estimating techniques • Life-cycle cost analysis for building systems	• Perform a detailed quantity takeoff for concrete, formwork, and reinforcement from construction drawings [Usage] • Prepare a unit price estimate for a defined work package [Assessment] • Apply parametric models to develop a conceptual cost estimate for a building [Assessment] • Conduct a life-cycle cost analysis to compare two alternative building envelope systems [Usage]
Readings : [RSMMeans2024], [PMI2021]	

Unit 3: Construction Budgeting, Bidding, and Financial Control (8 hours)	
Competences Expected: ABET-5	
Topics	Learning Outcomes
• Bid preparation, submission, and analysis processes • Cash flow forecasting and management for construction projects • Value engineering and constructability analysis • Financial statements and performance metrics for construction firms	• Explain the components and typical markup structure of a competitive bid [Familiarity] • Develop a monthly cash flow forecast for a construction project [Usage] • Perform a value engineering workshop to identify cost-saving alternatives without sacrificing function [Assessment] • Interpret key financial ratios for assessing a construction company's health [Familiarity]
Readings : [RSMMeans2024], [PMI2021]	

Unit 4: Construction Site and Field Management (24 hours)	
Competences Expected: ABET-5	
Topics	Learning Outcomes
• Site mobilization: temporary facilities, access, utilities, and site organization • Field supervision and daily site operations management • Subcontractor and trade coordination and sequencing • Progress reporting, documentation, and site coordination meetings • Materials management: procurement tracking, delivery, and storage • Quality control and inspection during construction execution • Stakeholder communication and conflict resolution on site • Project closeout: punch lists, commissioning, and turnover	• Develop a site mobilization plan including temporary facilities and access logistics [Usage] • Supervise daily site operations and resolve field-level execution issues [Assessment] • Coordinate subcontractor and trade sequencing to avoid schedule conflicts [Usage] • Prepare a progress report and lead a site coordination meeting [Usage] • Track material procurement, delivery, and on-site storage for a work package [Assessment] • Conduct a quality control inspection during a construction execution phase [Assessment] • Resolve a stakeholder conflict arising during site execution [Familiarity] • Manage project closeout activities, including punch lists and turnover [Usage]
Readings : [Gould2018], [Fisk2013]	

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