

# Construction Planning, Scheduling, and Control

<b>Code</b> CEM-802	<b>Credit Hours</b> 3-0
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## Course Description

This course offers an extensive exploration of the principles and applications of planning, scheduling, and controlling in the construction industry. Students will gain an in-depth understanding of various planning techniques and learn to develop and interpret bar charts, precedence diagrams, and arrow diagrams to visually represent project schedules. They will explore factors influencing duration estimates and learn the calculation of early and late start/finish times for project tasks using the Critical Path Method (CPM). The course will cover resource management, including the allocation and levelling of resources to optimize project performance, and teach the application of crashing techniques to reduce project duration through time-cost trade-offs. Additionally, students will comprehend the concepts of Program Evaluation and Review Technique (PERT) and Monte Carlo simulations to manage uncertainty and risks in project schedules. Emphasis will be placed on the impact of scheduling decisions on productivity and methods for monitoring and updating project schedules to ensure timely and cost-effective completion of construction projects.

## Textbook(s):

1. Mubarak, S. A. (2019). "Construction Project Scheduling and Control (4<sup>th</sup> ed.)." John Wiley & Sons.
2. Callahan, T. Michael, Quackenbush, G. Daniel, & Rowings, E. James. (1992). "Construction Project Scheduling." McGraw-Hill Education.

## Reference Book(s):

1. Kerzner, H. (2017). "Project Management: A Systems Approach to Planning, Scheduling, and Controlling (12<sup>th</sup> ed.)." Wiley.
2. Hendrickson, C., & Au, T. (2008). "Project Management for Construction." Carnegie Mellon University.

## Prerequisites

CE 474 (Construction Project Scheduling)

## ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Terms	25%
Term Project	10%
ESE	45%

## Teaching Plan

Week No.	Topics	Learning Outcomes
1	Introduction	Course outline, objectives, teaching plan, assessment methods, and review of key concepts.
2-4	Planning Techniques and Project Organization	<p>Comprehend various planning techniques applicable to construction projects.</p> <p>Develop and interpret bar charts, precedence diagrams, and arrow diagrams.</p> <p>Understand factors influencing duration estimates for project tasks.</p> <p>Analyze project scope and create a work breakdown structure (WBS).</p> <p>Apply milestone planning to track project progress.</p> <p>Understand project specifications, contracts, and drawings.</p> <p>Understand different organizational structures, including functional, product, matrix, and mixed structures.</p> <p>Learn about project transfer and managing multinational projects.</p>
5-8	Critical Path Method (CPM)	<p>Calculate early and late start/finish times for project tasks. Identify critical construction activities using the Critical Path Method (CPM).</p> <p>Analyze the critical path to determine project duration and flexibility.</p> <p>Apply float analysis to manage project delays. Use CPM software tools for project scheduling.</p> <p>Understand the applications of CPM in claims, cost control, cash-flow analysis, progress payments, trend analysis, and sensitivity analysis.</p> <p>Activity on arrow, node, PERT Analysis</p> <p>Risk-based scheduling using simulations etc.</p>
9	<b>MID-TERM EXAM</b>	
10-13	Resource Management and Crashing Techniques	<p>Allocate and level resources for a project to optimize performance. Implement resource smoothing and leveling techniques</p> <p>Learn about schedule compression techniques. Apply 'crashing' techniques to reduce project duration, considering time-cost trade-offs. Define least-cost scheduling and understand how direct and overhead costs vary with time.</p> <p>Develop strategies for managing limited resources and balancing workload.</p> <p>Create resource histograms and charts to visualize resource allocation.</p> <p>Determine the project progress using various tools</p>

14-17	Integrated Schedule Control and Productivity Optimization	<p>Understand time-phased diagrams and target schedules. Learn the importance of updating network schedules and the information needed for updates.</p> <p>Time impact analysis</p> <p>Explore elements of project control including schedule, performance, and cost control.</p> <p>Understand statistical project control and control through rescheduling and termination.</p> <p>Explore types of computers used in network scheduling, access methods, project management software, and expert systems.</p> <p>Learn the conceptual approach, and engage with project estimators, managers, subcontractors, owners, and engineers.</p> <p>Physically create the schedule using software like MS Project.</p>
18	<b>End Semester Exams</b>	