ITT Technical Institute

PM4650

Construction Project Scheduling

Onsite Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

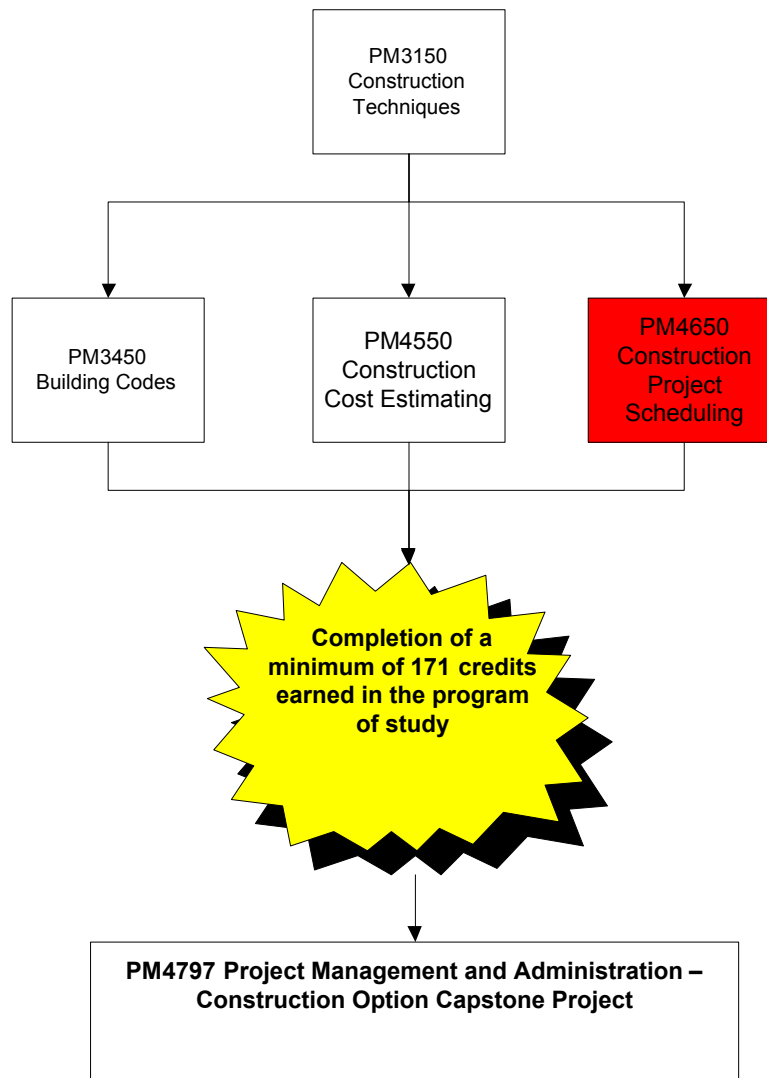Prerequisite: PM3150 Construction Techniques or equivalent

Course Description:

This course examines the planning and scheduling of construction projects. Topics include time schedules for materials, labor and equipment, and the use of communication tools in construction project planning

Where Does This Course Belong?

Construction Project Scheduling is a course required to obtain a bachelor's degree in the Project Management and Administration - Construction Option program. This course introduces the construction concepts and an introduction to construction materials.

The goal of the program is to help the student acquire the necessary skills to become a versatile member of a construction team. Graduates may begin their careers in a variety of entry-level positions involving construction estimating, construction project management, or building code compliance.

The following course sequence provides an overview of how Construction Project Scheduling fits into the Construction core of the program:

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                        │     PM3150       │
                        │  Construction    │
                        │   Techniques     │
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│   PM3450     │      │     PM4550       │      │     PM4650       │
│ Building     │      │  Construction    │      │  Construction    │
│ Codes        │      │  Cost Estimating │      │  Project         │
│              │      │                  │      │  Scheduling      │
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                  │    Completion of a        │
                  │ minimum of 171 credits    │
                  │  earned in the program    │
                  │       of study            │
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│  PM4797 Project Management and Administration –               │
│  Construction Option Capstone Project                         │
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NOTE: *Refer to the catalog for the state-specific course and program information, if applicable.*

This course is required for the Project Management and Administration - Construction Option. This program covers the following core areas:

- This program covers the fundamentals of project management.

- The program offers a foundation in project management, construction techniques and legal issues relating to the project management field.

- Areas of study include, construction project management, building codes and construction cost estimating.

- The goal of the program is to help the student acquire the necessary skills to enter the workplace and be a versatile member of a construction team.

Course Summary

Major Instructional Areas

1. Review of project management basics
2. Checklists, daily to-do lists, and magnetic scheduling boards
3. Bar chart schedules
4. Introduction to CPM scheduling
5. Creating the rough logic diagram
6. Determining durations
7. Calculating start and finish dates
8. Calculating float
9. Using lags in rough logic diagrams
10. Reviewing and analyzing schedules
11. Creating bar charts and tabular reports from rough logic diagrams
12. Linear schedules
13. Updating the schedule
14. Using schedules to forecast and balance resources

Course Objectives

1. Describe project scheduling and how it relates to the construction industry.
2. Prepare a work breakdown structure and the rough logic diagram for a construction project.
3. Develop and calculate a CPM schedule.
4. Control resource management in construction scheduling.
5. Perform schedule updating and earned value analysis.
6. Manage costs in construction scheduling project management software.
7. Perform schedule acceleration.
8. Produce reports that communicate the right level of information to the recipient in the most efficient manner.
9. Properly identify, document, and incorporate delays into the project schedule in order to resolve construction delay claims.

Learning Materials and References

Required Resources

Complete Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Mubarak, S. (2010). *Construction project scheduling and control* (2nd ed.). Hoboken, NJ: John Wiley and Sons, Inc.	■		■
Other Items	**New to this Course**	**Carried over from Previous Course(s)**	**Required for Subsequent Course(s)**
Microsoft Project		■	

Recommended Resources

Books, Professional Journals

- Engineering News Record (ENR) (http://enr.construction.com/)

  Find information here on news and features about construction projects.

Professional Associations

- Project Management Institute (PMI) (http://www.pmi.org/)

   PMI establishes standards for project management.

- Associated General Contractor's of America (AGC) (http://www.agc.org/)

  AGC is a trade association for the construction industry. It has a database of members you can

  access.

ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)

Books > Books 24x7
- Kendrick, T. (2004). The project management tool kit: 100 tips and techniques for getting the job done right. New York NY: AMACOM.
- Kliem, R. L. (2004). Leading high performance projects. Baca Raton, FL: J. Ross Publishing, Inc.
- Prentice, S. (2007). Cool down: Getting further by going slower. Hoboken, NJ: John Wiley & Sons.
- Verma, V. K. (1997). The human aspects of project management: Managing the project team.
- Volume Three. Newtown Square, PA: Project Management Institute.

Books > Ebrary
- Aldisert, L. M. (2002). Valuing people: How human capital can be your strongest asset. Chicago, IL: Dearborn Trade, A Kaplan Professional Company.
- Baker, S. (2000). Complete idiot's guide to project management. Indianapolis, IN: Alpha Books.
- Heerkens, G. Project management. New York, NY: McGraw-Hill Trade.
- Kanaga, K. (2007). How to launch a team: Start right for success. Greensboro, NC: Center for Creative Leadership

- Lewis, J. P. (2002). Working together: 12 principles for achieving excellence in managing projects, teams, and organizations. New York, NY: McGraw-Hill Education Group.
- Richman, L. L. (2002). Project management step-by-step. New York, NY: AMACOM.

NOTE: All links are subject to change without prior notice.

Information Search

Use the following keywords to search for additional online resources that may be used for supporting your work on the course assignments:

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- Project scheduling
- Construction project management
- Logic diagrams
- Earned value analysis
- Schedule updating

Suggested Learning Approach

In this course, you will be studying individually and within a group of your peers. As you work on the course deliverables, you are encouraged to share ideas with your peers and instructor, work collaboratively on projects and team assignments, raise critical questions, and provide constructive feedback.

Use the following advice to receive maximum learning benefits from your participation in this course:

DO	DON'T
- Do take a proactive learning approach - Do share your thoughts on critical issues and potential problem solutions - Do plan your course work in advance - Do explore a variety of learning resources in addition to the textbook - Do offer relevant examples from your experience - Do make an effort to understand different points of view - Do connect concepts explored in this course to real-life professional situations and your own experiences	- Don't assume there is only one correct answer to a question - Don't be afraid to share your perspective on the issues analyzed in the course - Don't be negative about the points of view that are different from yours - Don't underestimate the impact of collaboration on your learning - Don't limit your course experience to reading the textbook - Don't postpone your work on the course deliverables – work on small assignment components every day

Course Outline

Unit 1: INTRODUCTION TO CONSTRUCTION PROJECT MANAGEMENT, PART 1

Upon completion of this unit, students are expected to:

Out-of-class work: 9 hours

- Explain the different elements of project scheduling.
- Describe the factors that affect construction planning and scheduling.
- Outline the activity order for a residential building.
- Analyze objectives and limitations of a scheduling scenario.
- Summarize activity time estimates for construction of a new building.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 1	Exercise	Unit 1 Exercise 1: Vacation Planning	3%
	Project	Unit 1 Project 1: New Building	3%

Unit 2: INTRODUCTION TO CONSTRUCTION PROJECT MANAGEMENT, PART 2

Upon completion of this unit, students are expected to:

Out-of-class work: 9 hours

- Develop questions to ask to extract information about a construction project.
- Interview a general contractor.
- Analyze objectives and limitations of a scheduling scenario.
- Construct a bar chart with a project's activities.
- Sequence activities for a construction project.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 2	Assignment	Unit 2 Assignment 1: Extracting Information	3%

Unit 3: BASIC NETWORKS

Upon completion of this unit, students are expected to:

Out-of-class work: 9 hours

- Create a rough logic diagram.
- Explain how arrow and node networks are used.
- Explain lags and leads.
- Describe the usefulness of time-scaled logic diagrams.
- Contrast a node network and a bar chart.
- Draw a precedence diagram.
- Calculate early and late dates.
- Calculate total float.
- Identify the critical path.
- Apply knowledge of work breakdown structures and logic diagrams to a construction project.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapters 3-4	Assignment	Unit 3 Assignment 1: Lags and Leads	3%
	Exercise	Unit 3 Exercise 1: Commercial Building Precedence Diagram	3%
	Project	Unit 3 Project 1: Remodeling Chemical Laboratory	3%

Unit 4: THE CRITICAL PATH NETWORK

*NOTE: This unit spans 2 weeks.

Out-of-class work:
9 hours

Upon completion of this unit, students are expected to:

- Determine activities and durations.
- Use a bar chart to demonstrate project activities, budgets, and responsibilities.
- Develop a precedence diagram.
- Calculate forward pass in a schedule (early dates).
- Calculate backward pass in a schedule (late dates).
- Calculate total and free float and highlight the critical path.
- Use end-of -day, start-of-day, and combination methods to calculate a schedule.
- Describe factors affecting productivity.
- List some considerations for the final schedule.
- Apply the end-of-day method for a remodel project.
- Apply knowledge of CPM scheduling to problem solving.
- Integrate final schedule considerations in calculating productivity and labor days.
- Develop a schedule using computerized scheduling software (Microsoft Project).

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Mubarak, Chapter 5	Assignment	Unit 4 Assignment 1: Factors Affecting Productivity	3%
	Exercise	Unit 4 Exercise 1: CPM Calculations	3%
		Unit 4 Exercise 2: Final Schedule	3%
		Unit 4 Exercise 3: Small Office Building	3%
	Project	Unit 4 Project 1: Natural Gas Compressor	3%

Unit 5: RESOURCE ALLOCATION AND RESOURCE LEVELING

Out-of-class work:
9 hours

Upon completion of this unit, students are expected to:

- Identify the 3 different types of resources.
- Describe materials management.
- Define resource allocation.
- Define resource leveling.
- Apply the resource allocation steps to a construction schedule.
- Level resources by applying resource leveling algorithms.
- Assign resources and budgets to activities using computerized scheduling software (MS Project).
- Perform resource allocation and leveling on small, simple schedules.

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	**Activity/Deliverable Title**	**Grade Allocation** (% of all graded work)
• Mubarak, Chapter 6	Exercise	Unit 5 Exercise 1: Leveling Algorithms	3%
		Unit 5 Exercise 2: Resource Leveling Problem Set 1	3%
		Unit 5 Exercise 3: Resource Leveling Problem Set 2	3%
	Project	Unit 5 Project 1: Resource Allocation with Microsoft Project	3%

Unit 6: SCHEDULE UPDATING & PROJECT CONTROL

Upon completion of this unit, students are expected to:

- Explain the need for schedule updating.
- Analyze the effect of delays.
- Discuss the importance of updating the project schedule.
- Detail what to update.
- Summarize the most common methods for updating.
- Manually update a schedule.
- Describe the impact of adding and deleting activities.
- Apply Earned Value Analysis (EVA) concepts to a simple schedule.
- Identify changes in critical path.
- Update a construction project using Microsoft Project.
- Analyze impacts of schedule changes on project completion date.

Out-of-class work:
9 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 7	Exercise	Unit 6 Exercise 1: Earned Value Analysis	3%
	Assignment	Unit 6 Assignment 1: Modifying and Revising the Schedule	3%
	Project	Unit 6 Project 1: Updating with Microsoft Project	3%

Unit 7: SCHEDULE COMPRESSION AND TIME-COST TRADE-OFF

Upon completion of this unit, students are expected to:

- Discuss the reasons for project schedule acceleration.
- Calculate the normal, least-cost, and crash durations and costs.
- Use terminology related to schedule compression and time-cost trade-off concepts.
- Shorten the duration of a project.
- Discuss the concept of "Optimum Scheduling."
- Determine the impact to costs (direct and indirect) when compressing a schedule.
- Assess the time-cost trade-off.
- Analyze a delay on a construction project.
- Apply time-cost trade-off concepts and schedule compression techniques using Microsoft Project.

Out-of-class work:
9 hours

READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 8	Assignment	Unit 7 Assignment 1: Determining the Costs of Accelerating a Project Schedule	3%
	Exercise	Unit 7 Exercise 1: Time-Cost Trade-off	3%
		Unit 7 Exercise 2: Disaster Strikes!	3%
	Project	Unit 7 Project 1: Acceleration with Microsoft Project	3%

Unit 8: REPORTS & PRESENTATIONS			
Upon completion of this unit, students are expected to: • Describe the characteristics of good communication. • Describe the information needs of the different types of people involved in a construction project. • Evaluate the different types of reports. • List the characteristics of good presentations. • Recommend reports and presentations to use in different situations. • Create reports using Microsoft Project.			*Out-of-class work:* 9 hours
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 9	Exercise	Unit 8 Exercise 1: Reports and Presentation Questions	3%
	Project	Unit 8 Project 1: Reports and Roles	3%

Unit 9: DELAYS & SCHEDULE ANALYSIS			
Upon completion of this unit, students are expected to: • Define delays and reasons for delay claims on a construction project. • Classify the types of delay claims issues. • Categorize the types of delays resulting in a claim (excusable, non-excusable, concurrent). • Discuss the basic suppositions (assumptions) relating to the definition of a delay. • Identify common scheduling mistakes related to delay claims. • Explain the most common forms of dispute resolution. • Explain how contractors and project owners attempt to prove delays and recover delay damages.			*Out-of-class work:* 9 hours
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Mubarak, Chapter 13	Exercise	Unit 9 Exercise 1: Delays	3%
		Unit 9 Exercise 2: Legal Research	3%
	Project	Unit 9 Project 1: Delays and Microsoft Project	3%

Unit 10: COURSE REVIEW AND FINAL EXAM			
			Out-of-class work: 9 hours
READING ASSIGNMENT	GRADED ACTIVITIES / DELIVERABLES		
	Grading Category	Activity/Deliverable Title	Grade Allocation (% of all graded work)
• Review all course readings	Exam	Final Exam	19%

Note: Your instructor may add a few learning activities that will change the grade allocation for each assignment in a category. The overall category percentages will not change.

Evaluation and Grading

Evaluation Criteria

The graded assignments will be evaluated using the following weighted categories:

Category	Weight
Assignment	15%
Exercise	42%
Project	24%
Exam	19%
TOTAL	**100%**

Grade Conversion

The final grades will be calculated from the percentages earned in the course, as follows:

Grade	Percentage	Credit
A	90–100%	4.0
B+	85–89%	3.5
B	80–84%	3.0
C+	75–79%	2.5
C	70–74%	2.0
D+	65–69%	1.5
D	60–64%	1.0
F	<60%	0.0

Academic Integrity

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct, including plagiarism, self-plagiarism, fabrication, deception, cheating, and sabotage. For more information on the academic honesty policies, refer to the Student Handbook and the Course Catalog.

(End of Syllabus)