

ITT Technical Institute  
**PM4550**  
**Construction Cost Estimating**  
**Onsite Course**

**SYLLABUS**

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**Credit hours:** 4.5

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

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

Prerequisites: PM3150 Construction Techniques or equivalent

**Course Description:**

In this course, students study the estimation of direct and indirect construction project costs, such as labor, material and equipment. Topics include overhead and profit, bidding and computer-based estimating.

## Where Does This Course Belong?

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The following diagram demonstrates how this course fits in the standard program:

Construction Cost Estimating is a course required to obtain a bachelor's degree in the Project Management-Construction program. This course introduces the estimation techniques used in the Construction Management Industry.

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 Cost Estimating fits into the program.



**NOTE:** Refer to the catalog for the state-specific course and program information, if applicable.

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This course is required for the Project Management Construction program. 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. Basic Mathematical calculations and the use of Spreadsheets
2. What is Cost Estimating and the different types of estimates
3. Using RS Means Data and adjusting for local conditions
4. Concrete
5. Masonry
6. Metals
7. Woods & Plastics, Thermal & moisture protection
8. Doors & windows, interior finishes and equipment
9. Fire suppression, plumbing, mechanical and earthwork
10. Equipment analysis and general conditions
11. Assembly and approximate estimates

## Course Objectives

1. Demonstrate a systematic approach to completing the estimating process in commercial construction.
2. Demonstrate basic skills required to measure and calculate quantities.
3. Describe the methods used for pricing the various takeoff elements in a construction project estimate.
4. Prepare a takeoff of concrete work for a construction project.
5. Prepare a takeoff of masonry work for a construction project.
6. Prepare a takeoff for a construction project using metal components.
7. Estimate the quantity of woods and plastics.
8. Estimate the pricing for thermal and moisture protection for a project.
9. Estimate the doors and windows, finish materials, and equipment needed for a construction project.
10. Prepare an estimate using fire suppression, plumbing, mechanical and electrical factors and Means CostWorks data sets.
11. Prepare an estimate using earthwork factors and Means CostWorks data sets.
12. Prepare a price estimate for construction equipment and excavation work.
13. Apply assembly and approximate estimating techniques
14. Analyze equipment and general requirements in the estimating process.
15. Prepare a price estimate of concrete, masonry, structural steel, carpentry, and miscellaneous items.

## Learning Materials and References

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### Required Resources

Complete Textbook Package	New to this Course	Carried over from Previous Course(s)	Required for Subsequent Course(s)
Mubarak, S. (2012) <i>How to estimate with means data &amp; costworks</i> , 4th 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)
Means Data CostWorks . (2012). [CDROM]. Hoboken, NJ: John Wiley and Sons, Inc.	■		

### Technology Requirements

- Windows-compatible computer with Windows 2000 or later
- 450 MHz DPU (minimum) / 800 MHz CPU (recommended)
- 64 MB RAM (minimum) / 128 MB RAM (recommended)
- 1024 x 768 monitor – high color
- 24X CD-ROM drive

### Recommended Resources

#### Internal

- ITT Tech Virtual Library:  
<http://myportal.itt-tech.edu/library/Pages/HomePage.aspx>.

#### External

- Wiley Student Companion Site

Wiley offers a Student Companion Site for the course's required text. Log on to:  
<http://bcs.wiley.com/he-bcs/Books?action=index&itemId=1118025288&bcsId=7236>

**Or** you can log on to [www.wiley.com](http://www.wiley.com), then type the text isbn (1118025288) in the search bar on the upper right hand side of the web page and click the search button. You will then be taken to a screen with the text cover image and title listed. Click on the "Visit the Companion Sites" link under the text title and then click on the "Student Companion Site" link from the drop down menu.

(Note: This site is not password protected)

- Books:

- *Skills for Engineering and Construction Projects*. New York: The Fairmont Press, 2003.
  - This reference can give more information on construction projects from an engineering perspective.
- Brook, Martin. *Estimating and Tendering for Construction Work*. 3<sup>rd</sup> ed. Amsterdam: Boston Elsevier, 2004.
  - For further information on estimation and cost analysis, see this text.
- Merritt, Frederick S., and Jonathan T. Ricketts. *Building Design and Construction Handbook*. 6th ed. New York: McGraw-Hill Professional, 2000.
  - This text serves as a reference for design and construction.

**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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- Cost estimation
- Cost analysis
- Pricing concrete
- Pricing masonry
- Pricing structural Steel
- Pricing carpentry
- Pricing construction equipment

## Suggested Learning Approach

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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
<ul style="list-style-type: none"><li>▪ Do take a proactive learning approach</li><li>▪ Do share your thoughts on critical issues and potential problem solutions</li><li>▪ Do plan your course work in advance</li><li>▪ Do explore a variety of learning resources in addition to the textbook</li><li>▪ Do offer relevant examples from your experience</li><li>▪ Do make an effort to understand different points of view</li><li>▪ Do connect concepts explored in this course to real-life professional situations and your own experiences</li></ul>	<ul style="list-style-type: none"><li>▪ Don't assume there is only one correct answer to a question</li><li>▪ Don't be afraid to share your perspective on the issues analyzed in the course</li><li>▪ Don't be negative about the points of view that are different from yours</li><li>▪ Don't underestimate the impact of collaboration on your learning</li><li>▪ Don't limit your course experience to reading the textbook</li><li>▪ Don't postpone your work on the course deliverables – work on small assignment components every day</li></ul>

**Course Outline**

<p><b>Unit 1: Introduction to CostWorks, Basic Calculations, and Spreadsheet Types</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Describe the importance of having a rational and systematic process for estimating.</li> <li>• Identify how rounding impacts the estimation process.</li> <li>• Describe the importance of consistency in rounding across tools.</li> <li>• Examine the two phases of the estimating process in determining cost.</li> <li>• Explain the process of making data adjustments for labor and materials based on geographical area.</li> <li>• Prepare an estimate for the costs of building using materials and labor factors.</li> <li>• Define estimating.</li> <li>• Describe the purpose of estimating.</li> <li>• Describe the types of estimates.</li> <li>• Examine the components that go into an estimate.</li> <li>• Estimate quantities of components.</li> <li>• Examine the time factors that go into an estimate.</li> <li>• Explain the impact of rounding on the estimation process.</li> <li>• Contrast two estimates using different rounding calculations.</li> <li>• Interpret data used in CostWorks.</li> </ul>			<p><b>Out-of-class work:</b> 8 hours</p>
<p><b>READING ASSIGNMENT</b></p>	<p><b>GRADED ACTIVITIES / DELIVERABLES</b></p>		
	<p><b>Grading Category</b></p>	<p><b>Activity/Deliverable Title</b></p>	<p><b>Grade Allocation</b> (% of all graded work)</p>
<ul style="list-style-type: none"> <li>• Mubarak, Introduction and Chapters 1-3</li> </ul>	<p>Exercise</p>	<p>Unit 1 Exercise 1: Determining Costs of a Project</p>	<p>2.5%</p>
	<p>Assignment</p>	<p>Unit 1 Assignment 1: Numerical Rounding and Mathematical Judgment (Concrete)</p>	<p>1.5%</p>
	<p>Project</p>	<p>Unit 1 Project 1: Creating an Estimate</p>	<p>3.0%</p>

<p><b>Unit 2: General Conditions and Equipment Analysis</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Discuss the role of depreciation in determining the cost of equipment ownership.</li> <li>• List the expenses associated with equipment ownership.</li> <li>• Discuss what general conditions are and when they are calculated.</li> <li>• Review the reference materials in Means Data CostWorks.</li> <li>• Summarize how equipment costs are accounted for in the contractor's estimating and budgeting.</li> <li>• Estimate the cost of equipment ownership with varying conditions.</li> <li>• Estimate for General Conditions.</li> </ul>			<p><b>Out-of-class work:</b> 11 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>• Mubarak, Chapters 4 and 13</li> </ul>	Assignment	Unit 2 Assignment 1: Equipment Costs	1.5%
	Lab	Unit 2 Lab 1: Equipment Analysis	2.5%
	Project	Unit 2 Project 1: Final Estimate	3.0%

<p><b>Unit 3: Adjusting Means Data</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Describe the factors that can affect a project.</li> <li>• Use the CostWorks estimate summary feature to prepare an estimate.</li> <li>• Apply job condition specifics to a Means data set.</li> <li>• Integrate knowledge of estimating, influencing factors, and CostWorks to create an estimate for a multi-location project.</li> <li>• Explain the impact that labor markup, interpolation, and substitution of labor rates have on an estimate.</li> <li>• Describe how overtime, inflation, and escalation due to union contracts can affect costs.</li> <li>• Recognize the impacts of unit consistency.</li> </ul>			<p><b>Out-of-class work:</b> 8 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>• Mubarak, Chapter 5</li> </ul>	Lab	Unit 3 Lab 1: Fine Tuning	2.5%
	Project	Unit 3 Project 1: Multi-Location Request	3.0%



<b>Unit 4: Concrete</b>			<b>Out-of-class work:</b> 11 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> <li>List elements of the quantity takeoff for concrete work on a construction project.</li> <li>Discuss how Mix &amp; Placement and Cold Weather Placement impact the concrete estimate.</li> <li>Estimate the quantity of concrete.</li> <li>Complete a computer takeoff of concrete work using the Means Data CostWorks software.</li> <li>Determine overlap length of rebar and impact on a concrete estimate.</li> <li>List variables that impact the cost of concrete.</li> <li>Determine impact of reinforcement and framework on concrete cost in a construction project.</li> <li>Discuss how Proportional Quantities and Mini-Assemblies are used to streamline the estimating process.</li> <li>Prepare an estimate for a public garage using Means Data CostWorks.</li> </ul>			
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>Mubarak, Chapter 6</li> </ul>	Assignment	Unit 4 Assignment 1: Concrete Costs	1.5%
	Lab	Unit 4 Lab 1: Concrete Practice	2.5%
	Project	Unit 4 Project 1: Public Garage	3.0%

<b>Unit 5: Masonry</b>			<b>Out-of-class work:</b> 11 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> <li>Describe the two types of masonry and reinforcements used.</li> <li>Identify considerations when estimating masonry.</li> <li>Describe the factors that impact a mason's productivity.</li> <li>Identify impacts of material selection on the masonry estimate.</li> <li>List the takeoff elements for masonry work in a construction project.</li> <li>Identify how dimensional changes impact the estimate.</li> <li>Identify the impacts of profit and overhead on the masonry estimate.</li> <li>Calculate the cost of masonry for complex designs.</li> </ul>			
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>Mubarak, Chapter 7</li> </ul>	Assignment	Unit 5 Assignment 1: Masonry Factors	1.5%
	Exercise	Unit 5 Exercise 1: Masonry for Complex Designs	2.5%
	Lab	Unit 5 Lab 1: Profit and Overhead	2.5%
	Project	Unit 5 Project 1: Erecting a Wall	3.0%

<p><b>Unit 6: Metals</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Explain why steel is used in construction.</li> <li>• Describe how steel is ordered and priced.</li> <li>• Describe the processes that impact the metal estimate.</li> <li>• Estimate steel weights.</li> <li>• Describe the take-off portion of the metal estimate.</li> <li>• Estimate costs for steel components.</li> <li>• Determine how to approximate cost early in the design process</li> <li>• Estimate bare costs.</li> <li>• Estimate a roof structure as an assembly.</li> <li>• Determine cost estimates from conceptual drawings.</li> <li>• Prepare an estimate for a steel building based on various scenarios.</li> <li>• Use a multistep process to make a complex system estimate.</li> </ul>			<p><b>Out-of-class work:</b> 11 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation (% of all graded work)</b>
<ul style="list-style-type: none"> <li>• Mubarak, Chapter 8</li> </ul>	Assignment	Unit 6 Assignment 1: Calculating Bare Costs for Steel Components	1.5%
	Lab	Unit 6 Lab 1: Estimating Parts 1, 2, and 3	2.5%
	Project	Unit 6 Project 1: Framed Steel Building	3.0%

<p><b>Unit 7: Wood &amp; Plastics, Thermal &amp; Moisture Protection</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Discuss the basic wood products, measurements, and quantities associated with wood products.</li> <li>• Discuss the basic measurement used in determining thermal and moisture protection.</li> <li>• Review slope factors.</li> <li>• Describe how to calculate floor and roof areas.</li> <li>• Describe how to estimate wood framing systems, roof systems.</li> <li>• Convert quantities into fully priced estimated line items.</li> <li>• List the different components in a wood frame roof assembly.</li> <li>• Estimate the quantity takeoff associated with framing and roof systems.</li> <li>• Estimate materials, bare costs, and total cost for framing and roofing.</li> </ul>			<p><b>Out-of-class work:</b> 11 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation (% of all graded work)</b>
<ul style="list-style-type: none"> <li>• Mubarak, Chapter 9</li> </ul>	Assignment	Unit 7 Assignment 1: Estimating a Roofing System Components and Pricing	1.5%
	Lab	Unit 7 Lab 1: Quantity Take-Off for Framing and Roofing Systems	2.5%
	Project	Unit 7 Project 1: Estimating from a Floor Plan	3.0%

<p><b>Unit 8: Doors &amp; Windows, Interior Finish, &amp; Equipment</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• Discuss the differences in the methods used to quantify divisions 8-14.</li> <li>• List the different items that need special consideration in the finish estimate.</li> <li>• List the steps required in the estimation of paint from cut in to final cover.</li> <li>• Discuss the concerns that estimators should have in the finish estimate process.</li> <li>• Discuss how areas of specialties, equipment, furnishings, and special construction can impact job specific requirements.</li> <li>• Apply different quantification processes to doors and windows.</li> <li>• Estimate specialties using Means Data CostWorks.</li> <li>• Estimate bare costs and costs including overhead and profit for different scenarios.</li> </ul>			<p><b>Out-of-class work:</b> 11 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation (% of all graded work)</b>
<ul style="list-style-type: none"> <li>• Mubarak, Chapter 10</li> </ul>	Assignment	Unit 8 Assignment 1: Considerations for Finish Estimate	1.5%
	Exercise	Unit 8 Exercise 1: CostWorks Problem Set	2.5%
	Lab	Unit 8 Lab 1: Doors and Windows	2.5%
	Project	Unit 8 Project 1: Estimating a Ceiling Grid	3.0%

<p><b>Unit 9: Fire Suppression, Plumbing, Mechanical, Electrical &amp; Earthwork</b></p> <p>Upon completion of this unit, students are expected to:</p> <ul style="list-style-type: none"> <li>• List the items that may not be shown on the drawings that will impact the estimate.</li> <li>• Explain the considerations an estimator needs to understand for fire suppression systems.</li> <li>• Discuss the application of Means data to mechanical drawings.</li> <li>• Discuss the application of Means data to Means electrical estimates.</li> <li>• Consider the factors that impact the quantification for the MEP estimate.</li> <li>• List the types of earthwork required on a project.</li> <li>• Consider the factors that impact the earthwork quantities.</li> <li>• Discuss the importance of proper equipment selection in earthwork estimates.</li> </ul>			<p><b>Out-of-class work:</b> 11 hours</p>
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation (% of all graded work)</b>
<ul style="list-style-type: none"> <li>• Mubarak, Chapters 11 and 12</li> </ul>	Assignment	Unit 9 Assignment 1: Estimate Considerations	1.5%
	Exercise	Unit 9 Exercise 1: Earthwork Problem Set	2.5%
	Lab	Unit 9 Lab 1: Fire Suppression and Plumbing	2.5%
	Project	Unit 9 Project 1: Excavation	3.0%

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<b>Unit 10: Assembly and Approximate Estimates</b>			<b>Out-of-class work:</b> 8 hours
Upon completion of this unit, students are expected to: <ul style="list-style-type: none"> <li>• Discuss the need for the assemblies estimate.</li> <li>• Discuss how the assemblies estimate is used in estimating.</li> <li>• Discuss the accuracy of the assemblies estimate.</li> <li>• Discuss where in the design process the approximate it is used.</li> <li>• Explore the entire estimating process.</li> <li>• Determine the applicable level of estimate to be used and at different design points.</li> <li>• Estimate a building and components using the assemblies estimate process.</li> <li>• Estimate a building using the approximate estimate process.</li> </ul>			
<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>• Mubarak, Chapters 14 and 15</li> </ul>	Lab	Unit 10 Lab 1: Use of Assemblies in the Estimating Process	2.5%
	Project	Unit 10 Project 1: Assemblies	3.0%

<b>Unit 11: Final Project</b>			<b>Out-of-class work:</b> 8 hours
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<b>READING ASSIGNMENT</b>	<b>GRADED ACTIVITIES / DELIVERABLES</b>		
	<b>Grading Category</b>	<b>Activity/Deliverable Title</b>	<b>Grade Allocation</b> (% of all graded work)
<ul style="list-style-type: none"> <li>• Review all chapters</li> </ul>	Final Project	Final Project: Building Plans	25.5%

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

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### Evaluation Criteria

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

Category	Weight
Assignment	12.0%
Lab	22.5%
Project	30.0%
Exercise	10.0%
Final Project	25.5%
<b>TOTAL</b>	<b>100%</b>

### 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

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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)*