



## COURSE OUTLINE

Course Number	Course Title	Credits
BCT232	Construction Estimating	3
Hours: 0 Studio/Lab, 3 Lecture	Pre-requisite BCT110 Construction Materials & Methods BCT120 Construction Graphics BCT104 Codes for Construction	Implementation Sem/Year Fall 2017

### Course description:

#### **Construction Estimating**

The study of construction documents for producing construction job estimates, addressing the roles and responsibilities of the Construction cost estimator. Both residential and light commercial applications are addressed. An introduction to contracts and types of bids is provided. Familiarization with computer estimating software applications is included. (3/0)

### Required texts/other materials:

#### **Construction Estimating Using Excel**

**SECOND EDITION**

**Steven J. Peterson, MBA, PE**

**Prentice Hall ISBN-13: 978-0-13-800719-5**

Other learning resources:

Means Construction cost

Online web site in text

**Last Revised:** Fall 2021

BCT232 - Construction Estimating

**Course Coordinator:** James Maccariella, maccarij@mccc.edu

**Available Resources:**

**GENERAL OBJECTIVES:**

- A. Familiarize the student with the various parts and aspects of a complete set of Construction Documents.
- B. To familiarize the student with the methods used to obtain a reasonable cost estimate and be aware of some current cost figures.
- C. To sensitize the student to the cost of construction to become aware and more critical of methods and materials used in his designs.

**STUDENT LEARNING OUTCOMES**

1. Arrange and prepare, from material and labor take-off list, a complete estimate.
2. Explain responsibilities and ethics of an estimator.
3. Demonstrate, define and explain the use of a construction spread sheet for estimating.
4. Understand and relate the theory of estimating for building construction as related to the structure of plans and specifications estimates.
5. Demonstrate, define and explain quantity surveying, unit cost synthesis and analysis, bid organization and preparation.
6. Describe competitive simulations and exercises in estimating.
7. Recount the estimator's qualifications, responsibilities and ethics.

**Course-specific General Education Knowledge Goals and Core Skills.**

**General Education Knowledge Goals**

**Goal 1. Communication.** Students will communicate effectively in both speech and writing.

**Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Goal 9. Ethical Reasoning and Action.** Students will understand ethical issues and situations.

**MCCC Core Skills**

**Goal A. Written and Oral Communication in English.** Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.

**Goal B. Critical Thinking and Problem-solving.** Students will use critical thinking and problem solving skills in analyzing information.

**Goal C. Ethical Decision-Making.** Students will recognize, analyze and assess ethical issues and situations.

**Goal D. Information Literacy.** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Goal E. Computer Literacy.** Students will use computers to access, analyze or present information, solve problems, and communicate with others.

**Goal F. Collaboration and Cooperation.** Students will develop the interpersonal skills required for effective performance in group situations.

## **UNIT I– THE ART OF ESTIMATING, THE ESTIMATING AND BIDDING PROCESS and ETHIC**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain the role estimating plays in the success of a construction company.
- Identify what skills are needed to become a good estimator.
- Explain the role of the bid package in the estimating process.
- Identify the tools available to estimators.
- Explain why practice is important.
- Describe the steps taken to complete an estimate.
- Identify the general scope of work and the items which need to be bid to complete an estimate.
- Define ethics as it relates to estimating. 2,7; **Goal 9, Goal C.**
- Discuss some of the ethical situations an estimator may face during his or her career. 2,7; **Goal 9, Goal C.**

## **UNIT II– INTRODUCTION TO EXCEL**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Perform basic operations in Excel including: managing workbooks and worksheets, entering data, formatting worksheets and cells, creating headers and footers, and printing worksheets.
- Explain the difference between absolute and relative references.
- Use the ROUND, ROUNDUP, ROUNDDOWN, CEILING, FLOOR, SUM, AVERAGE, and IF functions.
- Explain how to test worksheets and why it is important.

## **UNIT III FUNDAMENTALS OF THE QUANTITY TAKEOFF**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain the purpose and the procedures for preparing a quantity takeoff.
- Explain the purpose of a work package and how they are developed.
- Identify the five main categories of building components and identify what items are associated with each of these categories.
- Explain how waste is added to an estimate.

## **UNIT IV CONCRETE and MASONRY, METALS, WOODS, PLASTICS, AND COMPOSITES**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Prepare a quantity takeoff for the concrete, forms, area to be finished, and reinforcing needed to construct footings, columns, walls, beams, slabs, and other concrete members.
- Prepare a quantity takeoff for block, structural brick, and brick veneer.
- Prepare a quantity takeoff for structural steel, joists, metal deck, and miscellaneous steel.
- Prepare a quantity takeoff for wood framing including sills, posts, girders, floor joists, walls, headers, hold downs, blocking, rafters, trusses, sheathing, and soffit.

- Describe how the framing method affects the quantity of materials needed.
- Prepare a quantity takeoff for wood decks.
- Prepare a quantity takeoff for wood trim.
- Prepare a quantity takeoff for cabinets and counter tops.

## **UNIT V THERMAL AND MOISTURE PROTECTION OPENINGS and FINISHES**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Prepare a quantity takeoff for waterproofing and damp proofing, building paper and vapor barriers, insulation, shingle roofing, siding, soffit, fascia, and membrane roofing.
- Prepare a quantity takeoff for doors, windows, commercial storefront, glazing, and hardware.
- Prepare a quantity takeoff for interior finishes including metal stud partitions, drywall, tile, acoustical ceilings, wood and laminate flooring, sheet vinyl, vinyl composition tile, rubber base, carpet and pad, and paint.

## **UNIT VI- FIRE SUPPRESSION, PLUMBING, HVAC, and ELECTRICAL SYSTEMS**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Prepare a quantity takeoff for a fire sprinkler system.
- Prepare a quantity takeoff for residential and simple commercial plumbing systems.
- Prepare a quantity takeoff for residential and simple commercial heating air conditioning and ventilation systems.
- Prepare a quantity takeoff for residential and simple commercial electrical systems.

## **UNIT VII EARTHWORK, EXTERIOR IMPROVEMENTS and UTILITIES**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain swell and shrinkage.
- Convert among bank, loose, and compacted volumes.
- Determine excavation volumes using the geometric method, the average-width-length-depth method, the average-end method, the modified-average-end method, and the cross-sectional method.
- Determine the volume of backfill.
- Prepare a quantity takeoff for asphalt and base, site concrete, and landscaping.
- Prepare a quantity takeoff for underground utilities including excavation, piping or conduit, bedding, and backfill.

## **UNIT VIII MATERIAL PRICING, LABOR PRODUCTIVITY and HOURS, and LABOR RATES**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Describe and calculate the cost components of material pricing.
- Estimate material prices from historical costs.
- Know how to obtain pricing from suppliers.
- Define FOB and describe its importance in the procurement of construction materials.
- Describe the relationship between output and labor-hours per unit.
- Explain the factors affecting productivity and their effect on productivity.

- Calculate productivity from historical data.
- Calculate productivity from field observations using cycle times and rate of progress.
- Calculate the number of labor hours required to complete a task.
- Describe the components of labor burden and explain where to find the burden rates for their company.
- Determine the hourly cost of labor including the costs of burden.

## **UNIT VIII EQUIPMENT COSTS CREW RATES SUBCONTRACT PRICING and MARKUPS**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain the difference between equipment ownership and operation costs.
- Calculate the hourly ownership and operation costs for a piece of equipment.
- Determine the average wage rate per labor-hour for a crew.
- Determine the equipment cost per labor-hour for a crew.
- Prepare a Request for Quote.
- Write a scope of work.
- Estimate subcontractor costs from historical data.
- Discuss what factors should be taken into account when selecting a subcontractor.
- Calculate building permit, bond, and profit and overhead markups.
- Explain why an estimator should track competitor's bids and show how this may be done.

## **UNIT IX PRICING EXTENSIONS AVOIDING ERRORS IN ESTIMATES**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Determine the material, labor, and equipment cost.
- Fill out the Detail and Summary cost worksheets.
- Obtain a total estimated cost, including all markups, for a construction project.
- Identify sixteen ways to avoid errors in estimates.
- Explain why it is important for estimators to incorporate many of these principles into their bidding practices.

## **UNIT X SUBMITTING THE BID PROJECT BUYOUT THE ESTIMATE AS THE BASIS OF THE SCHEDULE**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain how to submit a bid using standard bid documents.
- Explain what should be included in a proposal letter.
- Write a professional business letter.
- Write a professional e-mail.
- Identify the types of issues that should be addressed in a subcontract.
- Prepare a purchase order.
- Describe the use of a material contract and how it is different from a subcontract.
- Describe how information from the estimate should be used in the preparation of the schedule.
- Calculate the duration of a task based upon the labor-hours and crew size from the estimate.

## **UNIT XI CONVERTING EXISTING FORMS, CREATING NEW FORMS, PROPOSALS AND BEYOND WITH EXCEL**

### ***LEARNING OBJECTIVES***

The student should be able to:

- Explain the process of converting paper forms to Excel.
- Automate repetitive tasks with a macro.
- Add error protection using conditional formatting and data validation.
- Protect the worksheet against changes.
- Explain the steps taken to create a new form.
- Create a series of numbers in Excel.
- Name cells in Excel.
- Add dropdown boxes to Excel.

### **METHOD OF PRESENTATION**

The main method of instruction will be by actually producing a job estimate using actual examples obtained from the industry. This is a Hybrid course half online and one half in classes. The typical Lecture portion will be the responsibility of the student to read the chapter, access the power point presentations and complete the assignment each week before the recitation time. The recitation time, (in class) will be used to explain examples and demonstrate methods and techniques which may be used to achieve an acceptable estimate check assignments and answer questions. The assigned text will be covered and several outside sources of relevant material may be indicated for study.

### **EVALUATION**

Short tests will be given approximately each week on the material covered. A cost estimate of a small structure or site will be required for the final exam. Cost books will be allowed. Cost estimate for the building or site will be required as office practice and will be completed by the last week of class. All submittals will be judged on neatness, comprehensiveness, detail and understanding. Students will be required to keep a notebook of all class notes, assignments, quizzes, outside reading and other materials to be handed in at the completion of the course for evaluation of completeness and returned for student's future reference.

### **PROPOSED GRADING**

Notebook	10%
Quizzes and Assignments	50%
Final Exam	20%
Estimating Project	<u>20%</u>
	100%

### **Academic Integrity Statement:**

Students are expected to comply with the college-wide requirements for academic integrity. Mercer County Community College is committed to Academic Integrity—the honest, fair, and continuing pursuit of knowledge, free from fraud or deception. This implies that students are expected to be responsible for their own work. Presenting another individual's work as one's own and receiving excessive help from another individual will qualify as a violation of Academic Integrity. The entire policy on Academic Integrity is located in the Student handbook and is found on the college website ([http://www.mccc.edu/admissions\\_policies\\_integrity.shtml](http://www.mccc.edu/admissions_policies_integrity.shtml)).

**Special Needs Students Statement**

Mercer County Community College is committed to ensuring the full participation of all students in all activities, programs and services. If you have a documented differing ability or think that you may have a differing ability that is protected under the ADA and Section 504 of the Rehabilitation Act, please contact Arlene Stinson in LB 216 [stinsona@mccc.edu](mailto:stinsona@mccc.edu) for information regarding support services. If you do not have a documented differing ability, remember that other resources are available to all students on campus including academic support through our Academic Learning Center located in LB 214.