

COST ENGINEERING AND CONTROL**Course Objective:**

Cost engineering is defined as “the application of scientific and engineering principles and techniques to problems of cost estimation, cost control, business planning, and management science.” Implicit in this definition are problems of profitability analysis, project management, and the planning and scheduling of major engineering projects.

The objective of the course is to teach how the principles of financial management and project control can be adapted and used in the management of construction companies. These principles are useful primarily for general managers and owners, because they are responsible for managing the resources and finances of their companies. However, these same principles can help project managers improve the profitability of their projects and understand the underlying reasons for some of the decisions made by top managers.

During the quarter, the students compete in a simulated online bidding game called BIG: Building Industry Game. Usually every three students form a company and bid for a number of projects each week. During the class, the results of the bids and the performance of each team over the previous two months will be reviewed. The objective of the game is to maximize the retained earnings of their companies.

Following is a tentative week-by-week description of the course:

April 1 Construction Accounting System

Overview of the construction industry; Introduction to construction financial management and how it differs from financial management in other industries; Importance of good financial management for construction companies; Accounting systems for construction companies, including accounting transactions, comparison of accounting conventions, percentage of completion method, and completed contract method

April 8 Depreciation - Analysis of Financial Statements

Depreciation methods for construction assets; fundamentals of income tax and preparation of an income tax projection; impact of depreciation methods on income tax projections; Ratios for analyzing a company's financial statements; Financial failures in the construction industry and financial failure analysis by using ratios and comparisons with industry averages

April 15 Estimating Process

Conceptual estimating, factor estimating, parametric estimating, equipment factored estimating

April 22 Business Strategy - Managing General Overhead Costs - Bidding Strategies - Project Materials Management Systems

Business strategy in a competitive environment, including establishing a company's objectives, break-even analysis, and profitability analysis for different parts of a company; Preparation of a general overhead budget; Quantitative and qualitative construction risk factors; Estimating Process and Bid Preparation Bidding strategies; Setting profit margin for bids; Optimum markup calculations based on the Friedman and Gates models. Overview of project materials management systems, including different attributes of a typical system, such as vendor inquiry and evaluation, purchasing, quality assurance and control, expediting and shipping, receiving and storage, and surplus management. Materials estimate, with consideration for waste, shrinkage, and scrap in quantity takeoff.

April 29 Labor Productivity - Labor Cost

Labor productivity measurement methods, including job-ticket reports, non-repetitive one-cycle time study, multiple-cycle time study, and work sampling. Factors impacting labor productivity, such as scheduled overtime and learning curve; Determination of labor burden markup and projection of labor costs; Discussion of labor burden components, including different types of federal and state taxes and benefits based on collective bargaining agreements.

May 6 Midterm Exam

May 13 Earned Value Management System

Monitoring and controlling construction costs for materials, labor, subcontractors, equipment, and general overhead by using the Earned Value Method Analysis; Guidelines for implementation of ANSI 748 for small projects; Monitoring profitability using different metrics, such as Cost Performance Index and Schedule Performance Index, Job cost systems.

May 20 Cash Flows for Construction Companies - Project Cash Flows - Equipment Cost - Financial Decision Making Tools

Annual cash flow projection for a company, including evaluation of different sources of funding, interest charges associated with different financing options, loans and lines of credits, unbalanced bidding, and overdraft calculations, managing cash flows at the project level. Equipment cost, Discussion of quantitative methods, such as MARR, adjusting life spans, and net present value, to provide the basis for making financial decisions regarding capital assets.

June 3 **Changes and Extras - Claims and Disputes**

Contract modifications, including changes and extras, types of changes, change order process, and cost of delays caused by change orders; Claims and disputes, including both compensable and noncompensable delays, Eichleay formula for extended home office overhead, and claims for acceleration of the work and productivity losses.

June 10 **Final Exam**

Due: BIG Bidding Analysis

Time: Lecture M 6:30-9:30 PM

Text: Cost Accounting and Financial Management for Construction Project Managers, authored by Len Holm, published by Routledge, 2019

Course Grade: Homework 20%; Midterm 20%; Final Exam 30%, BIG Activities 10%, Case Studies 15% (5% each),..BIG Bidding Analysis 5%.

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