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 two 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 week-by-week description of the course:

**Week 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

Chapters 1 to 4 and Handouts

**Week 2**  
**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

Chapters 5, 6, and 13

**Week 3**  
**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.

Chapter 7 and Handouts;  
Due: Homework 1
Week 4  Business Strategy - Managing General Overhead Costs - Bidding Strategies

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

Handouts and Chapters 9 to 11

Week 5  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

Chapter 8 and Handouts

Due: Homework 2

Week 6  Review; Midterm Exam

Due: Homework 3

Week 7  Cash Flows for Construction Companies - Project Cash Flows

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.

Handout, Chapters 12 and 14

Due: Homework 4

Week 8  Equipment Cost - Tools for Making Financial Decisions

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.

Handouts, Chapters 16, 17, and 18

Week 9  Changes and Extras - Claims and Disputes – Project Materials Management Systems

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. Materials estimate, with consideration for waste, shrinkage, and scrap in quantity takeoff. 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.

Handouts

Due: Homework 5
Week 10  Final Exam

Due: BIG Bidding Analysis

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

Text: Construction Accounting and Financial Management by Steven Peterson, 3rd Ed., 2013

Course Grade: Homework 25%; Midterm Exam 25%; Final Exam 30%, Case Studies 15% (5% each), BIG Bidding Analysis 5%.

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