

# **B.S. in Construction Management Course Descriptions**

## **CMGT-101 - Construction Graphics**

**Course Description** Students will be introduced to the graphical language of construction and design through a combination of interactive lecture\demonstration classes, graphic exercises and practical studio/field exercises. The studio exercises will include the reading and interpretation of graphics. Graphic and Field exercises will present a variety of opportunities for student understanding and expression of both visible field conditions and conceptual details as well as immersing the students in the use of graphics to accurately describe existing built conditions.

### **Course Learning Outcomes**

- Read and interpret the graphical expression used in a full spectrum of construction drawings, details, and sketches to include, architectural, structural, civil, mechanical, electrical, disciplines.
- Locate information within a set of construction drawings with regard to form, size, distance, quantity of elements, and interrelation of elements
- Convey drawing information completely and accurately, in a narrative form, to those not familiar with construction graphics.
- Express their understanding of drawings and field conditions using accurate free hand sketches of existing field conditions and suggested details.

## **CMGT-102 – Introduction to the Construction Industry**

**Course Description** This course is intended to explore the multiple participants, construction manager's roles, duties, and typical tasks performed during the life a construction project. Students will be introduced to the operation of contracts and methods used by construction managers in a lecture/discussion format. The principles will be reinforced through individual and group classroom activities and exercises.

### **Course Learning Outcomes**

- Define the roles of project stakeholders throughout the life of a construction project
- Evaluate project success from the perspective of all project stakeholders
- Define and demonstrate how agreements serve to ensure quality, timely completion, cost control, and safety in the course of construction projects
- Identify how cooperation among stakeholders can enhance project success
- Recognize the inherent risk assumed by stakeholders in construction projects

## **CMGT-104 – Introduction to Estimating and Scheduling**

**Course Description** This course teaches the methodology, procedures, and organizational techniques involved in the preparation of a competitive bid and schedule. Conceptual and detailed estimates are prepared based on real construction documents. The course is structured in laboratory modules that cover the Project Development Process. The intent is to pull the process together in a single course to provide a strong understanding of preliminary design, estimation, scheduling and analysis.

Students will be engaged in the lecture/discussion classroom setting and actively apply the techniques through a variety of practical group exercises and laboratory case experiences of increasing complexity. Estimating with computer software is introduced.

### **Course Learning Outcomes**

- Understand the various types of estimates that are used in the construction industry
- Know how to prepare a quantity takeoffs and extend quantities to costs
- Prepare a bid recap/summary
- Locate and compile information vital to the development and maintenance of schedules and budgets
- Organize, calculate and present construction project budgets using common spreadsheet applications
- Interpret the results of changes in the schedule or budget resulting from periodic progress or changes in the nature or scope of the project in an ethical manner
- Develop schedules using the Critical Path Method Algorithm
- Express the results of schedule and budget studies in concise written form

## **CMGT-200 - Construction Project Planning & Scheduling**

**Course Description** The course will broaden the student's understanding and use of construction scheduling methods pertinent to the management of a construction project.

### **Course Learning Outcomes**

- Analyze proposed and ongoing projects through an elemental task framework and understanding the serial and parallel relationships of those elemental tasks
- Apply the CPM algorithm to establish and manage a project schedule using computer based scheduling software
- Update progress data in an active schedule document and generate and interpret progress reports of management information
- Recognize the ways in which effective schedule models and schedule data are used to improve project efficiencies.
- Design and conduct what/if studies of an active or proposed project in support of management decisions
- Work effectively in a group to complete and coordinate a multidisciplinary project.
- Express results and ideas related to schedule models both verbally and in writing to various

## **CMGT-202 - Construction Cost Estimating & Budgeting**

**Course Description** This course will broaden and deepen the student's understanding of construction cost estimating. Topics include general principles of measuring work and preparing quantity takeoffs. Step by step methods of estimating to produce an accurate construction cost estimate using the latest in electronic takeoff technology are covered. The course culminates with the students preparing a complete cost estimate for a specific project

### **Course Learning Outcomes**

- Differentiate the varying role of cost estimating in the pre- construction, construction and close out phases of construction projects.
- Demonstrate the application of techniques for performing material quantity surveys from contract documents in architectural, structural, civil, mechanical, plumbing, and electrical, disciplines.
- Obtain and use historical unit cost data to prepare the elements of construction cost budgets.
- Assemble the quantity and cost information into purchasing and construction budget systems.
- Express estimating skills and work effectively in a group in preparing a complete cost estimate and report for a specific multidisciplinary project, including narrative, tabular format, and through oral presentation.

## **CMGT-204 - Behavior of Materials**

**Course Description** The course will broaden and deepen the student's understanding of the external forces systems acting on structural elements and strength of materials-the internal forces and deformations that result from external forces.

### **Course Learning Outcomes**

- Construct free-body diagrams and calculate the reactions of static equilibrium
- Identify and apply the criteria for selecting suitable materials for strength and stiffness for a variety of structural applications
- Calculate simple forces, moments, stress, strain, and shear in structural elements and analyze the physical behavior of those elements under various loads.

## **CMGT-206 - Building Systems**

**Course Description** Through analysis of relevant case studies, this course examines building mechanical and electric systems from the construction manager's point of view. The class will review how the basic design calculations are performed to determine how building systems are selected and designed, review design documents including drawings and specifications, how the subcontractor bid packages are determined, purchasing of subcontracts, review of the shop drawing process, review of the mechanical systems shop drawing coordination process, construction of systems, turn-on and energization, start-up, testing, systems balancing, commissioning of systems, final turn-over, training, demonstration to the Owner, and close-out.

### **Course Learning Outcomes**

- Identify the component systems incorporated in the design of a commercial building.
- Understand and explain the functional relationships of a building's component systems.
- Analyze the value of various alternative building systems that is derived from quality, constructability, and performance characteristics.
- Evaluate the role various building systems serve in achieving a project's sustainability goals.
- Recognize and understand the unique characteristics of building systems with regard to estimating, submittals, commissioning, documentation and warranty.

## **CMGT-208 - Materials & Methods of Construction**

**Course Description** This course is intended to broaden and deepen the student's understanding of building systems, material science, important to students of construction management, architecture and engineering. Emphasis is placed on exploring the impact of design decisions with construction scenarios on the final product. Topics include sitework, foundation and structural framing systems of concrete, reinforced concrete, site cast and pre-cast concrete; brick and concrete masonry, reinforced masonry, roofing, cladding systems and interior and exterior finishes.

### **Course Learning Outcomes**

- Identify basic building materials and systems incorporated in the design of both residential and commercial buildings.
- Recognize how materials are fabricated and connected to form a building's wall and floor systems.
- Identify the value of various alternative building materials and methods derived from quality, constructability, and performance characteristics.
- Analyze materials and building systems based on code compliance, budget, function, constructability, and value.

## **CMGT-300 – Construction Accounting and Cost Control**

**Course Description** The course will broaden the student's understanding and use of construction cost accounting systems and reporting methods pertinent to the management of a construction management financial system.

### **Course Learning Outcomes**

- Demonstrate the methods by which cost data is acquired and organized in a construction cost accounting system
- Analyze financial performance of individual projects using project cost accounting reports and formulate recommendations that would lead to duplicating success and avoiding undesirable project outcomes.
- Recognize the inherent ethical issues surrounding the collection, analysis, and reporting of construction cost accounting data.
- Distinguish the accounting practices and customs specific to the construction industry.
- Formulate financial analysis to support sound management decisions.

## **CMGT-302 - Construction Contract Administration**

**Course Description** This course explains the various facets of construction contract administration from both the contractor's and CM's point of view. The student will be introduced to the construction contract documents typically used for effective project management. Topics will include contract components, types of construction contracts, subcontracts and supply contracts, design/build contracts, bidding and award of contracts, negotiation, claims and disputes, changes to the work, time and cost, correction of the work and contract completion.

### **Course Learning Outcomes**

- Distinguish between various forms of construction contract with regard to advantages, disadvantages, risks from the perspective a both contracting parties.
- Interpret the operation of construction contract terms for a range of circumstances throughout the project duration.
- Recognize the special way the law applies to construction projects and construction companies.
- Demonstrate the interrelationship of the various contracts that define the agreements among members of the project team.
- Recognize the rights, duties, and responsibilities associated with contracts for construction.
- Interpret construction specifications along with other contract documents to define both the scope and quality of constructed

## **CMGT-304 - Construction Safety & Risk Management**

**Course Description** The course will broaden the student's understanding of Safety Issues pertinent to the management of construction projects.

### **Course Learning Outcomes**

- Develop awareness and understanding of jobsite safety hazards, mitigation techniques, and OSHA Regulation compliance.
- Formulate quantitative approaches to assess, evaluate, and respond to job site risks
- Successfully satisfy the requirements for obtaining OSHA 30 hour certification
- Demonstrate a clear understanding of approaches to risk management
- Evaluate jobsite conditions, procedures, and operations and propose appropriate risk mitigation procedures

## **CMGT-306 - Construction Site Operations**

**Course Description** This course familiarizes students with the various forms of contract used in the construction industry and best practices for their administration and management. Through exploration of cases and current events, students will explore contract operation regarding rights, duties, responsibilities, claims management and assignment of risk. Emphasis is placed on the management of contracts as a means for the achievement of overall project success.

### **Course Learning Outcomes**

- Anticipate the staffing requirements and understand the roles of those individuals required to operate and manage various types of construction project sites.
- Develop, document, and communicate an efficient, effective construction site plan on a project-specific basis to include phasing, temporary facilities, temporary utilities, vertical and lateral transportation, storage facilities, security, safety, lighting, and environmental considerations
- Recognize the need for scaffolding, false work, shoring, and formwork and best practices for their design and implementation
- Understand the administrative requirements of project site management to include effective communication, record keeping, product samples and submittals, and record drawings

## **CMGT-310 - Construction Surveying**

### **Course Description**

The theory and practice of surveying is introduced through lectures and labs. Students are introduced to modern surveying instruments like Total Station and are expected to use them during labs to perform fieldwork. Fieldwork addresses the topics discussed in class to give students hands-on experience with surveying.

### **Course Learning Outcomes**

- Apply a working knowledge of surveying equipment and techniques required to do basic construction layout
- Setup and operate a total station and other surveying equipment
- Perform horizontal distance measurement
- Apply horizontal angle measurement techniques
- Determine elevations of existing features and set elevations for future construction on a project site
- Recognize how topography relates to construction progress
- Discuss typical problems encountered in surveying and how they affect a Construction Manager
- Value the importance of surveying to the CM profession

## **CMGT-450 - Construction Management Seminar**

**Course Description** It is a seminar intended to prepare students for professional practice through a survey of the current and future state of the industry. This course is intended to provide students with an overview of the world of construction through the portal of ENR (Engineering News-Record). Current and future industry trends and challenges will be examined throughout the course. Topics include emerging technologies, business trends, project case studies, construction economics, legal issues, legislative and political activities affecting construction, building information modeling (BIM), sustainable construction and environmental concerns.

### **Course Learning Outcomes**

- Apply the broad range of skills and knowledge acquired in the Construction Management curriculum to the understanding, evaluation, and solution of challenges faced by industry executives.
- Effectively collaborate to conduct conclusive evaluations of complex real-world management challenges.
- Recognize the value of a lifelong curiosity regarding threats and opportunities presented by current and emerging industry trends.
- Clearly communicate complex ideas to a broad audience using appropriate media.
- Identify and evaluate the ethical choices faced by construction management professionals and formulate value-based responses.

## **CMGT-499 - Construction Capstone Project**

**Course Description** This course is the application of course materials covered in the four-year curriculum to an actual construction project. Students are required to submit and present a comprehensive bid package with a detailed quantity takeoff and estimate, a list of activities with appropriate relationships, a (critical path method) CPM network schedule, and Leadership in Energy and Environmental Design (LEED) certification plan. Preparation includes developing a company organization along with detailed project bid. Students will be working in groups of 3-4 to set up the construction company and prepare submittals for a commercial project. The course requires each team making a presentation to an “owner/client organization” and an audience consisting of faculty, alumni, and representatives from the industry. The students are required to not only apply all that they have learned but also to synthesize and integrate the knowledge gained to solve additional problems they have not previously encountered. In addition to testing their knowledge, the course emphasizes collaboration and communication skills through written submittals and report writing, oral assignments, and facilitated classroom discussion

### **Course Learning Outcomes**

- Explore the process of collaborating with designers and consultants.
- Examine, research and evaluate different the use of construction materials for a specific project
- Demonstrate a working knowledge for determining pre-construction requirements
- Demonstrate proficiency in developing a complete bid package for an actual project
- Demonstrate outstanding written and oral communication skills with construction project team members and outside evaluators
- Analyze ethical, social, and environmental responsibility of construction professionals

## **BLAW 301-1 – Business Law 1**

**Course Description** Lecture, class discussion and case problems emphasizing legal principles on the following topics: the legal environment, government regulation of business, contracts, personal property, environmental liability as it relates to business transactions, bankruptcy, employment and human resources, and current legal issues, to include the legal environment as it impacts business decision making. Finally, business ethics is addressed throughout the course both in lecture format and live and online interactive student engagement.

### **Course Learning Outcomes**

- To be able to discern potential legal issues as a manager of a business and to take preemptory and/or remedial actions with legal counsel to address said issues.
- To be able to engage in strategic planning with a working knowledge of the legal component necessary to achieve business success, in cooperation with legal counsel.
- To be able to ethically discern a personal pattern of ethical business behavior and to develop the skill sets necessary to maintain said behavior in an increasingly complex environment.

- To be able to research, draft, and orally present a Recommendation Type Analytical Report in regard to an issue with a legal component facing a business.

## **ECON 205 – Principles of Macroeconomics**

**Course Description** To introduce the discipline of economics and to provide a basic understanding of how the economy functions. This requires a blend of economic theory and institutional material; the course will emphasize real-world applications. International trade will constitute a major component of the course.

### **Course Learning Outcomes**

- Model supply and demand relationships to understand various market dynamics.
- Understand how GDP is measured and the difference between real and nominal values; understand the correlates and causes of GDP/cap. Growth
- Differentiate the three types of Unemployment; understand what this statistic measures - Identify the causes and costs of inflation
- Assess the appropriate role of the government: tax issues and price setting
- Discuss the business cycle and long run growth - Understand the role of money in the economy, the money supply process, the structure of the Fed.
- Use the Dynamic Aggregate Demand and Aggregate Supply model to account for changes in GDP growth and inflation
- Understand the use of monetary and fiscal policies to affect GDP and inflation. Appropriate grammar and clear expression are expected on writing assignments in order to develop skills imperative for your future careers.
- To achieve this end, please allow adequate time for editing.
- Additional support is available from the Writing Center.

## **ECON 206 – Microeconomics**

**Course Description** To introduce the discipline of economics and to provide a basic understanding of how markets function, how prices are determined and how resources are allocated. This requires a blend of economic theory, institutional material, and real-world applications. International examples will be included throughout the course.

### **Course Learning Outcomes**

- Analyze market dynamics using the logical construct of supply and demand analysis.
- Forecast changes in consumer behavior based on an understanding of the determinants of demand.
- Identify market imperfections and assess the appropriate role of the government.
- Disaggregate the costs faced by a firm and forecast the impact of government policy or labor market shifts, etc., on the decisions of the firm.
- Differentiate industry structures to understand strategic interactions involved in pricing, advertising, R&D, etc.

## **STAT 201 – Introduction to Statistics**

**Course Description** Descriptive statistical measures and probability theory are combined to provide the basis for statistical decision-making techniques. Areas covered: data presentation; measures of central tendency; measures of variability; basic probability laws; binomial; Poisson; 't,' and normal distributions; confidence intervals; hypothesis testing.

### **Course Learning Outcomes**

- Distinguish between random and non-random sampling and create such samples.
- Group raw data manually and using Excel, and create different types of graphs to describe data.
- Calculate and explain mean, median, mode, standard deviation and variance.
- Understand the concept of probability and to apply probability rules.
- Understand the concepts of binomial and normal distributions and use them to find probabilities.
- Create confidence intervals and conduct hypothesis tests on single samples. Distinguish between large and small samples.
- Demonstrate the use of Microsoft Excel to conduct various tests and statistical operations.

## **FINC 301 – Financial Management**

**Course Description** This course provides an introduction to finance that examines the role of the financial decision maker at the corporate level. Four basic questions are examined: the goal of the firm, investment decisions of the firm, financing decisions of the firm and dividend decisions of the firm. The technique of discounted cash-flow analysis is developed and emphasized as it relates to corporate financial decisions.

### **Course Learning Outcomes**

- Identify the goal of the firm
- Understand the basic principles of finance
- Describe the key components of US financial market system and the financing of business
- Apply concepts of time value of money to solve problems in personal finance, corporate finance, and investments
- Define, measure, and explain the relationship between risk and return
- Explain the features of different types of bond and how they are valued
- Explain the characteristics of common stock and how they are valued
- Determine the feasibility of a project using payback period, the net present value, and internal rate of return.
- Understand the trade-offs while making capital structure and dividend policy decisions
- Understand the exchange rate risks in international business and how to manage it.

## ACCT 101—Financial Accounting

**Course Description** Designed to introduce all business students to the field of accounting, the course covers the fundamental principles of accounting, highlighting balance sheet and income statement presentations. Primary emphasis on accounting as a source of financial information.

### Course Learning Outcomes

- Describe importance of integrity of financial reports, particularly to external parties or the general public
- Recognize the names of major national and international rule making bodies (FASB, IASB, SEC, Public Company Accounting Oversight Board (as a creation of the Sarbanes Oxley Act), AICPA, IMA, AAA.
- Describe accounting career opportunities (public, private, government, education)
- Describe basic differences between sole proprietorships, partnerships, and corporations (taxation, liability, limited life vs. unlimited life)
- Analyze and record business transactions
- Adjust financial information to a full accrual basis for external reporting purposes
- Prepare a general ledger, adjusted trial balance, income statement, statement of retained earnings, and balance sheet for service companies
- Prepare related closing journal entries in order to periodically update retained earnings
- Prepare basic entries related to the purchase and sale of goods (with discount terms) in a merchandising setting
- Prepare a general ledger, adjusted trial balance, income statement, statement of retained earnings, and balance sheet for merchandising companies
- Prepare related closing journal entries in order to periodically update retained earnings
- Define financial assets and provide examples
- Describe internal controls over cash, including ability to prepare bank reconciliations
- Account for bad debt using direct write-off vs. allowance methods, including ability to describe most appropriate of these two approaches under GAAP
- Describe basic accounting for investments in equity securities using the "mark-to-market" approach, including description of reasons for departure from cost principle in reporting marketable securities.
- Calculate accounts receivable turnover and average collection period
- Use specific identification, FIFO, LIFO, or weighted average cost flow assumptions to determine ending inventory and cost of goods sold in a perpetual inventory system
- Use specific identification, FIFO, LIFO, or weighted average cost flow assumptions to determine ending inventory and cost of goods sold in a periodic inventory system
- Calculate inventory turnover and the average number of days to sell inventory
- estimate ending inventory and cost of goods sold using the retail method and the gross profit method;
- Determine cost of fixed assets
- Determine depreciation expense on fixed assets using straight-line vs. accelerated depreciation methods, including an ability to describe the effects on income of these methods

- Account for the disposal of fixed assets
- Account for the cost and amortization or impairment of intangible assets
- Account for depletion of natural resources
- Describe shareholder rights and responsibilities/functions of the Board of Directors
- Record paid-in-capital on common or preferred stock issues
- Prepare and describe the elements of the stockholders' equity section of the balance sheet (including paid-in-capital, treasury stock, and retained earnings)
- Apportion cash dividends between preferred and common shareholders depending on whether preferred stock is cumulative or non-cumulative
- Demonstrate the effects of stock splits on stockholders' equity and on market value
- Record stock dividends (large vs. small)
- Calculate basic earnings per share with or without the existence of preferred stock (note: diluted earnings per share is described but its detailed computation is addressed in more advanced courses)
- Describe at least two similarities and two differences between U.S. GAAP and GAAP promulgated by the IASB
- Describe primary reasons why international standards have become necessary.

## **ARCH 204 – Great Buildings**

**Course Description** This course surveys selected, key monuments of architectural history from ancient through modern times that are paradigmatic of building art and science during a particular period. The buildings spotlighted represent dominant types from pyramids to skyscrapers that are not only laboratories for innovative design and cutting-edge technologies, but also are expressive of the values and aspirations of the society at large. Developments in the areas of materiality and structural systems will be integrated with changing social, economic, political, stylistic, and environmental demands that are normative of a particular time and place. Students majoring in Architecture, Architectural Studies, Landscape Architecture, or Interior Design are not permitted to take this course.

### **Course Learning Outcomes**

- Identify key architectural monuments produced from ancient to modern times and analyze why certain buildings serve as models for American architecture.
- Analyze developments in materiality, structural systems, and technologies throughout architectural history.
- Define the variables that impact the production of the built form and apply that methodology in researching historical and modern structures.
- Compare and contrast key monuments from different cultures, periods, and circumstances to understand variations and developments in the built environment.
- Describe the social, economic, functional, technological and philosophical shifts that contribute to style changes and alterations of building types and forms from period to period.
- Develop descriptive and analytic writing and research skills specific to construction management assessed by the American Institute of Constructors.

## **ARCH 303 – Structures**

**Course Description** This course merges structural form and analysis as a simultaneous act and introduces the role of structural engineering in the architectural process. Students develop familiarity with the fundamentals of statics, gain a sense of how structures resist forces, and learn to visualize the load path and the direction of forces through the process of designing actual building structures and details. Structural design and analysis are taught using both numerical and graphical methods to determine the preliminary shapes of cable structures, arches, and trusses.

### **Course Learning Outcomes**

- Develop the student's understanding of the basic principles of structural behavior in withstanding gravity and lateral forces and the evolution, range, and appropriate application of contemporary structural systems.
- Develop the student's understanding of the entire design process for a whole structure, starting with the formation of structural ideas and continue the development of structural ideas into workable solutions, preliminary design of details and preliminary determination of member sizes.
- Merge the fundamentals of statics and strength of materials naturally in the context of the structural design process.
- Design and analyze structures through graphical methods and numerical methods where needed in the design process.