



Course Name:

Project and Construction Management

Course Number: 20-309	Credit: 3
Program: Undergraduate	Course Type: Technical required
Prerequisite: Construction Equipment and Methods	Corequisite:

Course Description (Objectives):

In this course, various important aspects of construction project management are investigated:

- State-of-art theory, methods and quantitative tools utilized to efficiently plan and develop construction projects;
- Efficient management methods revealed through practice and research;
- Practical project management knowledge from real-world situations.

To achieve this, a basic project management framework will be analyzed in which the project life cycle is broken into organizing, planning, implementing, monitoring, controlling and learning from old and current construction projects. Within this framework, students will enhance their understanding about the methodologies and tools necessary for each aspect of the process as well as the theories upon which these are built. By the end of this semester, students will be able to adapt and apply the framework to effectively manage a construction project in an Architecture/Engineering/Construction (A/E/C) organization.

Course Content (outline):

- **Structure of the Construction Industry**

Project Life Cycle, Major Types of Construction, Professional Services Selection, Construction Contractors, Financing of Constructed Facilities, Legal and Regulatory Requirements, Changing Environment of the Construction Industry, Role of Project Managers

- **Organizing for Project Management**

Trends in Modern Management, Strategic Planning and Project Programming, Effects of Project Risks on Organization, Organization of Project Participants, Traditional Designer-Constructor Sequence, Professional Construction Management, Leadership and Motivation for the Project Team



- **Feasibility Studies**

Process of conducting a feasibility study, Economic Feasibility, Technical Feasibility, Financial Feasibility, Environmental Feasibility

- **Design and Construction Process**

Design and Construction as an Integrated System, Innovation and Technological Feasibility, Innovation and Economic Feasibility, Design Methodology, Value Engineering, Construction Planning, Industrialized Construction and Pre-fabrication

- **Contracting Principles**

Project Delivery Systems, Procurement Methods, Contracts Types, Payment Agreements

- **Cost Estimation**

Costs Associated with Constructed Facilities, Approaches to Cost Estimation, Type of Construction Cost Estimates, Effects of Scale on Construction Cost, Unit Cost Method of Estimation, Methods for Allocation of Joint Costs, Historical Cost Data, Cost Indices, Applications of Cost Indices to Estimating, Estimate Based on Engineer's List of Quantities, Allocation of Construction Costs Over Time

- **Construction Planning**

Basic Concepts in the Development of Construction Plans, Key Elements of Construction Plans Including Project Charter, Project Management Plan, Scope of Work, Statement of Work (SOW), Work Breakdown Structure (WBS), Cost Breakdown Structure (CBS), Organization Breakdown Structure (OBS)

- **Fundamental Scheduling Procedures**

Relevance of Construction Schedules, Critical Path Method, Calculations for Critical Path Scheduling, Activity Float and Schedules, Presenting Project Schedules, Critical Path Scheduling for Activity-on-Node

- **Cost and Time Control and Monitoring**

Cost Control Problem, Forecasting for Activity Cost Control, Control of Project Cash Flows, Schedule Control, Schedule and Budget Updates, Relating Cost and Schedule Information

- **Construction Risk Management**

- Sources of Risk in Construction Projects, Process of Risk Management

References:

- Project management for construction: Fundamental concepts for owners, engineers, architects, and builders, C. Hendrickson and T. Au, 1989.
- Construction management. D. W. Halpin, John Wiley & Sons, 2010.



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- Project management: a systems approach to planning, scheduling, and controlling. H. R. Kerzner, John Wiley & Sons, 2013.
- System and Project Management. Peña-Mora, Anumba, Lyneis, Soibelman, Park, Samii, and Kalligeros, MIT/Prentice Hall Textbook Series on Civil, Environmental and Systems Engineering.
- A Guide to Project Management Body of Knowledge (PMBOK® Guide) Project Management Institute, 2013.
- Project management: techniques in planning and controlling construction projects. H. N. Ahuja, S. P. Dozzi, and S. M. AbouRizk, John Wiley & Sons, 1994.
- Construction project management. R. H. Clough, G. Sears, and S. K. Sears, John Wiley & Sons, 2000.



Course Name:

Construction Equipment and Methods

Course Number: 20-311	Credit: 3
Program: Undergraduate	Course Type: Technical required
Prerequisite: Soil Mechanics	Corequisite: -

Course Description (Objectives):

This course is designed to familiarize the student with management principles and methods involved in construction equipment selection, operation and safety. It will also provide the student with an overview of the different types of modern construction equipment and its main components, the equipment's economics, financial concerns, and usage. The course will promote skills necessary to select and manage an equipment mix that yields maximum productivity and the best value in the project.

The main themes of the course are the followings:

1) An overview of the different types of construction equipment, the equipment's usage, as well as the company's and the project's practical, economic, and financial aims and concerns.

2) Management principles and methods involving construction equipment.

Evaluation and selection methods of equipment combination that yields the maximum production at the best or most reasonable cost for a given project to successfully being executed.

Course Content (outline):

• **Construction Equipment**

Factors Affecting the Selection of Construction Equipment, Cost of Ownership and Operating Construction Equipment, Selection of Alternative, Cost Accounting for Equipment, Economic Life of Construction Equipment, Efficiency and Production of Construction Equipment, Overall Structure of Construction Equipment, Forces and Resistances, Speed vs. Horsepower, Fleet Balancing

• **Earthmoving Operations**

Managing Earthmoving Equipment Including Bulldozers, Loaders, Hauling Units and Dump Trucks, Scrapers, Rollers and Compactors

• **Excavation Operations**

Managing Excavating Equipment Including; Power Shovels, Trenchers, Backhoes, Draglines, Clamshells, TBM

• **Lifting Operations**

Managing Lifting Equipment and Cranes Including: Truck Mounted Cranes, Rough Terrain Cranes, Tower cranes



- **Production of Crushed Stones and Aggregates**

Managing Equipment such as Crushers and Screens

- **Portland Cement and Asphalt Concrete Production**

Managing Portland Cement and Asphalt Concrete Production and Placement Equipment Including: Batching Plants, Truck Mixers, Concrete Pumps, Asphalt Plants, Finishers

- **Welding and Air Compression**

Managing Compressed Air and Welding Equipment and Tools

- **Steel Structures and Reinforced Concrete**

Introduction to the Methods of Constructing Steel, Concrete and Prefabricated structures

- **Designing the Fleet Size and Type To Maximize Productivity of Construction Equipment**

Process of Selecting and Coordinating the Appropriate Equipment Fleet to Maximize Productivity of Construction Equipment

- **Health, Safety and Environment (HSE)**

Importance of Considering Health, Safety and Environmental Factors in Construction Operations

References:

- Construction Planning, Equipment and Methods (Peurifoy)
- Modern Construction Equipment and Methods (Harris)
- Equipment Manufacturers' Technical Data and Specifications such as:
 - Caterpillar Performance Handbook
 - Komatsu Performance Handbook