

INFORMATION SYSTEMS & MANAGEMENT

OVERALL COURSE OBJECTIVES:

Accelerate your understanding of Six Sigma, Lean, IoT, GIS, and project management methodologies. You will attain proficiency in key areas, such as cost estimation, project initiation, IoT applications, and the principles of codecs used in IoT applications. The aim is to acquire industry-standard practices, methodology, and tools required to effectively manage, control, and improve business processes in various fields.

LEARNING OUTCOMES: On successful completion of the course the students shall be able to:

1. Develop a deep understanding of cost estimation and cost control in construction projects, including the importance of controlling costs and monitoring project cash flow.
2. Gain advanced knowledge of project initiation and planning, including the fundamentals of GIS data and how to create effective maps using different data types and methods.
3. Master the skills of Six Sigma, including an understanding of its principles, the tools for analysis and improvement, and its control phases.
4. Learn to use the Arduino platform, Raspberry Pi, and DragonBoard™ 410c for IoT applications and manage the schedule using different tools and methods.
5. Understand the principles of audio and video codecs used for IoT applications, including identifying different tools and metrics for critical components of Six Sigma and Lean.
6. Gain advanced knowledge of project management, including staffing, planning, executing a project, and building a bill of materials for a product.

Construction Management - I	Construction Cost Estimating and Cost Control
	Construction Finance
Construction Management - II	Construction Project Management
	Construction Scheduling
GIS, Mapping, and Spatial Analysis	Spatial Analysis and Satellite Imagery in a GIS
	GIS Data Acquisition and Map Design
	GIS, Mapping, and Spatial Analysis Capstone
	Introduction to GIS Mapping
Six Sigma Practices - I	Six Sigma Advanced Analyze Phase
	Six Sigma Advanced Define and Measure Phases
	Six Sigma Advanced Improve and Control Phases
	Six Sigma and the Organization (Advanced)
Six Sigma Practices - II	Six Sigma Principles
	Six Sigma Tools for Analyze
	Six Sigma Tools for Define and Measure
	Six Sigma Tools for Improve and Control

COURSE CONTENT:

Module 1 : [Construction Cost Estimating and Cost Control](#) [20 Hours]

This course introduces the types of cost estimation from the conceptual design phase through the more detailed design phase of a construction project. In addition, the course highlights the importance of controlling costs and how to monitor project cash flow. Learners will work on a break-even analysis of construction tasks in a project. The course begins with Professor Odeh providing an overview of what will be covered. Next, learners explore the stages of design in a construction project. Professor Odeh then describes the types of cost estimates in a construction project, and the tools and methods used to create estimates.

By the end of this course, you will be able to:

- Acquire the fundamentals of cost estimation and the design phase to perform cost estimation
- Learn about cost control and cost control methods, emphasizing the Earned Value Method or EVM
- Understand the close out period of the project by exploring the punch lists, final approval, and turnover to the client

Sub-Topics

Building the Estimate

Close Out Period

Construction Cost Control Methods

Construction Cost Estimating and Cost Control Overview

Cost Estimation in Practice
Earned Value Method (EVM)
Introduction to the Types of Cost Estimates
Lean in Cost Control
Post Contract and Cost Estimation within a Project
Pricing
Procurement
Program Cost Estimating
Project Cash Flow
Quantity Take-Off and Measurement
Technology Trends in Cost Estimating and Cost Control
Understanding Design in the Construction Industry

Formative Assessments:

16 Graded Quizzes

Module 2 : [Construction Finance](#) [18 Hours]

This course expands the knowledge of a construction project manager to include an understanding of economics and the mathematics of money, an essential component of every construction project. Topics covered include the time value of money, the definition and calculation of the types of interest rates, and the importance of Cash Flow Diagrams.

The course covers these topics in three sections. The first section focuses on the foundation of building the mathematics of money, often referred to as value of money. It also highlights the present value techniques and the internal rate of return from a construction manager point of view.

The second section of the course focuses on vertical construction finance and the last part focuses on horizontal construction finance. Under the vertical construction finance, the instructor discusses real estate finance and how that has been done with more in-depth details and gives examples for students to solve with instructions.

The last topic, horizontal finance, is divided into two parts. To begin, the instructor introduces vast details about public private partnership. This module highlights around three case studies about PPP projects, which would be an introduction to project financing in horizontal work. After introducing case studies, the instructor demonstrates the risks associated with construction finance. After that, similar to the previous three courses, the course finishes with emphasizing the importance of construction finance.

Sub-Topics

Course Wrap-up
Financial Plans for Development Projects
Introduction To The Construction Finance Course
Lean in Construction Financing
Project Finance
Public - Private Partnerships
Real Estate Finance for Development Projects
Risk In Project Finance
The Mathematics of Money

Formative Assessments:

9 Graded Quizzes

Module 3 : [Construction Project Management](#) [30 Hours]

Construction Project Management introduces learners to Project Initiation and Planning. Columbia University professor, Ibrahim Odeh, along with industry experts join together to provide a comprehensive overview of the construction industry. There are 10 modules that allow learners to become knowledgeable of construction management within the dynamic construction industry.

Professor Odeh teaches learners about the fundamentals of the Project Development Cycle while guest lecturers discuss Lean Project Delivery method and Lean Design Behaviors. Technological advances, such as Building Information Modeling (BIM), will be introduced with real world examples of the uses of BIM during the Lifecycle of the Project. The course concludes with Professor Odeh discussing the importance of project planning and scheduling and an opportunity to develop a Work Breakdown Structure.

By the end of this course, you will be able to:

- Learn about construction management, including an understanding of the construction industry, the role of a project manager, construction contract types, and project delivery methods
- Explain the fundamental principles to establish Environment, Health and Safety in the construction industry
- Detail the principles and application of sustainability development in construction industry
- Summarize the work breakdown structure (WBS) and estimate the construction activity duration

Sub-Topics

Building Information Modeling and Technology Trends in Construction

Construction Industry Overview

Course Overview

Environment, Health and Safety of Construction Processes

International View of Construction Projects

Introduction to Project Planning

Lean Project Delivery

Project Delivery

Role of a Construction Manager

Sustainability in the Construction Industry

Formative Assessments:

10 Graded Quizzes

Module 4 : [Construction Scheduling](#) [22 Hours]

This course focuses on learning how to develop and manage a schedule. The first module provides an overview of the Construction Scheduling course. The second module introduces bar or Gantt charts

and how they are used as scheduling tools. During the third module, learners will create activity precedence diagrams, also referred to as activity on node diagrams, which graphically represent the construction activities in a project and their relationships. The fourth module provides an overview of the types of construction activity relationships encountered in a construction project and how to represent them in an activity precedence diagram. Forward and backward pass calculations are covered in the fifth module, and during the sixth module, Professor Odeh discusses the importance of critical paths, including what it is and why it is important.

By the end of this course, you will be able to:

- Discover key project scheduling techniques and procedures
- Learn how to develop and manage a schedule, and understand scheduling tools such as bar charts, activity on arrow, and activity on nodes
- Explore the multiple relationships that connect all the construction activities in our project from start to finish
- Learn about creating a network diagram, defining the importance of the critical path in a project network, and defining project activities float
- Understand the fundamentals of bar charts, precedence diagrams, activity on arrow, Program
- Evaluation and Review Technique (PERT), range estimating, linear project operations, and the line of balance (LOB)

Sub-Topics

Activity Floats
Activity on Arrow
Activity Precedence Diagrams
Bar (Gantt) Charts
Critical Path
Forward and Backward Pass Calculations
Introduction to Construction Scheduling
Lean Design in Construction Scheduling
Linear Construction Operations and Line of Balance
Program Evaluation & Review Technique (PERT) and Range Estimating
Risk Allocation and Planning
Scheduling for Large Programs
Technology Applications for Scheduling
The Role of the Scheduler in Construction Management
Types of Construction Activity Relationships
Understanding Work Dates and Calendar Dates

Formative Assessments:

12 Graded Quizzes

Module 5 : [Spatial Analysis and Satellite Imagery in a GIS](#) [14 Hours]

In this course, you will learn how to analyze map data using different data types and methods to answer geographic questions. First, you will learn how to filter a data set using different types of

queries to find just the data you need to answer a particular question. Then, we will discuss simple yet powerful analysis methods that use vector data to find spatial relationships within and between data sets. In this section, you will also learn about how to use ModelBuilder, a simple but powerful tool for building analysis flowcharts that can then also be run as models. You will then learn how to find, understand, and use remotely sensed data such as satellite imagery, as a rich source of GIS data. You will then learn how to analyze raster data. Finally, you will complete your own project where you get to try out the new skills and tools you have learned about in this course.

Sub-Topics

Filtering Data Using Queries

Project: Spatial Analysis

Raster analysis

Remote sensing as a GIS data source

Vector analysis

Formative Assessments:

5 Graded Quizzes & 1 Peer Review Assignment

Module 6 : [GIS Data Acquisition and Map Design](#) [20 Hours]

In this course, you will learn how to find GIS data for your own projects, and how to create a well-designed map that effectively communicates your message. The first section focuses on the basic building blocks of GIS data, so that you know what types of GIS files exist, and the implications of choosing one type over another. Next, we'll discuss metadata (which is information about a data set) so you know how to evaluate a data set before you decide to use it, as well as preparing data by merging and clipping files as needed. We'll then talk about how to take non-GIS data, such as a list of addresses, and convert it into "mappable" data using geocoding. Finally, you'll learn about how to take data that you have found and design a map using cartographic principles. In the course project, you will find your own data and create your own quantitative map.

Sub-Topics

Finding data and preparing it for your project

Geocoding addresses and postal codes

GIS File Types, Data Models, and Topology

Map Design Principles

Mapping Quantitative Data

Project: Getting Data and Making Your Own Map

Quantitative Map Types

Formative Assessments:

7 Graded Quizzes & 1 Peer Review Assignment

Module 7 : [GIS, Mapping, and Spatial Analysis Capstone](#) [11 Hours]

In this capstone course, you will apply everything you have learned by designing and then completing your own GIS project. You will plan out your project by writing a brief proposal that explains what

you plan to do and why. You will then find data for a topic and location of your choice, and perform analysis and create maps that allow you to try out different tools and data sets. The results of your work will be assembled into an Esri story map, which is a web site with maps, images, text, and video. The goal is for you to have a finished product that you can share, and that demonstrates what you have learned.

Sub-Topics

Data Acquisition and Preparation
Data Discovery and Project Proposal
Introduction to Story Maps
Map Design
Spatial Analysis
Story Map

Formative Assessments:

2 Graded Quizzes & 2 Peer Review Assignment

Module 8 : [Introduction to GIS Mapping](#) [14 Hours]

Get started learning about the fascinating and useful world of geographic information systems (GIS)! In this first course of the specialization GIS, Mapping, and Spatial Analysis, you'll learn about what a GIS is, how to get started with the software yourself, how things we find in the real world can be represented on a map, how we record locations using coordinates, and how we can make a two-dimensional map from a three-dimensional Earth. In the course project, you will create your own GIS data by tracing geographic features from a satellite image for a location and theme of your choice. This course will give you a strong foundation in mapping and GIS that will give you the understanding you need to start working with GIS, and to succeed in the other courses in this specialization.

This course is for anyone who wants to learn about mapping and GIS. You don't have to have any previous experience - just your curiosity! The course includes both practical software training and explanations of the concepts you need to know to make informed decisions as you start your journey to becoming a GIS analyst.

Sub-Topics

Flattening the Earth with Map Projections
Introduction to ArcGIS
Mapping Locations with Coordinate Systems
Mapping the real world with vector and raster data
Project: Creating Your Own Data
What is a GIS?

Formative Assessments:

6 Graded Quizzes & 1 Peer Review Assignment

Module 9 : [Six Sigma Advanced Analyze Phase](#) [7 Hours]

This course is for you if you are looking to dive deeper into Six Sigma or strengthen and expand your knowledge of the basic components of green belt level of Six Sigma and Lean. Six Sigma skills are widely sought by employers both nationally and internationally. These skills have been proven to help improve business processes and performance. This course will take you deeper into the principles and tools associated with the "Analyze" phase of the DMAIC structure of Six Sigma.

In this course, your instructors will introduce you to, and have you apply, some of the tools and metrics that are critical components of Six Sigma. This course will provide you with the advanced knowledge of hypothesis testing and design of experiments as they are associated with Six Sigma and Lean.

Sub-Topics

Design of Experiments (DOE) - Part 1

Design of Experiments (DOE) - Part 2

HYPOTHESIS TESTING

Formative Assessments:

3 Graded Quizzes

Module 10 : [Six Sigma Advanced Define and Measure Phases](#) [15 Hours]

In this course, your instructors will introduce you to, and have you apply, some of the tools and metrics that are critical components of Six Sigma. This course will provide you with the advanced knowledge of team dynamics and performance, process analysis, probability, statistics, statistical distributions, collecting and summarizing data, measurement systems analysis, process and performance capability, and exploratory data analysis associated with Six Sigma and Lean.

Sub-Topics

Probability and Statistics

Process Analysis and Documentation

Statistical Distribution

Yellow Belt Refresher - Team Basics

Formative Assessments:

8 Graded Quizzes

Module 11 : [Six Sigma Advanced Improve and Control Phases](#) [10 Hours]

This course is for you if you are looking to dive deeper into Six Sigma or strengthen and expand your knowledge of the basic components of green belt level of Six Sigma and Lean. Six Sigma skills are widely sought by employers both nationally and internationally. These skills have been proven to help improve business processes and performance. This course will take you deeper into the principles and tools associated with the "Improve" and "Control" phases of the DMAIC structure of Six Sigma.

It is highly recommended that you complete the "Yellow Belt Specialization" and the courses "Six Sigma and the Organization (Advanced)," "Six Sigma Advanced Define and Measure Phase," and "Six Sigma Advanced Analyze Phase" before beginning this course.

Sub-Topics

Lean Tools
Lean Tools for Process Control
Root Cause Analysis
Statistical Process Control (SPC) & Control Plan

Formative Assessments:

4 Graded Quizzes & 1 Peer Review Assignment

Module 12 : [Six Sigma and the Organization \(Advanced\)](#) [16 Hours]

This course is for you if you are looking to dive deeper into Six Sigma or strengthen and expand your knowledge of the basic components of green belt level of Six Sigma and Lean. Six Sigma skills are widely sought by employers both nationally and internationally. These skills have been proven to help improve business processes and performance. This course will introduce you to the purpose of Six Sigma and its value to an organization. You will learn about the basic principles of Six Sigma and Lean. Your instructors will introduce you to, and have you apply, some of the tools and metrics that are critical components of Six Sigma. This course will provide you with the basic knowledge of the principles, roles, and responsibilities of Six Sigma and Lean.

Every module will include readings, videos, and a quiz to help make sure you understand the material and concepts that are studied. You will also have the opportunity to participate in discussions and peer review exercises to give you the opportunity to apply the material to your daily life.

Sub-Topics

Design for Six Sigma
Lean Principles in the Organization
Management and Planning Tools & Business Results for Projects
Project Identification - VOC - Project Management Basics
Six Sigma and the Organization

Formative Assessments:

7 Graded Quizzes

Module 13 : [Six Sigma Principles](#) [13 Hours]

This course is for you if you are looking to learn more about Six Sigma or refresh your knowledge of the basic components of Six Sigma and Lean. Six Sigma skills are widely sought by employers both nationally and internationally. These skills have been proven to help improve business processes and performance. This course will introduce you to the purpose of Six Sigma and its value to an organization. You will learn about the basic principles of Six Sigma and Lean. Your instructors will introduce you to, and have you apply, some of the tools and metrics that are critical components of Six Sigma. This course will provide you with the basic knowledge of the principles, roles, and responsibilities of Six Sigma and Lean.

Sub-Topics

Lean Foundations and Principles

Quality Tools and Six Sigma Metrics
Six Sigma Foundations, Principles, Roles and Responsibilities
Team Basics

Formative Assessments:

5 Graded Quizzes

Module 14 : [Six Sigma Tools for Analyze](#) [8 Hours]

This course will cover the Measure phase and portions of the Analyze phase of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) process. You will learn about lean tools for process analysis, failure mode and effects analysis (FMEA), measurement system analysis (MSA) and gauge repeatability and reproducibility (GR&R), and you will be introduced to basic statistics. This course will outline useful measure and analysis phase tools and will give you an overview of statistics as they are related to the Six Sigma process.

The statistics module will provide you with an overview of the concepts and you will be given multiple example problems to see how to apply these concepts. Every module will include readings, discussions, lecture videos, and quizzes to help make sure you understand the material and concepts that are studied.

Sub-Topics

Data Analysis
Measurement System Analysis
Process Analysis Tools
Root Cause Analysis

Formative Assessments:

4 Graded Quizzes

Module 15 : [Six Sigma Tools for Define and Measure](#) [9 Hours]

This course is for you if you are looking to learn more about Six Sigma or refresh your knowledge of the basic components of Six Sigma and Lean. Six Sigma skills are widely sought by employers both nationally and internationally. These skills have been proven to help improve business processes and performance. This course will cover the Define phase and introduce you to the Measure phase of the DMAIC (Define, Measure, Analyze, Improve, and Control) process. You will learn about Six Sigma project development and implementation, you will become familiar with project management tools, you will be introduced to statistics and understand its significance to Six Sigma, and finally you will learn about data collection and its importance to an organization.

Sub-Topics

Basic Statistics
Data Collection
Project Identification
Project Management Basics

Formative Assessments:

4 Graded Quizzes

Module 16 : [Six Sigma Tools for Improve and Control](#) [9 Hours]

This course will provide you with the tools necessary to complete the final components of the analyze phase as well as the improve and control phases of the Six Sigma DMAIC (Define, Measure, Analyze, Improve, and Control) process. This course is the final course in the Six Sigma Yellow Belt Specialization. You will learn about relationships from data using correlation and regression as well as the different hypothesis terms in hypothesis testing. This course will provide you with tools and techniques for improvement. You will also understand the importance of a control plan, as well as its key characteristics, for maintaining process improvements. Every module will include readings, discussions, lecture videos, and quizzes to help make sure you understand the material and concepts that are studied.

Sub-Topics

Control Tools and Documentation

Correlation and Regression

Hypothesis Testing

Improvement Techniques

Formative Assessments:

4 Graded Quizzes & 1 Peer Review Assignment

ASSESSMENT:

For summative assessments, Coursera will provide question banks for which exams can be conducted on the Coursera platform or the faculty will create their own assessments.

Note: If a Course or Specialization becomes unavailable prior to the end of the Term, Coursera may replace such Course or Specialization with a reasonable alternative Course or Specialization.