



# MEM

MASTER IN ENGINEERING  
MANAGEMENT

CE | كلية الهندسة  
COLLEGE OF ENGINEERING

جامعة الامير سلطان  
PRINCE SULTAN  
UNIVERSITY



## Master in Engineering Management (MEM)

### INTRODUCTION

The Master in Engineering Management program (MEM) is designed to accelerate the development of engineering management skills among Professional in the area Engineering, Computing, Architecture and Design. It offers graduate students an opportunity to develop the technical expertise and the business competence that is in high demand for management positions in technology-based industry.

PSU-CE Master of Engineering Management is an interdisciplinary program that bridges the gaps between the fields of engineering, technology, and business. The program provides a solid balance of fundamental engineering principles, management and leadership techniques, and the art and science of business within the engineering industry. Students gain the theoretical, quantitative, and analytical skills and tools they will need to contribute to interdisciplinary teams or to take a leadership position in engineering management and address complex business challenges with innovative, practical, and effective solutions.

All students are prepared for various potential careers in the engineering management field, including project management, product development and management, supply chain management, construction management, and technical organizations.

### PROGRAM VISION

To be a leading Engineering Management program that is recognized locally and internationally for quality education and developing future leaders.

### PROGRAM MISSION

To provide accessible education in the theory and application of engineering management that prepares participants for successful careers in industry, government, and academia aligned and inspired by the Saudi Vision transformative programs.

## GRADUATION REQUIREMENTS

To receive the Master's degree, students must satisfy the requirements related to credits, program of study, and other courses within the maximum period that is specified in the PSU Graduate Rules and Regulations. The requirements are as follow:

- Complete the credits required by the respective program track
- Satisfy program requirements

## PROGRAM OBJECTIVES| THE CABABILITY OF:

- Thinking strategically while respecting engineering principles.
- Addressing managerial problems from an engineering point of view.
- Developing innovative approaches for management decisions.
- Understanding how to manage an ever changing technology base.
- Developing a systems approach to problem and/or opportunity definition.

## PROGRAM LEARNING OUTCOMES| THE ABILITY TO:

- Prepare participants for a lifelong career addressing the critical technical and managerial needs of private and public organizations.
- Emphasize developing analytic abilities, making better decisions, developing and executing strategies, and leading people who innovate.
- Use basic engineering concepts flexibly in a variety of contexts.
- Apply knowledge, skills and techniques of engineering and management to execute contemporary projects and operations effectively and efficiently.
- Understand the concepts and application of good management practices to foster innovation and sustain global competitiveness.
- Demonstrate leadership and effective communicate skills.

## CAREER OPPORTUNITIES

- Management Consultant
- Program and Project Management
- Business Development
- Operations Manager
- Construction Management Engineer
- Senior Lead Business Analyst
- Cost Systems Analyst
- Entrepreneurship
- Industrial Management Engineer
- Construction Project Engineer

## STUDY PLAN

The MEM program consists of 3 tracks:

1. Construction Management
2. Industrial and System Engineering
3. Project Management

Student can choose the track that fit their expertise and desire. The student can also choose to follow either Thesis option or non-thesis option.

## DEGREE REQUIREMENTS

The degree requirements for Thesis and Non-Thesis option are:

Thesis Option	Non-Thesis option
Successful completion of a 24 credit hours of graduate courses	Successful completion of a 30 credit hours of graduate courses
Completion and successful defense of a Master thesis	

The courses are selected based on the approval of the advisor and the graduate committee coordinator. The student has to maintain at least a GPA of 3.0.

## STRUCTURE OF THE PROGRAM

**1- Thesis Option:** Twenty four Credit hours and a six credit hours thesis are required:

Number & Type of Courses	Credit Hours (CRS)
4 Core Courses	12
4 Elective Courses	12
Master Thesis	6
<b>Total</b>	<b>30</b>

**2- Non-Thesis Option:** Thirty Credit hours of core and elective courses are required:

Number & Type of Courses	Credit Hours (CRS)
4 Core Courses	12
6 Elective Courses	18
<b>Total</b>	<b>30</b>

## CORE COURSES

CODE	TITLE	CRS
EM 511	Project Management	3
EM 512	Statistical Quality Analysis	3
EM 513	Engineering Financial Analysis	3
EM 514	Strategic Planning	3

**ELECTIVE COURSES**

Student should select four courses from the following list to complete the requirement for the degree

CODE	TITLE	CRS
EM 531	Sustainable Construction	3
EM 532	Construction Technology and Methods	3
EM 533	Construction Claims and Disputes Resolution	3
EM 534	Construction Project Safety Management	3
EM 535	Application of Information Technology in Construction Project Management	3
EM 536	Procurement Process and Cost Estimation	3
EM 537	Construction Project Scheduling and Planning	3
EM 539	Special Topics in Construction Management	3
EM 551	Lean Manufacturing	3
EM 552	Inventory Control and Production System	3
EM 553	Introduction to Operation Engineering Management Decision Analysis	3
EM 554	System Simulation	3
EM 555	Advanced Optimization for Engineering Management	3
EM 556	Quality Management for Engineers	3
EM 557	Engineering Risk Management	3
EM 558	Supply Chain Engineering	3
EM 559	Special Topics in Industrial and System Management	3
EM 560	Enterprise productivity	3
EM 561	Six Sigma Processes	3
EM 571	Leadership and Organizational Behavior	3
EM 572	Communicating Technical Information	3
EM 573	Marketing and Technology Venture	3
EM 574	Energy Resources Management	3
EM 575	Project Scheduling and Planning	3
EM 576	Operations Management	3
EM 578	Data Mining for Engineering Applications	3
EM 579	Special Topics in Project Management	3
EM 598	Project Research 1	3
EM 599	Project Research 2	3
EM 600	MSc Thesis	6

If a student would like to have a track of the following, he/she should take four courses from the following elective courses, or otherwise he/she can do a general EM degree without any of the track(s).

**Track 1: Construction Management**

- 1.Application of Information Technology in Construction Project Management
2. Construction Claims and Disputes Resolution
- 3.Construction Project Safety Management

- 4.Construction Project Scheduling and Planning
- 5.Construction Technology and Methods
- 6.Procurement Process and Cost Estimation
- 7.Project Research
- 8.Special Topics in Construction Management
- 9.Sustainable Construction

**Track 2: Industrial and System Engineering**

- 1.Advanced Optimization for Engineering Management
- 2.Data Mining for Engineering Applications
- 3.Engineering Risk Management
- 4.Enterprise productivity
- 5.Introduction to Operation Engineering Management Decision Analysis
- 6.Inventory Control and Production System
- 7.Lean Manufacturing
- 8.Project Research
- 9.Quality Management for Engineers
- 10.Six Sigma Processes
- 11.Special Topics in Industrial and System Management
- 12.Supply Chain Engineering
- 13.System Simulation

**Track 3: Project Management**

- 1.Communicating Technical Information
- 2.Data Mining for Engineering Applications
- 3.Engineering Risk Management
- 4.Leadership and Organizational Behavior
- 5.Marketing and Technology Venture
- 6.Operations Management
- 7.Procurement Process and Cost Estimation
- 8.Project Research
- 9.Project Scheduling and Planning
- 10.Quality Management for Engineers
- 11.Special Topics in Project Management

## STUDY PLAN

### 1-Thesis Option

#### First Semester

CODE	TITLE	CRS
EM 511	Project Management	3
EM 512	Statistical Quality Analysis	3
EM 513	Engineering Financial Analysis	3
Total Credit Hours		9

#### Second Semester

CODE	TITLE	CRS
EM 514	Strategic Planning	3
EM 5xx	Elective Course	3
EM 5xx	Elective Course	3
Total Credit Hours		9

#### Third Semester

CODE	TITLE	CRS
EM 5xx	Elective Course	3
EM 5xx	Elective Course	3
EM 600	Thesis	6
Total Credit Hours		12

#### Forth Semester

CODE	TITLE	CRS
EM 600	Thesis	6
Total Credit Hours		6

### 2-Non Thesis Option

#### First Semester

CODE	TITLE	CRS
EM 511	Project Management	3
EM 512	Statistical Quality Analysis	3
EM 513	Engineering Financial Analysis	3
Total Credit Hours		9

#### Second Semester

CODE	TITLE	CRS
EM 514	Strategic Planning	3
EM 5xx	Elective Course	3
EM 5xx	Elective Course	3
Total Credit Hours		9

#### Third Semester

CODE	TITLE	CRS
EM 5xx	Elective Course	3
EM 5xx	Elective Course	3
Total Credit Hours		6

#### Forth Semester

CODE	TITLE	CRS
EM 5xx	Elective Course	3
EM 5xx	Elective Course	3
Total Credit Hours		6

## COURSE DESCRIPTIONS

### EM 511 Project Management

Credits: 3(3-0-0)

This course will provide knowledge on the fundamental methodologies and analytical techniques for the design and implementation of projects across a wide range of industries. This course provides knowledge on how to organize and manage resources required within the defined scope, time, cost and quality constraints and within acceptable levels of risk. The course provides knowledge on the principles and applications of project management in asset and operations manner. With the knowledge of this course participants can easily apply the different management theories in their respective project to achieve the output within prescribed goals.

### EM 512 Statistical Quality Analysis

Credits: 3(3-0-0)

This course covers modern quality control techniques to include the design of statistical process control systems, process/quality improvement, DMAIC process, statistical quality methods for improvement using descriptive statistics, probability distributions, point / interval estimation of parameters and statistical hypothesis testing. Basic methods of statistical process control (SPC), methods for process measurement and capability analysis (including Pareto charts, cause-and-effect diagrams, control chart, SIPOC and Shewhart control charts) are also investigated.

### EM 513 Engineering Financial Analysis

Credits: 3(3-0-0)

Financial Engineering is a multidisciplinary field drawing from finance and economics, mathematics, statistics, engineering and computational methods. Emphasis will be on the use of simple stochastic models to price derivative securities in various asset classes including equities, fixed income, credit and mortgage-backed securities. Considerations of the role of asset classes during the financial crisis will be given.

**EM 514 Strategic Planning**

Credits: 3(3-0-0)

This course provides a functional knowledge of strategic planning: its nature, scope, elements and development as a critical area of management education and of the steps in the strategic planning process. Also, provides an overview and applications of strategic planning theories, methods, and group processes in different organizational environments. Participants will learn how to perform internal and external analyses, identify problems, formulate goals and objectives, develop action plans, and evaluate strategic plans.

**EM 531 Sustainable Construction**

Credits: 3(3-0-0)

This course provides advanced knowledge, problem-solving skills and a comprehensive understanding of the key aspects of sustainability in construction engineering. It has a particular emphasis on the future trends of global sustainable development. It is intended to provide vital awareness of current and future problems associated with the intervention of sustainability strategies and their integration in the construction sector. Topics include: Sustainable technology and building materials; Sustainable energy and environment; Environmental engineering and management practice; Sustainable urban planning strategies; Integration of energy strategies in the design of buildings.

**EM 532 Construction Technology and Methods**

Credits: 3(3-0-0)

This course provides an understanding of construction methods, building systems, material and equipment selection. It provides the Construction Manager and Developer with the knowledge required to effectively understand the various components of a building. This will include: the mechanical, electrical, plumbing and sprinkler systems; the exterior and roofs of buildings; the structural make-up of a project (concrete, steel, wood and stone); types of foundations that could be used for a project; materials for interior construction work. Some discussion will be held in regard to cost differences of materials and systems used and the efficiency of potential systems being considered.

**EM 533 Construction Claims and Disputes Resolution**

Credits: 3(3-0-0)

The main purpose of having course is to elaborate the legal frame work for different construction claims which are recently observed in the construction industry. This course helps to introduce the different clauses in the Bill of Quantity book for managing the different claims and also strategy to resolve the dispute. With the knowledge of this course student can join the team of legal advisor for the dispute resolution process in their respective organization.

**EM 534 Construction Project Safety Management**

Credits: 3(3-0-0)

This course examines the management of labour and public safety for construction projects. It provides a comprehensive review of industry construction safety standards and public safety laws; such as international and local regulations; legal and economic issues of safety; risk reduction; risk & hazard identification and analysis.

**EM 535 Application of Information Technology in Construction Project Management**

Credits: 3(3-0-0)

The purpose of having this course is to give knowledge regarding the different tools used for Information Technology and how these different tools can be effect the productivity of the project. Students will learn how IT tools can be applied during the different stages of the project to achieve the output in more professional way.

**EM 537 Construction Project Scheduling and Planning**

Credits: 3(3-0-0)

This course provides advanced techniques in plan and schedule development and implementation for project management during the programming or construction phase of a project. Also the course covers monitoring, updating, and controlling the project schedule; earned value; analyzing change orders and delays; network models; resource levelling and equipment movement, and dispute-avoidance and considerations. Also the course covers a construction project schedule using computer software applications.

**EM 538 Green Buildings**

Credits: 3(3-0-0)

The growth of the green and sustainable building market has been widely publicized recently, accelerated largely by government policies and rising recognition that such buildings are more sustainable, environment-friendly and economical to operate in the building construction industry. The course explores basic knowledge of green building principles and practices on the basis of Leadership in Energy and Environmental Design (LEED) rating system. The course also studies LEED Score System in order to evaluate green building design and construction as well as building operation and maintenance, which is categorized in eight basic areas: Location and Transportation, Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation, Regional Priority.

**EM 539 Special Topics in Construction Management**

Credits: 3(3-0-0)

This course covers a new or specialized topic in Construction Management for which there is a strong faculty and student interest, but is not covered in other courses.

**EM 551 Lean Manufacturing**

Credits: 3(3-0-0)

Lean manufacturing is a systematic method for the minimizing (or eliminating) of waste within a manufacturing system. The wastes to be eliminated in lean manufacturing include overproduction, waiting time, transporting, inappropriate Processing, excessive inventory, excessive Motion, and defects. Lean manufacturing improvement techniques creates a culture that is constantly improving productivity, facilitating innovation, speeding the market and maintaining a competitive edge.

**EM 552 Inventory Control and Production System**

Credits: 3(3-0-0)

The current course aims to give students ability to inventory management principles, material quantitative techniques, Inventory control systems, Inventory and material management, Inventory costs, for different productions systems (pull, push, and hybrid). Further, the course includes,

inventory classifications, Economic order quantity, Materials cost methods, and Material Requirement Planning.

**EM 553 Introduction to Operation Engineering Management Decision Analysis**

Credits: 3(3-0-0)

Understand the philosophical background and analytical tools of decision analysis. Tools include decision trees and influence diagrams. The course covers methods of representing alternatives, uncertainty, risk and conflicting objectives and the use of maximum expected value criterion in finding optimal decision. Applications include a variety of business and management problems. The course requires a project that makes use of decision analysis methodology for a certain management or business problem.

**EM 554 System Simulation**

Credits: 3(3-0-0)

Simulation is becoming an important tool in most management discipline as a method for analyzing, improving or investigating process performance. Theoretical aspects concern the performance evaluation of a system by means of Monte Carlo estimation. The practical aspects concern of being able to capture a realistic production, manufacturing, services system, logistic system, into an abstract simulation model.

**EM 555 Advanced Optimization for Engineering Management**

Credits: 3(3-0-0)

This expands operations research techniques to general convex programming. Topics include quadratic programming, geometric programming, semi-definite programming, stochastic programming, dynamic programming and minimax programming. Applications include portfolio optimization, energy optimization, network design and operation, finance, supply chain management and scheduling. The course will also demonstrate convex programming using interior point methods and includes a course project using MATLAB.

**EM 556 Quality Management for Engineers**

Credits: 3(3-0-0)

This course is designed to define quality problems and how to implement

solutions to successfully make positive changes in the organization by using modern quality concepts, tools and techniques. Principals of quality leadership, quality philosophies and quality management will be presented to students in order to enhance the productivity and improving the quality in the establishment they work for.

### **EM 557 Engineering Risk Management**

Credits: 3(3-0-0)

The purpose of this course is give knowledge about the current risk assessment and management for different engineering projects. Students can design the process for risk analysis and with the knowledge of risk management for different project and control the uncertainty. The knowledge of risk management will help them in decision making.

### **EM 558 Supply Chain Engineering**

Credits: 3(3-0-0)

Presents modern quantitative techniques for designing, analyzing, managing, and improving supply chains using deterministic and probabilistic models. Topics include a macro view of supply chains, demand forecasting, aggregate planning, sequencing and scheduling, inventory analysis and control, materials requirement planning, pricing and revenue management, contracts decisions, transportation decisions, location and distribution decisions, supplier selection methods, and global supply chains.

### **EM 559 Special Topics in Industrial and System Engineering**

Credits: 3(3-0-0)

This course covers a new or specialized topic in Industrial and Systems Management for which there is a strong faculty and student interest, but is not covered in other courses.

### **EM 560 Enterprise productivity**

Credits: 3(3-0-0)

Diagnosis and assessment of productivity loss, setting up productivity measurement program, productivity improvement methods, and tools utilized in enterprise productivity enhancement, the lean enterprise, case studies of assessing and improving productivity programs.

### **EM 561 Six Sigma Processes**

Credits: 3(3-0-0)

The course will cover modern design tools and methods on the Six Sigma paradigm. Topics include tools and methods including process flow diagrams, cause and effect diagrams, gage R&R, organizational leadership, product development, system integration, critical parameter management, quality function deployment, concept generation, and strategy for organizing six sigma techniques in industry among many others. Provide useful tools to conceive new product requirements, design baseline functional performance, optimize design performance, and verify system capability.

### **EM 571 Leadership and Organizational Behavior**

Credits: 3(3-0-0)

Students will learn about strategies, models and practices on how to manage engineering firms. Personal approach to leadership will be enhanced through students' engagements in self-reflection about his style and experience. Theory taught in the class related to leadership will be examined through course project relevance to student experience in his organization.

### **EM 572 Communicating Technical Information**

Credits: 3(3-0-0)

This course aims at developing effective communication strategies that enable technical managers to connect with audience and achieve their related goals and remove barriers that block ideas. The course deals with enhancing communication strategies, writing and presenting technical information. Round table discussion a long with the assignments will enable students to learn how to persuade audience, readers and managements.

### **EM 573 Marketing and Technology Venture**

Credits: 3(3-0-0)

The application of modern marketing and its application are introduced. Identifying the winning solution to satisfy the customer's needs is presented through functional plans addressing pricing and product distributions. Students will gain better understanding of modern marketing through analysis of global trends and regional variations of marketing concepts.



**EM 574 Energy Resources Management**

Credits: 3(3-0-0)

Examine the four major components of energy management: supply, demand, regulation and environment; and the concepts and principles behind successful energy management. Topics include energy auditing and economic analysis; management control and maintenance systems; sustainability and high performance green buildings; alternative energy systems; boilers and fired systems; cogeneration and HVAC systems; ground source heat pumps; lighting and electrical management; natural gas purchasing; thermal storage; codes and standards; indoor air quality; utility deregulation and energy systems outsourcing; energy security risk analysis methods; and financing energy management projects.

**EM 575 Project Scheduling and Planning**

Credits: 3(3-0-0)

This course provides advanced techniques in plan and schedule development and implementation for project management during the programming or construction phase of a project. Also the course covers monitoring, updating, and controlling the project schedule; earned value; analyzing change orders and delays; network models; resource levelling and equipment movement, and dispute-avoidance and considerations. Also the course covers a construction project schedule using computer software applications.

**EM 576 Operations Management**

Credits: 3(3-0-0)

In this course, you will learn about the role of operations and how they are connected to other business functions in manufacturing- and service-focused organizations. You will learn and practice the use of decision-making frameworks and techniques applicable at all levels, from management-level strategic decisions such as connecting process to the needs of various customer segments, to front-line tactical decisions such as choosing between ordering larger quantities vs. ordering more frequently.

**EM 578 Data Mining for Engineering Applications**

Credits: 3(3-0-0)

This course introduces data mining concepts and statistics/machine learning techniques for analyzing and discovering knowledge from large data sets

that occur in engineering domains such as manufacturing, healthcare, sustainability, and energy. The topics covered in this course include data reduction, data exploration, data visualization, concept description, mining association rules, classification, prediction, and clustering. The course discusses data mining case studies that are drawn from manufacturing, retail, healthcare, biomedical, telecommunication and other sectors.

**EM 579 Special Topics in Project Management**

Credits: 3(3-0-0)

This course covers a new or specialized topic in Project Management for which there is a strong faculty and student interest, but is not covered in other courses.

**EM 598 MSc Project**

Credits: 3(3-0-0)

A supervised research project aimed at providing practical and research experience in some aspects of engineering management is required for completion of the MSEM program. Students are expected to define the project, state its objectives, complete a literature review, set project specifications and methodologies that draw upon the tools and techniques studied in the program. A report and an oral defense presentation are required.

**EM 599 Research Project**

Credits: 3(3-0-0)

Selected topics of current interest, to be designated by subtitle and publish a paper in a refereed journal/conference.

**EM 600 MSc Thesis**

Credits: (6-0-0)

Master Thesis.



جامعة الأمير سلطان  
PRINCE SULTAN  
UNIVERSITY