School of Applied Technical Sciences

Master of Science in Engineering Management

Study Plan-Thesis Track

2018/2019

Master of Science in Engineering Management

1. Overview

Master of Science in Engineering Management (MSEM) is a degree that bridges the gap between the fields of engineering, technology, business management, and innovation. It is a multidisciplinary field that involves the application of advanced business methods, engineering techniques, and innovation tools to design, manage, and improve complex systems and achieve organizational objectives.

MSEM is aimed at attracting ambitious engineers who aspire to obtain a senior role in their organizations in which they integrate technical and management responsibilities with innovation to support business growth and new organizational trends. It is ideal for recent graduates hoping to make their first move into engineering and innovation management, as well as established professional engineers who aspire for a higher management role and wish to extend their knowledge beyond their specific technical field.

MSEM graduates can work as engineering managers, quality managers, innovation and technology managers, project managers, operations managers, as well as in planning and strategic management to lead their organizations.

2. Program Objectives:

Graduates of the MEM program will be able to achieve the following objectives:

1. Apply engineering and management knowledge and techniques to analyze complex decisions and design complex engineering systems.
2. Establish successful engineering management careers in public and private sector that will contribute to the development of Jordan and the region.
3. Successfully manage technological innovation through developing the strategies, structures, and systems needed for the effective commercialization of new products and services, business systems and production processes.
4. Develop competitive skills in problem solving techniques, interdisciplinary teamwork, and critical analysis of engineering management problems.
5. Develop profound understanding of global economic and technological aspects to meet the changing needs of a knowledge-based economy by adapting and responding to changes.
6. Engage in service to professional societies and communities through practicing engineering systems management with professionalism and ethics.

3. Program Learning Outcomes

Upon completion of the program, graduates should be able to:

1. Solve industry-related problems by applying advanced engineering management, business, and innovation knowledge.
2. Analyse and design complex systems using both qualitative and quantitative tools and perspectives.
3. Interpret quantitative and subjective data to make sound engineering and managerial decisions.
4. Evaluate possibilities and opportunities through combining creative thinking skills and tools with a thorough understanding of technological development.

5. Analyse, design, and manage innovation and product development for maximum effectiveness and value.
6. Develop and lead effective teams and projects and communicate effectively across the entire enterprise
7. Understand the ethical responsibilities of practicing engineering managers and the impact of their decisions within a global and societal context.
8. Appreciate the need for life-long learning and personal development

4. German Dimension

School of Applied Technical Sciences has well-established exchange cooperation with over 27 German partner universities. The cooperation includes the following and can be expanded to apply to the current master program:

1. Sending students to Germany for studying or practical purposes.
2. Exchange professors to teach block courses.
3. Capacity building and train the trainings program of staff through EU-funded projects.

5. Admission

All students having a BSc degree in any engineering discipline can apply to this master program. What are the other admission conditions such as GPA, language, accredited university, etc.

6. Program Prerequisites

Enrolled students are expected to pass an entry assessment exam on engineering statistics and engineering economics. Students who fail to pass the exam will be required to take a pre-requisite course (IE517 Statistics and Engineering Economics) and will be informed of this in their admission letter.

7. Curriculum

The numbering system is structured as follows (from left to right):

1. IE: Industrial Engineering Department
2. Level digit: 7 = Master level
3. The middle digit represents the specialized field of knowledge:
    1 = Operations Research
    2 = Innovation Management
    3 = Statistics & Quality
    4 = Management Sciences and Business Management
    5 = Technology Management
    6 = Research Methods
    7 = Special Topics
    8 = Comprehensive exam
4. The right digit represents the sequence of the course within the field.

8. Study Plan: Thesis Track

Classification	Credit Hours
Compulsory Courses	19
Elective Courses	6
Master Thesis	9
Total	**34**

1. Compulsory Courses (19 Credit hours)

Course No.	Course Title	Credit. hours	Pre-requisite
IE711	Operations Research & Simulation	3	-
IE721	Innovation & Entrepreneurship	3	-
IE732	Quality Engineering & Management	3	-
IE741	Operations & Supply Chain Management	3	IE711
IE742	Project Management	3	-
MBA712	Management and Cost Accounting	3	-
IE761	Research Methods	1	-
	Total	**19**	

2. Elective Courses (6 Credit hours) to be chosen from:

Course No.	Course Title	Credit. hours	Pre-requisite
IE733	Reliability & Maintenance Management	3	IE732
IE734	Lean Six Sigma	3	IE732
IE743	Facility & Asset Management	3	IE711
IE744	Business Law & Engineering Contracts	3	-
IE751	Applied Data Analytics		
IE752	Sustainability & Energy Management	3	-
IE771	Special Topics in Engineering Management	3	-
IE772	Special Topics in Innovation Management	3	-
MBA740	Organizational Behavior and Human Resources	3	-
MBA743	Strategic Management and Business Policy	3	
	Total	**6**	

3. Comprehensive Exam (0 Credit hours):

Course No.	Course Title	Credit. hours	Pre-requisite
IE799A-D	Master thesis	9	Dept. Approval
	Total	**9**	

Study Plan Guide: Thesis Track

First Year			
First Semester			
Course No.	**Course Title**	**Credit hours**	**Prerequisite**
IE711	Operations Research & Simulation	3	-
MBA712	Management and Cost Accounting	3	-
	Elective Course	3	-
Total		**9**	
Second Semester			
Course No.	**Course Title**	**Credit hours**	**Prerequisite**
IE732	Quality Engineering & Management	3	-
IE741	Operations & Supply Chain Management	3	IE711
	Elective Course	3	-
IE761	Research Methods	1	-
Total		**10**	

Second Year			
First Semester			
Course No.	**Course Title**	**Credit hours**	**Prerequisite**
IE742	Project Management	3	-
IE721	Innovation & Entrepreneurship	3	-
IE799B	Master thesis	3	-
Total		**9**	
Second Semester			
Course No.	**Course Title**	**Credit hours**	**Prerequisite**
IE799C	Master thesis	6	IE799B
Total		**6**	

9. Course Descriptions

IE711 Operations Research & Simulation (3 C.H.) **Pre-requisite:-**
The topics included are : Linear programming models, integer programming, transportation and assignment models, network models ,queueing theory , basic discrete event simulation methodology, random number generation, input analysis, validation, analysis of simulation output, and applications to various areas of scientific modeling.

IE721 Innovation & Entrepreneurship (3 C.H.) **Pre-requisite:-**
This course aims to equip students with an understanding of the main issues in the management of technological innovation and an appreciation of the relevant skills needed to manage innovation at both strategic and operational levels. It provides evidence of different approaches based on real-world examples and experiences of leading international firms. This course covers the following topics: What is innovation and why is it important?, Technological innovation and innovation diffusion, , creativity techniques and stimulating organizational creativity, Innovation strategy, Collaboration and open innovation, The management of research and development, The management different types of innovations, products, services, processes and business models, Capturing value from innovation.

IE517 Statistics and Engineering Economics **Pre-requisite:-**
The course aims to familiarize students with basic concepts in probability, expected values, variances, statistical inference and regression. Also to familiarize students with concepts of time value of money, decision making among alternatives, Inflation, real-options analysis, replacement decisions and capital-budgeting decisions.

IE732 Quality Engineering and Management (3 C.H.) **Pre-requisite:-**
Quality definitions. Quality management principles. TQM strategy. Quality management systems. Excellence models. Economics of quality. Statistical process control. Sampling procedures. Capability analysis. Introduction to six sigma. Introduction to reliability engineering. Process Re-engineering.

IE733 Reliability & Maintenance Management (3 C.H.) **Pre-requisite: IE 517**
This course focuses on the concept of reliability engineering and maintenance management. This course helps ensure that engineers see reliability success with every product they design, test, and manufacture. This course contains an introduction to reliability, a part on system's reliability, reliability engineering, reliability applications, failure prevention techniques, and an approach of design for reliability (DFR).The course also focuses on The Maintenance Management System (MMS) as a management tool for planning and budgeting deferred maintenance, capital improvement, equipment repair and replacement, and construction projects. It covers the following topics in maintenance management: Maintenance Management Objectives, Maintenance Policies & Strategies, Maintenance Planning & Scheduling, Work Order Systems, Maintenance Cost Control, Performance Keys Indicators, Designing a MMS, and Computerized Maintenance Management System (CMMS) & Software Applications.

IE734 Lean Six Sigma (3 C.H.) **Pre-requisite: IE 517**
The course talks about Lean, Six sigma, and Theory of Constraints, which includes the followings topics: Introduction to Six Sigma and implementation, Introduction to probability, Introduction to statistics, Six Sigma project definition, Six Sigma measurement system, Six Sigma analysis/statistics tools, Six Sigma Models, Theory of Constraints (TOC) concepts, TOC stages, Drum-Buffer-Rope (DBR) approach, TOC metrics, lean concepts, types of wastes, lean Tools.

IE741 Operations and Supply Chain Management (3 C.H.) **Pre-requisite: IE711**

Introduction to operations and project management. Operations planning, designing, acquiring, and operating. Operations interaction with the other activities of a firm (finance, marketing, quality, procurement, design, supply chain, inventory, Human resources). Understanding the Supply Chain, Supply Chain Performance, Understanding Financial Statement, Supply Chain Drivers and Metrics, Designing Distribution Networks, Network Design in the Supply Chain, Designing Global Supply Chain Networks, Supply Chain Forecasting, Managing Economies of Scale in a Supply Chain Cycle Inventory, Managing Uncertainty in a Supply Chain Safety Inventory, Determining the Optimal Level of Product Availability, Procurement and Sourcing Management, and Transportation and Distribution Management

IE742 Project Management (3 C.H.) **Pre-requisite:-**

Project Management framework. Project scope and selection. Human aspects of project management. Project Organization. Project Planning (planning process, time, cost, and resources).Project execution (controlling, auditing, risk, and termination).

IE743 Facility & Asset Management (3 C.H.) **Pre-requisite:-**

The course objective is to develop understanding of the concepts and methodology of facilities planning. Students will acquire knowledge and skills in the areas of strategic facilities planning, and manufacturing facilities design. Topics include: design of facilities, production lines, material handling system, selection of equipment, and labor performance measurement and evaluation.

IE744 Business and intellectual property laws (3 C.H.) **Pre-requisite:-**

This course establishes the concept of law and legal institutions in society, emphasizing areas of law relevant to business operations, general legal, and social environment with emphasis on business ethics; role of contracts in business; and employment obligations. The course covers the following topics: Contract Strategy, Contract Law, Contract Management, Contract Documents, Liability and Health and Safety, Insurance and Bonds, and Dispute Resolution, intellectual property rights, technology licensing.

IE751 Applied Data Analytics (3 C.H.) **Pre-requisite: IE517**

This course aims to give the student a working knowledge of how to use a computer software (i.e. R or Python) to extract knowledge and information from data. At the end of this course, students will be competent in using R or Python libraries to work with and analyze offline as well as online data. During the course, students will develop the soft and analytical skills to build data-based statistical and machine learning models.

IE752 Sustainability & Energy Management (3 C.H.) **Pre-requisite:-**

This course aims to qualify students to design and manage effective energy management programs that can meet sustainability and energy goals of their institutions. This is done through the combination of technical knowledge of energy consuming systems with energy economics and business aspects. Topics include: Design of energy management programs, energy codes and standards, sustainable and green facilities, energy fundamentals and calculations, energy procurement, energy rate structures, energy accounting, energy economics and financing, energy metering and instrumentation, commissioning, measurement & verification, energy auditing in buildings, energy auditing in industry, energy efficient systems, renewable energy systems, carbon reduction mechanisms

IE761 Research Methods (1 C.H.) **Pre-requisite: -**

Qualitative and quantitative Research Methodologies. How to plan and write a research proposal. Practical strategies for literature review. APA and IEEE style guidelines. Presenting research results and conclusions.

IE771 Special Topics in Engineering Management (3 C.H.) **Pre-requisite: -**
Selected topics of current interest in Engineering Management. The course is designed to give the students an opportunity to pursue special studies not offered in other courses.

IE772 Special Topics in Innovation Management (3 C.H.) **Pre-requisite: -**
Selected topics of current interest in Innovation Management. The course is designed to give the students an opportunity to pursue special studies not offered in other courses.

IE781 Master thesis **Pre-requisite: department approval**
Requires students to complete original research work in the area of engineering management. Students must demonstrate the ability to integrate the information and the skills accumulated in their study plan through rigorous written and oral communication. The thesis is completed under the supervision of a faculty member serving as the thesis advisor, and a final defense to the examining committee is required.

MBA712 Management and Cost Accounting **Pre-requisite:-**
This course focuses on understanding the usefulness of management accounting information to businesses and managers to drive effective and efficient decisions. This course provides students with vital information on relevant costs, qualitative factors in the dynamic interaction of cost, volume and profit analysis. This course includes studying costing systems to make operational decisions such as costing and pricing in today's competitive environments. Also, discussed is the profit planning and the impact of budgets on strategic plans and objectives, moreover, accounting for control, performance evaluation and appraisal is presented. Strategic management accounting including competitor analysis and customer profitability analysis are explained to evaluate decision making outcomes. Finally, Ethical practices of management accounting are essential components of this course as a mean of following the new trends of strategic management accounting.

MBA740 Organizational Behavior and Human Resources **Pre-requisite:-**
This course provides perspectives and skills that enhance understanding own behavior and our ability to influence the behavior of others in organizational settings. Further, organizations must rely on effective human resource management for their long-term sustainability. Especially in development organizations, human resource managers must be concerned with unique issues of balancing organizational, board, staff, and volunteer concerns, while also maintaining a committed, motivated, and productive workforce.

MBA743 Strategic Management and Business Policy **Pre-requisite:-**
The course brings together what the MBA students have learned in the business disciplines into strategy to achieve a sustainable competitive advantage through discussions of strategy formulation, selection and implementation. It relies heavily on interactive and case analysis learning methods. This course teaches MBA students the science and art of business strategy in modern organization's to achieve long term strategic objectives in today's turbulent business environment. It teaches MBA students the process of strategic management and business policy as a usual business practice that is embedded in the organization's culture on the top levels of management.