

Master of Science in Industrial and Management System Engineering
Program code: 066010

INTRODUCTION

Industrial and Management Systems Engineering Department (College of Engineering and Petroleum) offers a Master Degree in **Industrial and Systems Engineering (ISE)**. The program features a thesis and non-thesis option. The aim of this program is to equip graduates with quality industrial and systems engineering education and research experience necessary to pursue further graduate work at leading international institutions, and fulfill national aspirations and market needs.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENTS

33 (33) TOTAL COURSE CREDITS (non-thesis option in parenthesis)

6 (6) CORE COURSES (3 credits each)

0600-503 Statistical Concepts in Engineering

0660-553 Simulation Analysis and Applications

12 (18) SUBDISCIPLINE COMPULSORY (3 credits each)

Students must take at least one course from each of the following subdisciplines

A. Quality and Organizational Excellence

0630-516 Reliability and Maintainability (Mech. Eng.)

0660-535 Quality Engineering and Management

0660-536 Total Quality and Organizational Excellence

B. Safety and Human Factors

0660-521 Occupational Safety Engineering and Management

0660-523 System Safety and Risk Assessment

0660-525 Human Factors Systems

C. Operations Research

0600-507 Mathematical Optimization

0660-561 Linear Programming and Network Flows

0660-563 Data Analytics

D. Production and Operations Planning

0660-551 Production and Inventory Management

0660-552 Decision Analysis

0660-557 Supply Chain Management

6 (6) FREE ELECTIVE COURSES

* A maximum of 3 credits hours (thesis students) and 6 credits hours (project students) of graduate courses can be taken from:

- Area of Engineering (Core and elective)
- Area of Science
- Area of Joint Graduate Programs (Engineering/Science Specialization)

with the approval of the graduate program director before registering for the course.

9 (3) COMPULSORY COURSES

0660-592	Seminar	(0)
0660-593	Project	(3) (non-thesis only)
0660-597	Thesis	(0)
0660-598	Thesis	(0)
2000-599	Thesis	(9)

COURSE DESCRIPTION

0660-521: OCCUPATIONAL SAFETY ENGINEERING AND MANAGEMENT CR: 3

Survey of common safety hazards and abatement methods; safety engineering control and systems (ventilation, fire suppression, noise, climate conditions, fall protection); safety management systems; application of financial and statistical analyses in safety; safety application in oil and gas, logistics, healthcare, and construction.

0660-523: SYSTEM SAFETY AND RISK ASSESSMENT CR: 3

System safety concepts; risk assessment matrix; system safety program components; system safety analysis techniques and methods; MIL-STD-882, preliminary hazard analysis, failure mode and effect analysis, fault tree analysis, fault hazard analysis, Management Oversight Risk Tree, what-if analysis, Hazard and Operability Study. Applications in oil and gas, logistics, healthcare, and construction.

0660-525: HUMAN FACTORS SYSTEMS CR: 3

Fundamentals of human factors; the human error; the human-machine systems; applications of perceptual factors (visual, auditory, tactual) and cognitive factors in the design of products, machines, and systems; anthropometric-based workspace design; applications of human factors in oil and gas, construction, and other local environments.

0660-535: QUALITY ENGINEERING AND MANAGEMENT CR: 3

Quality fundamentals; methods for quality control and quality improvement; statistical process control and capability analysis; statistical software application; quality management systems concepts, principles, and requirements; applications in oil and gas, manufacturing, health care, education, banking and finance, and government.

0660-536: TOTAL QUALITY AND ORGANIZATIONAL EXCELLENCE
CR: 3

The total quality approach; organizational excellence programs; six sigma performance. Applications of excellence programs and operations in oil and gas, manufacturing, health care, education, banking and finance, and government.

0660-551: PRODUCTION AND INVENTORY MANAGEMENT
CR: 3

Introduction to production and service systems. Production planning and control in decision making. Forecasting. Aggregate production planning. Capacity planning. Materials requirement planning. Scheduling. Inventory Planning, Integrated Production Planning and Control Advanced topics in the operation of production systems (e.g., performance measures, self-regulating production control systems and scheduling) are introduced as well as advanced methods and tools for analyzing and solving planning, scheduling and control of production systems.

0660-552: DECISION ANALYSIS
CR: 3

This course provides a coherent approach to modern decision making, it provides an overview of the tools, techniques, and skills needed to analyze decision-making problems characterized by risk, uncertainty and conflicting objectives. The emphasis is tailored to the models representing decision situations by the use of probability and utility theory to represent uncertainties and preferences. Particularly, the course focuses on the application of a wide variety of quantitative methods to aid in decision-making, including statistical inference, Bayesian theory, populations and samples, decision tree analysis, expected monetary and cost values, value of perfect and sample information, conflicting alternatives, Analytical Hierarchy Process, and efficiency analysis of decision making units (Data Envelopment Analysis). Techniques learned throughout the course are implemented in real world decision problems using different software packages to realize how decision-making principles can be applied to vast areas such as business, engineering, technology, supply chains, healthcare, etc.

0660-553: SIMULATION ANALYSIS AND APPLICATIONS
CR: 3

Simulation concepts and methodologies for modeling complex real systems. Fundamental concepts of a system simulation and its applications will be demonstrated using a simulation language. Topics include, terminating and steady state systems, input data analysis, determination of simulation input parameters and distribution fitting, analysis of output, model verification and validation, variance reduction techniques and model animation. Application in oil and gas, prominent manufacturing and service sectors, logistics, healthcare government sector and others.

0660-557: SUPPLY CHAIN MANAGEMENT
CR: 3

This course focuses on suppliers, manufacturers, warehouses, distributors, retailers and customers to create an efficient supply chain. Topics include basic elements of the supply chain. Supply chain metrics. Decisions pertaining to logistics including: transportation, distribution, warehouse managements and information flow in the supply chain.

0660-561: LINEAR PROGRAMMING AND NETWORK FLOWS
CR: 3

The conventional linear programming model, the Simplex method: foundation and computation, special Simplex implementation, duality and sensitivity analysis, network flows.

0660-563: DATA ANALYTICS
CR: 3

This course presents a broad overview of the various aspects in data analytics such as data reduction, advanced data mining, exploring methodologies, scrubbing, modeling and interpretation. In addition to formulating and solving real world problems of massive data sets using the appropriate analytical modeling techniques and statistical principles. Particular attention will be paid to practical, efficient and statistically sound techniques of selected topics such as: data structures, visual analytics, data mining, clustering algorithms, classification and prediction models, rule-based classifiers and decision trees, Bayesian classifiers, basic machine learning models (K-nearest neighbors, support

vector machines), data reduction and principal component analysis. In addition, the course will address recent and emerging topics such as big data and massive data sets and mobile data analytics.

0660- 592: SEMINAR

CR: 0 CO-Requisites: 0660-593 Or 0660-597

With the guidance of the graduate program committee, the seminar topics include:

- Research writing methods.
- Presentation skills
- Surveying literature.
- Bibliography style.
- New tools (LaTeX, Data analysis etc...)

0660- 593: PROJECT

CR: 3 CO-Requisites: 0660-592

The student undertakes an independent project on a research topic of theoretical and/or experimental focus under the supervision of a faculty member listed in the supervisory list of the College of Graduate Studies. The objective is to provide the student with an opportunity to integrate and apply the knowledge gained throughout the course of study in a practical problem. The student must document the project in a scientific report following standard research writing guidelines and give a public presentation to the project examination committee.

0660- 597: THESIS

CR: 0 CO-Requisites: 0660-592

0660- 598: THESIS

CR: 0

2000- 599: THESIS

CR: 9