INDUSTRIAL ENGINEERING (M.S.)

Academic Year

2011-2012

School

Graduate School School Web site

School Dean

Henry Flores, Ph.D. hflores@stmarytx.edu

Department

Engineering

Program Director

Rafael Moras, Ph.D., P.E. rmoras@stmarytx.edu

Admission Requirements

To be considered for admission into St. Mary's University Graduate School, you will need to submit the following (along with application):

- (2) Letters of Recommendation
- (2) Official Transcripts reflecting your degree earned.
- Official GRE/GMAT/MAT
- Official TOEFL (80 Computer based) (international students only)
- Financial Guarantee (international students only)

Program Specific Admission Requirements

Admission is granted only to those with high promise for success in graduate study. Applicants demonstrate this potential through previous academic records and testing. To be considered for admission to the M.S.I.E. program, an applicant must fulfill the following:

1. Have a Bachelor of Science (B.S.) degree in engineering, the physical sciences or mathematics. Students with a degree in other disciplines may be admitted on a contingency basis provided they complete prerequisite courses including engineering calculus I and II, probability and statistics, and engineering programming.
2. Have
    1. a minimum grade point average (GPA) of 3.00 (A=4.00) in their B.S. degree; and
    2. a minimum quantitative GRE score of 600;
    3. Applicants who fail to meet any of the above standards may be admitted on a conditional basis. The graduate programs director evaluates these cases on an individual basis.

3. International students must submit minimum TOEFL scores of 213 on the computer-based test, 550 on the paper-based test, or 79 on the Internet-based test. Alternatively, students may submit a minimum ISELS score or 6.5
4. Submit a completed application form, a written statement of purpose indicating the applicant's interests and objectives, two letters of recommendation, and official transcripts of all college level work. Admission is granted only to those with high promise for success in graduate study. Applicants demonstrate this potential through pervious schooling and testing.

Degree Requirements

Industrial Engineering (30hrs)
Project Option

Course #	Course Title	Hours
Required: 15 hours (take all of the following)		
EG6303	Lean Production	3
EG7306	Six-Sigma Quality	3
EG6341	Supply Chain Management	3
EG6331	Simulation	3
EG8396	Capstone Project	3
Required: 3 hours Engineering Finance (choose one from the following):		
EG6305	Engr. Eco	3
EG7350	Financial Aspects Business	3
EG7354	Engr. Cost Analysis or another financial-based course, with Director's approval	3
Required: 3 hours Operations Research (choose one from the following):		
EG6332	Operations Research I	3
EG6333	Operations Research II	3
EG6310	Nonlinear Optimization	3
EG6308	Stochastic Processes	3
Required: 3 hours Manufacturing (choose one course from the following):		
EG6340	Manufacturing Engineering	3
EG6327	CAM and Robotics	3

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Course #	Course Title	Hours
Required: 6 hours IE elective work (choose two from the following)		
EG6301	Statistics	3
EG6304	Reliability	3
EG6307	Sequencing and Scheduling	3
EG6308	Stochastic Processes	3
EG6309	Human Factors/Ergo	3
EG6310	Nonlinear Optimization	3
EG6317	Advanced Quality Control	3
EG6327	CAM	3
EG6332	Operations Research I	3
EG6333	Operations Research II	3
EG6338	Special Topics	3
EG6340	Manufacturing Engineering	3
EG7303	Safety	3
EG7307	Plant/Facilities	3
EG7155, 7255, 7355	Internship	3
Other course work w/Graduate Program Director approval.		
	Total hours	**30**

Industrial Engineering (30hrs)
Thesis Option

Course #	Course Title	Hours
Required: 18 hours		
EG6341	Supply Chain Management*	3
EG6303	Lean Production*	3
EG6331	Simulation	3
EG7306	Six-sigma Quality*	3
EG8390	Thesis I and EG 8391 Thesis II	3

Required: 12 hours (choose four courses from the following, with Graduate Program Director approval)

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Course #	Course Title	Hours
EG6301	Statistics	3
EG6304	Reliability	3
EG6305	Eg Eco	3
EG7354	Engr. Cost Analysis	3
EG7350	Financial Aspects	3
EG6307	Sequencing and Scheduling	3
EG6308	Stochastic Processes	3
EG6309	Human Factors/Ergo	3
EG6310	Nonlinear Optimization	3
EG6317	Advanced Quality Control	3
EG6327	CAM	3
EG6332	Operations Research I	3
EG6333	Operations Research II	3
EG6338	Special Topics	3
EG6340	Manufacturing Engineering	3
EG7303	Safety	3
EG7307	Plant/Facilities	3
EG7155, 7255, 7355	Internship	3
Other course work w/Graduate Program Director approval.		
	Total hours	**30**

Department Courses and Descriptions

EG 6301 **Statistical Data Analysis** (3)
An applied approach to statistical inference in engineering and scientific work. Tests of hypothesis, regression analysis, analysis of variance and experimental design.

EG 6302 **Engineering Management & Decision Systems** (3)
Philosophy, theory, and practice of management; decision theory and social responsibility; management of research and development; the professional interrelationships of engineering to modern production organizations. Case studies in engineering management.

EG 6303 **Lean Production Systems** (3)
Forecasting. Inventory planning and control. Aggregate planning. Deterministic and stochastic inventory models. Master scheduling. Just-in-time and lean. Theory of constraints. Sequencing and scheduling.

Assembly line balancing.

EG 6304 **Reliability and Maintainability** (3)
Statistics of reliability. Reliability estimation and decision making. Reliability models. Redundancy. Experimentation and testing.

EG 6305 **Economic Analysis for Managerial Decisions** (3)
Criteria used for making decisions about proposed capital investments and the implementation of selected criteria in engineering design and investment decisions. Present worth, rate of return, payback period, cost-benefit analysis. Depreciation. Inflation. Taxes.

EG 6307 **Sequencing and Scheduling** (3)
Quantitative analysis of operational problems of production systems with a concentration on operations sequencing and scheduling in job shops, flow lines, and project work.

EG 6308 **Random Variables and Stochastic Processes** (3)
Introduction to the underlying theory of stochastic processes. Topics include: random sequences and convergence; autocorrelation, autocovariance, stationarity, ergodicity; stochastic calculus (continuity, differentiability, integrability); Poisson processes; white-noise processes; Gaussian process; random walk, Brownian motion, Wiener process; Markov chains; Markov processes; linear systems driven by random inputs.

EG 6309 **Human Factors and Ergonomics** (3)
Comprehensive and practical review of basic concepts in the integration of the human component into the design, development and evaluation of human-machine systems. (Same as PS 6309).

EG 6310 **Nonlinear Programming** (3)
Classical optimization, formulation, unconstrained and constrained optimization. Numerical search techniques, including penalty functions, gradient search and quadratic programming. Genetic algorithms.

EG 6327 **Computer Aided Manufacturing (CAM) & Robotics** (3)
Modem manufacturing systems including automation, computer integrated manufacturing, robotics, and programmable logic controllers. Computer implementation of CAM topics such as computational geometric modeling, dimensioning, and tolerancing. Experiments on programmable logic controllers, computer numerical control (CNC) programming, coordinate measuring machine (CMM) techniques, and computer aided design.

EG 6331 **Computer Simulation** (3)
Modeling of operational aspects of manufacturing and service systems using discrete and continuous simulation techniques. The statistics of simulation

EG 6332 **Operations Research I** (3)
Linear programming, Big-M and two-phase methods, revised simplex, duality theory, sensitivity analysis, transportation and assignment methods. Goal programming.

EG 6333 **Operations Research II** (3)

Network flow programming, dynamic programming, Markov chains, queuing theory, Monte Carlo simulation. May be taken independently of EG6332, Operations Research I.

EG 6338 **Special Topics** (3)
Course may be repeated for credit if topics vary

EG 6339 **Thesis Direction** (3)
The thesis is a culminating experience that provides a record of a student's achievement in the program. The thesis requires research leading to the discovery of new knowledge or enhancement of existing knowledge in the field of interest. A project that helps solve a practical problem may also be acceptable. The thesis features a complete documentation of the research study, including the theoretical background, description of the problem, the method used to investigate or solve the problem, presentation of results, interpretation of results, and explanation of the significance of the results.

EG 6340 **Manufacturing Engineering** (3)
An overview of modem manufacturing systems including computer aided manufacturing, computer integrated manufacturing, manufacturing resources planning, lean and just-in-time, and robotics. Economic and ergonomic aspects of product design. Experiments on computer integrated manufacturing and manufacturing processes are conducted.

EG 6354 **Management of Computer and Information Systems** (3)
This course examines a broad range of topics in the management of technology, information systems and organizational issues in exploiting new technology. The course explores concepts of applying computer information systems and communications technology to provide an effective frame work for managing competitiveness in an environment of rapid global change. Managing R&D, systems acquisition, decision-making, and links to other functional areas in the corporation are emphasized.

EG 6376 **Neural Networks** (3)
Neuron model and network architecture; Heb net; perception learning rule; ADALINE and MADAL1NE architectures and algorithms; back propagation algorithm; pattern classification; pattern association competitive neural networks. Prerequisite: Consent of instructor.

EG 6382 **Computer Aided Design and Manufacturing (CAD/CAM)** (3)
Overview of basic concepts of CAD/CAM. Application of computers for the design and creation of a manufacturing database. Hardware and software considerations in CAD. Modem manufacturing systems including automation, computer integrated manufacturing, robotics, and programmable logic controllers. Computer implementation of CAM topics such as computational geometric modeling, dimensioning, and tolerancing. A term project is required. Experiments on programmable logic controllers, computational modeling, computer numerical control (CNC) programming, and coordinate measuring machine (CMM) techniques are conducted.

EG 7303 **Safety Engineering.** (3)
Systems safety; product safety; safety and health related workplace hazards; worker safety; loss prevention principles and regulations; loss assessment and control, theories of accident causation. Safety standards.

EG 7306 **Six-Sigma Quality Systems.** (3)
Total quality management philosophy, with emphasis on statistical quality strategies. Statistical process control; supplier certification; benchmarking; simultaneous engineering; re-engineering; quality teams; quality audits; Kaizen; quality function deployment, Malcolm Baldrige National Quality Award guidelines.

EG 7307 **Plant Layout and Facilities Design** (3)
Principles and method of analysis and design of service, production, and manufacturing facilities. Location selection. Plant layout. Materials requirement and resource planning. Enterprise resource planning (ERP). Use of computers in facilities planning and control. A term project featuring the design of a production system is required.

EG 7351 **Systems Engineering** (3)
Systems analysis, engineering economics, and systems engineering and their impact on decision making. Systems of systems.

EG 7353 **Project Management** (3)
This course provides a management perspective on managing projects. It examines the basic nature of managing business, public, engineering and information systems projects, including the specific insights and techniques required. Issues such as the selection and management of the project team, project initiation, implementation and termination are addressed. This course is cross-listed with BA 7353. Students who have previously received credit for BA 7311 may not enroll in this course.

EG 7155, 7255, 7355 **Internship 1,2,** (3)
An experiential approach to advanced engineering topics through work in a company or organization. Industry/university cooperation is required. Topics vary depending upon the needs of the sponsoring company or organization and the academic needs of the student. Students may start an internship project anytime after enrollment in any engineering program. A minimum of three credit hours is required. Credit hours may be completed in increments of 1, 2, or 3 credit hours per semester. Prerequisite: consent of the graduate program director.

EG 8300 **Engineering Systems Management** (3)
A comprehensive course in the Engineering Systems Management graduate program. An analysis of case studies is conducted to integrate the functional areas studied in the program and engineering ethics. Class activities typically focus on practical applications of engineering systems management concepts.

Department Faculty

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