

## Engineering and Technology Management Graduate Certificate

Improve your professional-level communication and management skills so that you may more effectively manage projects. This **15-credit graduate program** prepares technically trained professionals to lead multidisciplinary teams that bridge the gap between operations and management.

This incremental approach to graduate study is designed to provide flexibility. The certificate offers three tracks:

- Quality Management
- Engineering and Project Management
- Emerging Technology Management

Credits earned may be applied to the Masters of Science in Industrial Engineering (MSIE), if desired.

### Who should participate:

- Engineers currently in or aspiring to a leadership role
- Industrial and manufacturing professionals who are looking for a higher degree of training in their field
- Engineers and computer scientists with a minimum of a bachelor's degree in a technical discipline
- Technical professionals who manage multidisciplinary teams for project design or management

### Upon completion of this certificate, participants will be able to:

- Confidently manage a staff in a technical or scientific setting
- Communicate with employees and colleagues in order to efficiently produce results
- Apply acquired managerial skills to advance their careers
- Pursue a master's degree in Industrial Engineering with advanced preparation and credits

**This certificate is applicable to such fields as:** manufacturing production workers, computer engineers, industrial engineers, computer scientists, workers in the pharmaceutical industry and the research and development industry, and more. See an academic consultant for more details.

### Admission requirements

Admission to the certificate program does not require students to take the Graduate Records Examination (GRE). However, students should satisfy all other requirements for admission to the Master's of Science in Industrial Engineering program. To learn more about admission, registration, and advising, call 412-624-6600.

### Fees and tuition

Tuition rates listed here are for the academic year 2003-2004. Rates will change for the 2004-2005 academic year in July 2004. The tuition rate for full time students in this program (those enrolled for 9 to 15 credits) is \$6,741 per semester for Pennsylvania residents. For part time students (those enrolled for 8.5 or fewer credits) tuition is \$644 per credit for in-state students. University fees (per term) are typically \$145 for part-time students and \$500 for full-time students.

### Payment Plans

- Discover, MasterCard, and VISA are accepted for tuition payment.
- If employed, check with your company's human resources office to see if you qualify for company tuition benefits.
- Deferred tuition payment plans are available for participants who wish to extend tuition payments over a longer period of time.

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*Revised 6/06/03*

## **Curriculum (15 credits)**

### ***Required courses***

*All courses are three credits*

#### **Engineering Management**

IE 2003

Concepts and processes of qualitative Engineering Management applied to the management of technical and scientific organizations will be covered. Topics included: (1) general systems theory; (2) management and the systems concept; (3) strategic planning and management systems; (4) systems analysis; (5) project management systems; (6) organizational design; (7) evaluation and control systems; and (8) managing technical professionals.

#### **Capstone Project**

IE 2090

Students will study analytical investigation techniques for total project problems in engineering and technology management organizations. Involves solving a significant problem at a client site utilizing capabilities acquired by students during program study. Emphasis will be placed on gaining team experience, writing, speaking, and selling ideas and solutions to problems. Project will culminate with a final technical report and formal presentation.

#### **Probability and Statistics for Engineers 1**

IE 2005

*(Only required for the Quality Management track)*

This course will cover sampling distributions, point and interval estimation, tests of statistical hypotheses, statistical quality control, design and analysis of experiments with one or more factors, regression analysis, and nonparametric statistics.

### ***Electives***

Choose electives based on the track

#### **Quality Management Track**

*Select two courses*

#### **Total Quality Management**

IE 2076

This course covers the theory and application of total quality management and quality control topics that are within the current trends of 'quality engineering.' The course will cover four areas: (1) Principles and Philosophies, (2) Product/Service Development, (3) the Manufacturing of the Product/Providing of the Service, and (4) Inspection of Incoming and Outgoing Materials. Under Principles and Philosophies, topics such as the history, pertinent gurus, leadership concepts, what is meant by customer satisfaction, employee involvement, continuous

process improvement, and performance measures are covered. For Product/Service Development, the use of benchmarking, QFD, BPR, problem solving tools, and Shanin techniques are explored along with the value of DOE and Taguchi methods. Although a separate course is offered in statistical quality control, the course will explore other quality techniques commonly used in the manufacturing of a product or of providing a service, such as the 'magnificent 7 tools,' TPM, zero defects FMEA, Pre-control, Positrol, and poka-yoka. Finally, the course will explore issues related to the inspection of raw materials and outgoing product, such as ISO 9000 and supplier certification. This course can provide a foundation for becoming a Certified Quality Engineer. It requires a prerequisite in basic statistics.

#### **Design of Experiments**

IE 2073

This course covers analysis of variance, completely randomized designs, randomized complete block designs, other blocking configurations, nested designs, fixed, and random and mixed models. Factorial experiments with qualitative and quantitative factors in various designs are studied, as well as, single degree of freedom contrasts; confounding in factorial experiments, fractional factorial designs, and response surface models.

#### **Statistical Quality Control**

IE 2077

This course teaches process monitoring with control charts (Shewhart, cusum, EWMA), feedback adjustment and engineering process control, process capability, autocorrelation, and selected topics from current literature.

#### **Applied Regression Analysis**

BIOSTAT 2049

This course focuses on basic analytic techniques of regression analysis with special analysis on valid interpretations of results using such techniques. Analysis with computer-packaged programs is stressed.

#### **Reliability and Maintainability**

IE 3075

This course provides a review of mathematical preliminaries, e.g., stochastic processes, laplace transforms, etc. Combinational reliability, hazard rates and their application, reliability improvement through redundancy and repair, optimization of system reliability, replacement and maintainability policies, software reliability, network reliability, power system reliability, and fault trees introduction to life testing are covered.

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## **Engineering and Project Management Track**

*Select three courses*

### **Probability and Statistics for Engineers**

IE 2005

This course covers sampling distributions, point and interval estimation, tests of statistical hypotheses, statistical quality control, design and analysis of experiments with one or more factors, regression analysis, and nonparametric statistics.

### **Cases in Systems Management**

IE 2032

This course examines case analysis with emphasis on the design and execution of strategies for technical and scientific organization. Topics include: (1) strategic management and implementation; (2) selection and execution of project management systems; (3) leadership of technical organizations; (4) environmental assessment; (5) the strategic management of projects; (6) organizational change process; (7) matrix management; and (8) planning, scheduling, and control.

### **Board Governance and Management**

IE 2033

This course captures the new era in enterprise governance, where the performance of an organization is shaped and ultimately determined by the characteristics and management practices of its board of directors. It utilizes the study of boards of directors in contemporary profit and non-profit organizations, in conjunction with students' experiences in leadership roles. Topics covered include the foundation of boards such as selection of board members, board structure, information management, communication, and relations with senior management, and the function of boards such as board evaluation, planning, management control, value creation, and stakeholder relations. In addition to various types of readings and weekly assignments, the course will include case studies and a group project.

### **Cost Management for Advanced Manufacturing**

IE 2037

This course focuses on current cost management topics such as activity based costing, life cycle costing, target costing and throughput accounting. Emphasis will be placed on the linkages to advanced manufacturing systems including performance measurement, design, cellular manufacturing, JIT and MRP II.

### **Advanced Engineering Economy**

IE 2040

This course covers sources and costs of capital, and the role of capital budgeting in achieving the financial goals of the organization. It also covers advanced engineering economy topics including project justification and competition, project selection under risk and uncertainty, multi-attribute decision-making, and sensitivity analysis.

### **Decision Models**

IE 2086

Decision theory, risk and uncertainty, value of information, preference measurements, prioritization of alternatives, multiple objectives, and hierarchical decisions will be addressed. Case studies are incorporated into lectures.

### **Project Management**

IE 3031

The concepts, techniques, tools, and processes of project management will be examined to include planning, organizing, and controlling the use of resources during a project's life cycle. The strategic concept of projects will be considered during focusing on product and process development in the technical organization.

## **Emerging Technology Management Track**

*Select three courses*

### **Probability and Statistics for Engineers 1**

IE 2005

Sampling distributions, point and interval estimation, tests of statistical hypotheses, statistical quality control, design and analysis of experiments with one or more factors, regression analysis, and nonparametric statistics will be explored in this course.

### **Entrepreneurship for Engineers**

IE 2039

This course considers the development of a new company from inception to "going public." It includes an understanding of accounting principles, budgeting, capital markets, venture capital, operating in the development stage, executive and employee requirements, product development, and growing the company. The course culminates in the group development of a business plan for a new company.

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## **Law and Engineering**

IE 2095

This is a survey course which will consider and review the impact of the law and the legal system on engineering and the impact of engineering on the law. It will review and consider the structure of relevant legal systems emphasizing the United States, the nature of legal reasoning, and the impact of the legal structure on a wide range of engineering activities. It will also review and consider how engineering developments change and develop the law and legal systems including the use of engineering experts in litigation.

## **Management of Technological Innovation**

IE 3034

Subjects covered in this course are the technological innovation process; planning and organizing for innovation; the role of idea champion and participative management; risk-taking; technological risk assessment; creativity; entrepreneurship in small and large companies; challenges for tomorrow's technology managers. The course includes lectures, group discussions, guest lecturers, and individual projects. This course is open to advanced students with instructor's permission.

## **University of Pittsburgh**

### **Department of Industrial Engineering**

The Department of Industrial Engineering was accredited in 1921, making it one of the five oldest IE departments in the world. The Department prides itself on a progressive curriculum, modern laboratories, active and diverse faculty, and an enthusiastic student body. It continually ranks in the Top 20 of the *US News and World Report* Graduate School Rankings. The Department cares about student learning and mentoring, and prepares students to be leaders in their fields.

### **School of Engineering**

The University of Pittsburgh School of Engineering is on the cutting edge of engineering education and research. With its integrated curriculum, renowned faculty, substantive hands-on learning environment, and state-of-the-art facilities, the school plays a vital role in the educational research and professional advancement of the Southwestern Pennsylvania region and the nation.

### **Learning Solutions**

Learning Solutions provides adult and continuing education programs that are designed to address changing employer and student needs. The high-quality, flexible programs include degree completion, certificates, and enrichment courses. Learning Solutions provides a single point of access to innovative programs and services of the College of General Studies and other schools of the University of Pittsburgh that both enrich lives and promote the economic health of the region.

*For more information, contact*  
**University of Pittsburgh**  
**Learning Solutions**

**412-624-6600**  
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