

# Engineering Management (M.S.)

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## About The Program:

The College of Engineering, which hosts the program, and the Fox School of Business and Management established this interdisciplinary Master of Science in Engineering Management. The degree program is designed as a career development option for students pursuing careers in technology-based ventures who desire to learn specific management techniques associated with the management of technology development and technology-based projects, either for customers or associated with the introduction of new technologies into existing organizations.

Students who complete the M.S. in Engineering Management learn many of the skills and approaches necessary to increase the productivity and innovative capacity of technology-driven organizations. They are exposed to aspects of management education, such as project management, IP strategy, and quality management, to which they may not have previously been exposed.

**Prerequisites for Admission:** An undergraduate degree in Science, Technology, or Engineering from an ABET-accredited or equivalent institution. Students with an undergraduate degree in a related field may also be considered, though they may require some prerequisite coursework.

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## Requirements of Programs:

- **Total Credit Hours:** 30
- **Culminating Events:**  
Successful completion of coursework constitutes the culminating event for the M.S. in Engineering Management.

## Core Courses

**Design Thinking** - Many technologists view design as a function that takes place after the product or solution has been developed. Design thinking offers an alternative, customer driven approach to the commercialization of technological innovation, which embeds potential customer usage patterns into the development from the outset. Design thinking is thus a radical approach to the design process that enables much higher levels of innovation (and therefore commercial success) into the design process, especially in comparison with the traditional view of design that tends to foster incremental thinking. In this course we will share case studies of successful and unsuccessful product design, and provide participants with a series of tools to help them understand and deploy a design thinking process. In the course we will share frameworks for identifying market and technology trends that can stimulate opportunities for radical designs based on user engagement. With an improved understanding of the design thinking process participants will be better prepared for commercial success, whether they work in a large company deploying new solutions, or are interested in starting their own venture. The course will place particular emphasis on the importance and role of experimentation and learning from failure, as well as provide access to a series of tools that can help an organization decide whether, or not, to continue with a specific development process. In this course, students learn theories and practices for

innovation, tools and methods for design inquiry, and characteristics of "design attitude." The course emphasizes hands-on project and studio-style project works.

**Idea to Invoice: Managing the New Product Development Process** – The course is designed to give technology students insights into the market and commercial factors that should be considered when developing new products or technologies. This course offers students the chance to understand and apply a number of analytical, decision making, and planning tools that can be used to guide the development of new products (and services) from idea to the marketplace (invoice). The course highlights critical issues associated with linking business objectives to technology development, and how each influences the other. Specific topics addressed include: the development of new product strategy and policy, selection of product market strategies, deployment and application of new product development processes, portfolio management, product development tools and metrics, market research, and importantly the people and organizational issues associated with the product development process. Participants in the course will learn to appreciate the advantages of introducing more formal new product development processes that break down the overall process into stages, and understand how and why the consideration of different strategic, technical and financial issues at each stage improve the likelihood of long-term commercial success. Not only will the course prepare participants for an active role in the product development process in a large organization or to participate in the technology development process in a new venture, they will also be prepared to obtain a certificate as a New Product Development Professional (NPDP) Certification offered by the PDMA.

**Management Principles for Innovators, Engineers and Technologists** – This is an introductory course for engineers and technologists who have no formal business training. It includes an introduction to the theory of the firm and the principles of management. It includes looking at the evolution of management, and the new roles for leaders and managers in innovative organizations. The course also gives a basic overview of corporate finance, and explains the various components of balance sheets, profit and loss and cash flow statements. Finally, the course deals with basic human resource and people management issues in the contexts of large organizations trying to adapt to rapid changes in the market.

**Project Management Overview and Project Management Essentials** – This course is designed for individuals working in both large and small organizations who are often faced with the challenges of managing multiple priorities and projects with limited resources. Whether these projects include a research and development project, the opening of a new production line, or the construction of a new facility, individuals are accountable for their on-time and on-budget performance. This course is an introduction course and follows a life-cycle approach to managing projects, beginning with project initiation concerns and ending with project termination.

**Financial Management for Technologists** – This course provides students with a real world understanding of what the key financial reports of a company actually mean and what is really important as a manager. It focuses on understanding profit and loss statements, budgets and cash flows. Also, it examines various methods for calculating financial return, and provides tools to help participants better budget, track project costs and decide between project alternatives.

**Lean Six Sigma and the Science of Improvement** – The discipline of quality management is increasingly recognized as an essential element in the management of any company. Quality management provides a number of approaches and tools to help individuals in both large and small organizations ensure that products and solutions consistently meet and exceed customer expectations, while ensuring that the company's processes maximize operational efficiency. In this course we will

introduce a number of quality management tools: Six-Sigma, kaizen and TQM, that participants will be expected to deploy on actual cases. In addition, students will be provided with an overview of statistical tools that are essential when deploying a quality management system (i.e. Pareto Analysis, correlations and regression). The course will also focus on developing appropriate measurement systems, in order to use quantitative as well as qualitative tools to help identify specific areas that need attention. This will help quantify the magnitude of identified problems, prioritize the sequence in which each is going to be addressed, and then measure improvements made. The course is essential to those operating in larger companies, but the tools deployed will be useful to anyone looking to improve the effectiveness and efficiency of a smaller business, including those running their own ventures.

**Capstone for Engineering Management** – The Capstone course will allow students to complete final projects in their Engineering Management program.

## **Fox School of Business and Management Courses**

**Select courses from the following:**

### **Innovation Intelligence: Plan, Build, Protect, and Monetize a Technology / Innovation**

**Portfolio** – Almost all firms want to be more innovative, however, few succeed at profiting from their innovations. Furthermore, some of the most interesting technological inventions are commercial failures. This course trains students in approaches to strategically manage an innovation or technology-focused organization or consultancy. Developing 'intelligence' in a domain requires accessing relevant information, analyzing it using appropriate approaches, and making informed strategic decisions based on your analysis. This course will demonstrate a number of tools and perspectives that are critical to strategically plan, coordinate, and make decisions relevant to innovation, research and development (R&D), and technology or new product development. You will learn to systematically assess R&D / technology trends and risks, scout for development opportunities, identify technology and product leaders and uncover their strategies, protect and leverage your portfolio of innovations/technologies, and build a coherent innovation plan that aligns with your organization's strategy.

**Entrepreneurial Thinking and New Venture Creation** – Whether students are aspiring entrepreneurs bent on launching new businesses or managers bent on growing profitable businesses, the module seeks students to "think big" and "think out of the box". The central focus of the module is on two key success factors: the entrepreneur; and his/her ability to create and recognize opportunities. It examines the concepts, skills and know-how, information, attitudes and alternatives that are relevant for entrepreneurs engaged in start-up and early-stage ventures, managers of new ventures within established organizations, and the relevant stakeholders. Key questions raised and answered in the module include: What are the key aspects of new venture creation process? Where can you look for new opportunities? How do you evaluate an opportunity? How do you generate, evaluate, and evolve your ideas? How do new ventures achieve growth? What are the key elements of deal structure? How should you structure a deal? What are the strategies for harvesting new ventures? What are the unique properties of entrepreneurs and their teams?

### **Global Innovation Strategy: Creating Agile, Innovative, Globally-Competitive Organizations** –

This course discusses innovation-based strategies as a source of competitive advantage as well as how to build and design agile / adaptive organizations that excel at innovation. Major topics include understanding how disruptive innovations impact industries, designing an organization that encourages innovation and embraces change, balancing performance and innovation demands, and organizing to take advantage of various sources of innovation. In addition, students will be exposed to a number of cutting-edge topics relevant to next-generation strategy: global R&D and emerging market innovation,

organizational learning and knowledge management, and open innovation approaches that engage both your customer base as well as your value system to innovate and create unparalleled value.

### **Lean Entrepreneurship / Innovation: Fast & Frugal Methods to Launch Startups & Test Innovative Ideas**

– The Lean Startup or Lean Launchpad methodology has transformed the way that entrepreneurship is taught and practiced and has even changed how the most innovative organizations in the world invent new products and services or reinvent themselves via innovation. In this experiential, hands-on course students will learn the 'customer-development' approach that serves as a counterpoint to traditional 'product development' undertaken in most organizations. Students will be immersed in the iterative (build-measure-learn) process and will learn how to accelerate the process via creative approaches to designing minimum-viable products, prototypes, and experiments. Furthermore, they will learn how to more systematically identify and test assumptions so that they can make decisions to pivot, proceed, or restart based on customer insights and evidence gathered.

**Business Model Innovation** – A business model describes how an organization creates and captures value - a business model is like the DNA of an organization. Business model tools and perspectives have recently advanced at a dramatic pace and business model innovations are one of the most significant sources of industry disruption. This course uses the business model canvas methodology as well as the strategic revolution/blue ocean strategy approaches to generate rule-breaking business models. In addition, building on this business model foundation, we will explore theories of innovation characteristics, adoption, and diffusion to provide practical advice and techniques for finding first customers, implementing innovative ideas, and driving acceptance by modifying your products, services, and business model.

**Creativity Unleashed: Harnessing Creativity to Solve Real-World Innovation Challenges** – We all face an innovation imperative - innovate or die. Innovation fuels our ability to be competitive - both on a corporate level and on a personal one. However, innovation remains elusive to many organizations and individuals. Students in this course will shift both their perspective and their behaviors as they learn a set of creativity tools that they will apply to real-world innovation challenges during class. This course delves deep into critical creativity topics like problem formulation, divergent thinking techniques, idea evaluation and convergent thinking, evolving ideas to increase impact and feasibility, and championing your ideas to find acceptance. No matter what career or profession you are going into, being familiar with creative approaches and techniques will help you to be more valuable, employable, innovative, and entrepreneurial. Developing your competencies in this area might be one of the most important investments you can make in yourself. Creativity has become one of the most sought after characteristics of employees and managers and is an important predictor of executive success. Creativity is not simply something you have, it is something that you can develop.

**Plan, Pitch, and Fund an Entrepreneurial Start-Up** – For many entrepreneurs securing funding is the most challenging phase of the entrepreneurial process. Although more options than ever before are available for early stage funding, a substantial portion of the entrepreneurial funding landscape involves appealing to potential investors. Increasingly accelerator programs, incubators, and a number of other key players in the entrepreneurial ecosystem are using the same criteria as angel and venture capital investors for selecting investment-worthy ventures. This course focuses on positioning and presenting your venture or concept such that it has the greatest chance to be funded. Your 'pitch' or investor presentation is a critical phase in the entrepreneurial process, and you should not underestimate how important it is to the success or failure of your company. The investor presentation is unlike any other business presentation you've done: investors are a most demanding and impatient audience. It's a fact that many companies that truly deserve to be funded don't get funded because they can't communicate what they have well enough to engage investors.

**Open Innovation and Managing Strategic Alliances** – It is said that competition is no longer company-vs-company but business ecosystem against business ecosystem. Unbridled advances in technology, connectedness, globalization, and fragmentation of value chains across industries have transformed the relationship between companies, customers, partners, and competitors. Increasingly the knowledge and specialization required by firms to produce new products, gain new resources including strategic intelligence, and to place bets across nascent markets resides outside of firms' boundaries. To be successful in this context, firms - from established industry giants to entrepreneurial new ventures - must build comprehensive open innovation strategies that engage and mobilize external stakeholders to productive and innovative ends. This course addresses the distinct challenges and opportunities posed by the confluence of digital community (i.e. "the crowd"), powerful and expanding data gathering and analytics, and the ambiguous boundaries of successful modern firms.

### **Electives (7.5 Credits Worth)**

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#### **Courses:**

Click [HERE](#) for more information on the courses below.

- Design Thinking
- Idea to Invoice: Managing the New Product Development Process
- Management Principles for Innovators, Engineers and Technologists
- Project Management Overview and Project Management Essentials
- Financial Management for Technologists
- Lean Six Sigma and the Science of Improvement
- Marketing Technological Products and Services
- Executive Engineering Leadership
- Advanced Financial Management for Technologists
- Project Management – Project Planning, Implementation and Case Study
- Special Topics in Engineering Management
- Independent Study in Engineering Management
- Capstone for Engineering Management
- Business Plan Development
- Business Strategy in a Global Environment
- Analytical Foundations of Strategy
- Foundations of Strategic Management
- Strategic Decision Support Systems
- Management of Technology and Innovation
- Management of Growth, Decline and Turnaround
- Industry Competitive Analysis
- E-Commerce Strategy
- Management of Mergers and Acquisitions
- New Venture Creation
- Growing Through Mergers & Acquisitions
- Competing on Value: Analyzing and Shaping Your Industry
- Strategy Implementation: Designing Organizations for Success
- Managing Strategic Alliances: Competing through Collaborations
- Firms in Crisis: Managing Turnaround
- Non-Profit Governance: Preparing to Sit on a Board of Directors
- New Venture Creation: Entrepreneurial Opportunities, Resources, and Teams
- Innovation-Based Strategy: Managing Disruptive Change
- Social Entrepreneurship: Change the World, Profitably

- Emerging Market Innovation: Reinventing the Multinational Firm
- Business Model Innovation: Profitable and High-Impact by Design
- Corporate Strategy: Managing Diversified Firms
- Creative Problem Solving: Perspectives & Techniques that Improve Creativity in Organizations & Life
- Financing Entrepreneurial and Corporate Ventures
- Innovation Adoption and Diffusion: Finding First Customers and Driving Widespread Implementation
- Managing Knowledge Networks: Understanding & Analyzing Social Networks in Organizations & Beyond
- The Crowd, The Cloud, and Open Innovation Strategy
- Social Entrepreneurship
- Sustainable Business Practices
- Management Consulting: Principles and Practices
- Engagement Management
- Innovation Intelligence: Plan, Build, Protect, and Monetize a Technology / Innovation Portfolio
- Principles of Strategy and Management
- Entrepreneurial Thinking and New Venture Creation
- Global Innovation Strategy: Creating Agile, Innovative, Globally-Competitive Organizations
- Lean Entrepreneurship / Innovation: Fast & Frugal Methods to Launch Startups & Test Innovative Ideas
- Business Model Innovation
- Creativity Unleashed: Harnessing Creativity to Solve Real-World Innovation Challenges
- Plan, Pitch, and Fund an Entrepreneurial Start-Up
- Open Innovation and Managing Strategic Alliances
- Special Topics
- Independent Study
- Future Franklins: Assessing the Feasibility of Innovative Business Ideas
- Special Topics: General & Strategic Management
- Competitive Strategy
- Strategy in a Global Context
- Competitive Strategy
- International Management
- Project in Consulting
- Multinational Strategic Management
- Contemporary Corporate Strategy
- Mng New/Small Enterprise
- Managing Bus Planning
- Seminar: Strategic Form - Environmental Analysis
- Seminar: Administrative Strategic Decisions
- Seminar: Management Control
- Spec Topic Strategy
- Directed Study in Mgt
- Theor Fndns in Entrepr
- Strategic Management of Technology and Innovation