



# Master of Science - Engineering Management

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## **Situational Analysis**

The engineering environment is changing radically:

- Intensity of **competitive pressures** continues to rise,
- **Development times** continue to shrink,
- System **complexity** is rising dramatically,
- New **processes, tools, skills, and technologies** have entered the workplace,
- **Outsourcing and offshoring** of engineering and management functions is commonplace.

### **Critical Industry Drivers:**

- **Growth** of sales and profits that “move the needle” has become a primary objective for established and start-up organizations.
- **Innovation** in products, services and processes is recognized as a key driver of growth.
- **Globalization** opens up new growth markets for products and services, new sources of competent, cost-effective innovation, and new competitor bases.

### **Master of Science in Engineering Management**

Students in this program are provided opportunities to improve and apply skills in the areas of:

- Generating innovative technical solutions to existing and emerging market needs,
- Transferring these technical solutions into commercially viable products and services,
- Developing global supplier and customer bases to apply these technical solutions worldwide.

Focus of coursework and projects is on:

- **Innovation**
- **Commercialization**
- **Globalization**

## Engineering Management Program Focus

- **Innovation:** Coursework covers topics such as voice-of-the-customer assessment, ideation (systematic idea generation), intellectual property generation, and technology roadmapping. Student teams apply these tools to project work to generate highly innovative technical solutions to real customer/market needs.
- **Commercialization:** Coursework provides opportunities for the student to learn how to develop product/process solutions that are designed to meet the unique needs of their customer. Student teams apply this knowledge to identifying commercially viable solutions that can provide sustainable competitive advantage.
- **Global Product Development:** Student team projects include cooperation with international industrial and educational partners on projects that have the potential to serve a global customer base.

## Elements of the Engineering Management Program:

1. **Instruction** – Curriculum expands student knowledge, skill, and **experience** in the three program focus areas.
2. **Projects** – Students gain direct hands-on **experience** in applying knowledge and skills to real-world new product, process and service development and commercialization projects.
3. **Partnerships** – Strong linkages to business, industry, and international institutions enables real-world **experiences** in innovation, commercialization, and globalization.

### **Program Structure**

Courses jointly offered by College of Engineering and the Graduate School of Business

- 33 credits required for graduation:
- 18 credits from College of Engineering,
- 15 credits from College of Business Administration,
- 27 credits total from core courses (next slide),
- 6 credits as electives (consent of advisor).

### **Business Courses – Graduate School of Business**

- Managerial Economics
- Operations and Supply Chain Management
- Managerial Accounting
- Marketing Management
- Financial Management
- Organizational Behavior
- Quantitative Decision Modeling and Analysis
- Applied Econometrics
- Seminar in Marketing

**Engineering Management (ENMA) Core Courses –  
College of Engineering (new)**

- ENMA 281: Engineering Project Management
- ENMA 282: Reliability, Failure Analysis, and Risk Assessment
- ENMA 283: Innovation and Technology
- ENMA 284: Lean Manufacturing Systems
- ENMA 285: Engineering Six Sigma Design and Development
- ENMA 286: New Product and Process Portfolio Management
- ENMA 287: Front-End Engineering Product Development
- ENMA 288: System Modeling, Simulation, and Analysis
- ENMA 289: Engineering Innovation and Entrepreneurship
- ENMA 290: Management Issues in Engineering and Technology

**ENMA or MBA?!**

- If your goal is to be CEO, then you should be enrolling in an MBA program.
- If your goal is to be involved in product, process, service, or technology innovation, commercialization, and globalization, then you should enroll in ENMA.
- Or, you can do both (sequentially)!
- If you plan ahead, you can transfer up to 12 credits to a second master's degree after completing a first.

***Great! How do I sign up?***

**Temporary Status:**

- Student wants to begin coursework but has not completed everything required to submit for regular degree-seeking admission (e.g, GRE).
- Active for one semester only.
- Application form and fee with self-reported undergraduate GPA.

**Non-Degree Status:**

- Used after student has completed a degree program and wants to continue taking courses but not working towards a degree
- Application Form and fee plus official transcripts from all post-secondary institutions.

**Degree Status:**

- Student is pursuing a Master's or Doctoral Degree.
- Application form and fee.
- Essay questions on the application.
- Official transcripts from all post-secondary institutions.
- Two letters of recommendation (three for international students).
- Official test scores on the GRE or GMAT.
- Resume or job profile.
- TOEFL score for international students.

**Engineering Management Program Status:**

- 20 students enrolled – Goal is 40.
- 7 ENMA courses – Goal is 10.
- 1 full-time, 1 part-time ENMA faculty -  
Goal is two full-time.
- Working relationships with:
  - Cracow University of Technology
  - Poznan University of Technology
  - Warsaw University of TechnologyGoal is to add Universidad Caxias do Sul, Brazil
- Recently formed Industry and Business Advisory Board

### **Student Team Projects – ENMA Courses**

- For ENMA courses, up to 50% of a student's grade depends on student team project results.
- Currently, ENMA team projects are typically associated with university research, primarily to simplify confidentiality and IP issues.
- That being said, we are actively seeking out appropriate **industry-sponsored** ENMA projects
- The following is a synopsis of projects that are or have been associated with ENMA courses...

### **Biodiesel Production**



**Project:** Re-design manual biodiesel reactor for automated operation.

**Markets:** Institutions that generate and dispose of waste vegetable oils, e.g., restaurants, food processors.

**Product:** Sensors and PLC-based controller package to retrofit existing manual system.

**Partnerships:** Florida Biodiesel Inc. – Manufacturer of 60 gal. and 500 gal. biodiesel reactors ([www.floridabiodieselinc.com](http://www.floridabiodieselinc.com)).

**Status:** First prototype complete May '07, two student projects Fall 07.

## **Fluid Condition Monitor**



**Project:** Develop sensors and analysis algorithms for monitoring fluid composition, contamination, and deterioration in biodiesel fuels.

**Markets:** Biodiesel fuel producers, distributors, users, production equipment OEMs, diesel engine OEMs.

**Product:** Hand-held field analyzer and sensor, in-situ sensor.

**Partnerships:** Paradigm Sensors LLC – Wisconsin-based start-up ([www.paradigmsensors.com](http://www.paradigmsensors.com)).

**Status:** Transfer of MU IP to Paradigm Sensors complete. Product prototype for Version 1 due November '07.

## **Dental Implants**



**Project:** Use Solid modeling and rapid prototyping to reduce time-to-temporary dental implant by a factor of five.

**Markets:** Dental surgery clinics.

**Product:** Integrated hardware-software system for fabricating dental implants.

**Partnerships:** Marquette University School of Dentistry, Warsaw University of Technology College of Mechanical Engineering.

**Status:** Detailed market study pending resource availability.

Cooperative Programs: Cracow University of Technology

**Green (Water-Based) Hydraulics**

Dr. Andrzej Sobczak, Dr. Janusz Pobedza

<http://www.eng.mu.edu/iere/GreenHydraulics>.

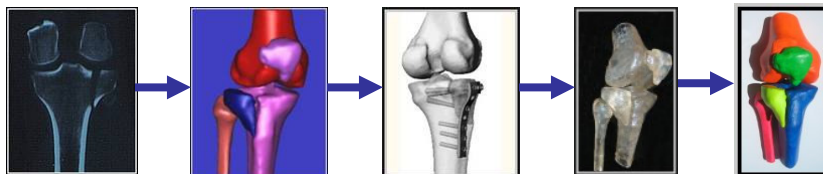


Cooperative Programs: Warsaw University of Technology

**Bone Fracture Rapid Prototyping**

Dr. Konstanty Skalski, Dr. Marek Pawlikowski

<http://www.eng.mu.edu/iere/BoneFractureModel>.



## **Engineering Management Program – Fall 2007 Projects**

<http://technologyforge.net/ENMATeamProjects/F07>

### **ENMA 282: Reliability and Design Failure Analysis**

- Nuclear Power Generation Reliability Considerations
- Natural Gas Distribution Network Reliability Considerations
- Process and Quality Sensing for Biodiesel Production Systems

### **ENMA 290: Eng. Innovation and Entrepreneurship**

- Nuclear Power Generation Technology Commercialization
- Natural Gas Usage Prediction Technology Commercialization
- Biodiesel Microbrewery System Technology Commercialization

### **Dr. Mark Polczynski**

- BS and PhD in Electrical Engineering from Marquette University.
- Twenty-seven years in industry at: Allen-Bradley, Cutler-Hammer, Square D, A.O. Smith, and Eaton Corp.
- Participated in two new company start-ups (Thor Technology, Paradigm Sensors) and one small business (irishflutes.net).
- Conducted electronic hardware and software design and product quality assurance, and supervised electronic manufacturing.
- Managed research and development groups, and facilitated new product and technology development in U.S., England, and Germany.
- Holds seven U.S. patents and one European patent.
- Entered academia in 2005: Engineering Director - Marquette University Masters of Science in Engineering Management Program.