

## Master of Engineering in Integrated MicroSystems (M. Eng. in Integrated MicroSystems)

### OVERVIEW

The Master of Engineering in Integrated MicroSystems is a 30 credit hour interdisciplinary program. The credit hours are distributed among the following areas: WIMS/ MEMS, Microfabrication Technology, Product Development and Manufacturing, Business and Management, and Interdisciplinary Teamwork. This program is designed to strengthen students' core engineering skills in a given discipline while being flexible enough to provide the opportunity to explore complementary areas. Moreover, our students will gain valuable business skills for product and process development. The interdisciplinary design team project focuses on current problems in MEMS/WIMS industry.

### BACKGROUND

The Master of Engineering in Integrated MicroSystems is being developed as part of the newly established NSF Engineering Research Center for Wireless Interated Microsystems. This interdisciplinary degree is being developed concurrently at each of the three participating institutions, Michigan State University, Michigan Technological University and the University of Michigan-Ann Arbor. The M. Eng. degree in Integrated MicroSystems would be aimed to prepare engineering students to become practitioners as professional engineers with special capabilities to understand lead science and engineering appropriate for Wireless Integrated MicroSystems/MicroElectroMechanical Systems (WIMS/MEMS) Technology and engineered systems, to understand industry procedures to design with cost and manufacturing processing the explicit factors, to contribute to multi-individual projects and sub-projects, to incorporate economic and cost factors in engineered effective leadership, manufacturing, development, management and business knowledge/acumen to lead groups and companies in a global economy.

### DEGREE OBJECTIVES

The main goal of the degree is:

*To prepare engineers to design and use MicroElectroMechanical Systems (MEMS) and Wireless Integrated MicroSystems (WIMS) for innovative applications by developing strengths in their engineering discipline, to have breath in relevant engineering and science, and to understand the complete product development and manufacturing process, including management and economic factors.*

The M. Eng. in Integrated MicroSystems is motivated by the need for technical leaders in the Wireless Integrated MicroSystems/ MicroElectroMechanical Systems (WIMS/ MEMS) areas who have depth in their own engineering disciplines, breath across engineering disciplines, knowledge of basic management issues, and the ability to lead project teams. This need has been defined through numerous discussions with industry. Further, the collaboration and the development of the degree in each of the three institutions, Michigan State, Michigan Technological University and University of Michigan-Ann Arbor correlate the development of this emerging technology. The M. Eng. in Integrated MicroSystems is a key element of that portfolio of degree programs.

### DEGREE REQUIREMENTS

The Master of Engineering in Integrated MicroSystems degree has the following requirements:

- A total of 30 credit hours of course work, of which at least 24 credit hours must be graded (not pass/fail), and at least 18 credit hours must be at the 500 level and above. A minimum grade point average of 5.0/9.0 (i.e. a B average) is also required.
- Students must take three classes in the Technical Depth Course Work – Core Courses (12 credits, graded):
  - Introduction to MEMS (EECS 414)
  - Advanced MEMS Devices and Technologies (EECS 514)

- Advanced Integrated Microsystems (EECS 515)
- Students must also take at least two Technical Breath Courses (at least 6 credits) of their choosing in the following areas:
- MEMS Materials and Processes
    - ▶ Microsystems Design (e.g. EECS 425 Integrated MicroSystems Laboratory)
    - ▶ Microelectromechanical Systems (e.g. ME 533 Microelectromechanical Systems)
    - ▶ Diamond Materials for MEMS/Sensor (e.g. ME 559 Smart Materials and Structures)
    - ▶ Bio-Materials (e.g. BiomedE 456 Tissue Mechanics, MSE 410 Design and Applications of Biomaterials)
    - ▶ Thin-Films Materials (e.g. ME 516 Mechanics of Thin-Films and Layered Materials, MSE 505 The Materials Science of Thin-Film)
  - Wireless Communications (e.g. EECS 430 Radiowave Propagation and Link Design, EECS 531 Antenna Theory and Design)
  - Optical MEMS (e.g. EECS 438 Advanced Lasers and Optics Laboratory, EECS 529 Semiconductor Lasers and LED's)
  - Biological/Chemical/Fluidics MEMS (e.g. ME 420 Fluid Mechanics II)
- Students must take at least two classes in Management/Product Development/Manufacturing Processes/Economic Factors (at least 5 credits). They must take Societal Impact Seminar and at least one class in the following areas besides the seminar: (list of acceptable courses will be available in the Program Office. Final selection of the elective courses will be approved by the Program Director)
- Societal Impact Seminar (required, EECS 830)
  - Manufacturing Design and process Integrations (e.g. EECS 568 Process Control for Microelectronics Manufacturing, ME 452 Design for Manufacturability)
  - Production and Quality Control (e.g. IOE 466 Statistical Quality Control, ME 401 Engineering Statistics for Manufacturing Systems)
  - Management and Systems (e.g. IOE 425 Manufacturing Strategies, IOE 452 Capital Budgeting)
- Students must take the Design Team Project (4-6 credits, pass/fail)

The incoming student must obtain the approval of the course advisor for the planned M. Eng. in Integrated MicroSystems degree program courses selected.

## FACULTY AND STUDENTS

The Integrated Micro Systems Program relies upon courses and faculty from various departments in the College of Engineering and other schools. Integrated MicroSystems students participate in the Manufacturing Seminar Series and work in teams on real-world problems. Faculty from various departments in engineering will also be asked to participate in providing lectures for these courses and in supervision student project teams.

## ADMISSIONS

Professionals who are employed in WIMS and related activities in the microelectronics industry, or recent graduates, may be admitted into the program, if they meet the prerequisites. Some specific admission requirements include the following:

- An undergraduate degree in engineering, chemistry, physics, biology or mathematics
- Graduate Record Examination (GRE)

## FINANCIAL AID

A limited number of fellowships are available through InterPro to those incoming students applying before February 1. Please indicate your interest in being considered for financial aid on the application form. Financial aid requests must be accompanied by GRE scores. For Teaching Assistantships apply directly to the Departments offering the courses that you are qualified to teach. For Research Assistantships apply directly to the individual faculty member with whom you would like to conduct research.

For additional information please contact:  
 Integrated MicroSystems  
 University of Michigan  
 1539 H.H. Dow  
 2300 Hayward Street  
 Ann Arbor, MI 48109-2136 (USA)  
 Phone: 734-763-0480 FAX: 734-647-0079  
 E-mail: [hek@engin.umich.edu](mailto:hek@engin.umich.edu) /  
[intermicros@engin.umich.edu](mailto:intermicros@engin.umich.edu)  
 Internet: <http://interpro.engin.umich.edu/intermicros>