WAYNE STATE UNIVERSITY

Graduate Programs in Engineering and Computer Science

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The following degree or certificate programs are offered by the various departments within the College of Engineering. Unless otherwise noted, MS programs require 32 credits and include both thesis and non-thesis options. PhD programs require 90 credits of coursework and research beyond the BS degree.

**Alternative Energy Technology:** The new Graduate Certificate program in Alternative Energy Technology (AET) is designed to provide students with specialized training to address the future of energy technologies, including fuel-cells, solar, and biodiesel, and the requirements to develop the infrastructure and systems needed for wide-spread implementation of these technologies. The Certificate requires 12 credits of coursework, including a core course in the fundamentals of AET. Students with a BS degree in any engineering field are eligible to apply. The College also plans to develop an MS program in AET in the near future.

**Biomedical Engineering:** Offering both MS and PhD programs, the Department of Biomedical Engineering is the newest department in the College of Engineering. Building upon a 65 year history of research collaboration between the School of Medicine and the College of Engineering, these new programs allow students to choose from a number of concentrations: transportation-related trauma; age-related injury and rehabilitation engineering; smart sensors and engineering neurophysiology; tissue engineering and biomaterials; and biomedical imaging. All students are required to complete a curriculum that integrates life sciences and engineering sciences. Unique laboratory courses are available to supplement classroom work. In addition, students may pursue research projects as part of a directed study course or a thesis/dissertation project. The 34 credit MS program is available for students interested in research or in a classroom-based program. Students from traditional engineering disciplines as well as the life sciences are eligible to apply.

**Chemical Engineering:** Students electing to pursue an MS or a PhD in Chemical Engineering may pursue research in specialized areas that include: polymer processing, thermodynamics, and transport properties; surface science of catalytic and polymeric materials; laser-based imaging of chemical species and reactions; environmental transport and management of hazardous waste; process design and synthesis based on waste minimization; biocatalysis in multiphase systems; bioremediation for waste treatment; tissue engineering; and pharmaco kinetics. All students complete advanced courses in transport phenomena, thermodynamics, kinetics and reactor design, and statistics or optimization, in addition to selected elective courses. Students and faculty are able to take advantage of the strong research programs in the sciences and the medical school, which create opportunities for interdisciplinary research. Students also benefit from the close ties of the department to local industry, in particular the US automobile companies and their suppliers.

**Civil and Environmental Engineering:** MSCE and PhD degrees are offered in the specialty areas of structural, transportation, geotechnical, environmental, and construction engineering. An urban focus is the common thread. The nine full-time faculty members of our department are very active professionally, and they directed externally funded research projects exceeding one million dollars in expenditures last year. All are well published and well recognized in their fields nationally and internationally. Several highly qualified professionals from local civil engineering organizations serve as adjunct faculty in our programs, contributing practitioner perspectives and advanced specialized knowledge. As the majority of students work either for local engineering companies, government agencies, or on campus, all Civil Engineering courses are offered in the evening.

**Computer Engineering:** Basic physical and mathematical principles are utilized to develop new devices and technologies in the field of computer engineering. Examples include the development of smaller, less expensive, and more powerful computers, parallel processing systems, and microprocessors. Students may pursue either an MS or a PhD in Computer Engineering, specializing in computer systems and applications. Students must select a core concentration -- general computer engineering; computer architecture and digital design; parallel and distributed systems; or machine intelligence and applications.

**Computer Science:** Offered through the College of Liberal Arts and Sciences, Computer Science graduate programs are available at the Graduate Certificate, Master’s, and Doctoral level. A Graduate Certificate in Scientific Computing allows students with at least a bachelor’s degree and a thorough understanding of computer programming to extend or upgrade their skills in scientific computing. At the Master’s level, both MA and MS programs are available. The 37-credit MA program provides students with a broad knowledge base in many areas of computer science, while the 33 credit MS degree focuses on a more concentrated cluster of topics, leading to a required master’s thesis. Coursework focuses on software development and computer architecture.

**Electrical Engineering:** The world of electrical engineering is broadening in its scope of application. There is a growing use of sophisticated data and satellite communication networks in modern telecommunications. Lasers, sophisticated control techniques, remote sensors, and transducers are employed for advanced automation and electric power systems. The application of electronics to health care and diagnostics, such as noninvasive and ultrasound imaging, and energy conversion devices, such as solar cells, creates exciting acareer opportunities. Students pursuing an MS or PhD in Electrical Engineering specialize in their choice of biomedical systems, communications and circuits, control systems, solid state devices, power systems, or optical engineering.
**Engineering Technology:** The MS program in Engineering Technology is designed to provide graduate education to ET baccalaureate degree holders and to prepare them for performing more sophisticated tasks in the technical workplace. Engineering technologists complement engineers, scientists, and technicians by forming a technological team to successfully produce an ever-increasing rate of technological advancement. The MS program requires 32 credits of course work, including 4 to 6 credits for a Master's Project that emphasizes the integration and application of knowledge to performing sophisticated tasks in practical industrial problems. Project research can be conducted at Wayne State or at an industrial site.

**Engineering Management:** The MS program in Engineering Management, offered by the Department of Industrial and Manufacturing Engineering, is designed to build both technical competence and business acumen. The program builds understanding and skills critical to the support of fast-to-market strategies, which also guarantee product quality and cost minimization. A systematic analytical framework is developed and coupled with tools for managing the engineering and technical functions within manufacturing-based companies. This cross-disciplinary program draws from the expertise of Engineering and Business and develops the engineering leader who is responsible for implementing strategies to successfully compete in the 21st century. Students must have a BS degree from an ABET accredited institution and significant experience as a practicing engineer or technical leader. This 42 credit program includes core courses in engineering and business, electives, and a capstone project that integrates lessons learned from across the curriculum.

**Hazardous Waste Management:** This program is designed for interested engineers, environmental scientists, environmental professionals, and health scientists who desire in-depth study of hazardous waste management. Students completing the MS program in HWM receive training in hazardous waste materials, law and administration, safety, toxicology, statistics, transportation, and emergency spill response and control. To be eligible for admission into the MS program, students must have completed the Graduate Certificate program in Hazardous Waste Control, offered by the Department of Occupational and Environmental Health Sciences. The MS program requires 38 credits, including the 13 credits required for the Graduate Certificate.

**Industrial Engineering:** The MS and PhD programs in Industrial Engineering provide students with the ability to function as a broadly-trained integration engineer, concerned with enabling complete systems to function effectively. At the MS level, the program is built on a core designed to provide a breadth of experience in systems modeling, analysis, and applications common in industrial engineering and operations analysis. Building upon this foundation, students construct a specialization in one of the following areas: quality management, lean operations management, or manufacturing systems. All students complete an 8 credit core program of engineering statistics and deterministic optimization before completing their specialization, which can include an 8 credit research thesis at the master's level.

**Manufacturing Engineering:** The College offers an MS program in Manufacturing Engineering with a focus on production life-cycle integration. The program is built on a core designed to provide a firm foundation in the various elements of manufacturing and systems engineering. This core program includes engineering materials, process technologies, and production systems. Building on this preparation, students select a specialization in computer integrated manufacturing, integrated product engineering, or quality engineering and may opt to complete a thesis.

**Materials Science:** The use of advanced materials in the manufacturing of durable goods and devices has presented challenges to the profession of materials science and engineering. Materials engineers apply their knowledge of material properties and molecular structure to the synthesis and processing of materials into useful products by controlling and improving their properties. Students in the MS and PhD programs can study and conduct research into the processing and rheology of polymers, computer simulation of polymeric and microporous materials, deformation and fracture of materials, the effects of processing on mechanical properties, and electronic materials and sensors. Students complete advanced course work in thermodynamics, the mechanical behavior of materials, transport phenomena, and advanced engineering mathematics, in addition to elective courses.

**Mechanical Engineering:** The challenge to a mechanical engineer may lie in the perfection and reliability of a device that will be duplicated a million-fold or in the control and optimization of a single complex system of unique design. The Mechanical Engineering MS and PhD curriculums provide students with the opportunity to concentrate in the diverse areas of acoustics, vibrations, machine tool design, biomechanics, combustion engines, automatic controls, composite materials, and fluid and solid mechanics. Each area is available to both part-time and full-time students, with research or non-research options at the Master's level. Faculty members in the Department are currently engaged in state-of-the-art research in all of these areas of specialization.

**Polymer Engineering:** Nearly every major industry has potential applications for engineering polymers. To meet the needs of modern society and to remain competitive in technology, many industries have initiated major programs to develop polymer materials. The Graduate Certificate program in Polymer Engineering is designed to meet the needs of working engineers and scientists who are seeking professional advancement in this growing field. Instruction in this program is provided by faculty from the Department of Chemical Engineering and Materials Science as well as distinguished industrial polymer scientists and engineers. The Graduate Certificate program consists of twelve credit hours of course work, including six hours of required classes in polymer science and polymer processing.
Located in the 5th largest metropolitan area in the U.S., Wayne State University is able to take advantage of the cultural and industrial resources of Detroit. Wayne State’s campus is in the heart of Detroit’s cultural district -- just blocks from the Detroit Institute of Art, the New Detroit Science Center, Orchestra Hall, the Museum of African American History, and the new homes of Detroit’s professional baseball and football teams.

The scientific and educational resources surrounding Wayne State also enhance opportunities for graduate students. The Detroit Medical Center, consisting of six hospitals immediately adjacent to Wayne State’s campus as well as several satellite hospitals, provides the School of Medicine and cooperating colleges -- including the College of Engineering and Department of Computer Science -- with unsurpassed facilities in the medical arena. The 5 libraries of the Wayne State system are supplemented by the holdings of the main branch of the Detroit Public Library, located across the street from campus. The inter-library loan facilities augment the 3,323,580 volumes and 18,643 journal subscriptions at Wayne State, many of which are now available electronically. The surrounding automotive industry, both the Big Three manufacturers and the hundreds of area suppliers, provide a real-world foundation to much of the research that is conducted in the College of Engineering.

The main Engineering Building, the Bioengineering Center, the Engineering Technology Building, and the new Manufacturing Engineering Building provide over 250,000 square feet of classroom, office, and laboratory space to the College of Engineering’s faculty and students. The Engineering Computer Center works to support the research and educational efforts of the College by providing and supporting the latest technologies in computer hardware, software, and networking. The computing facilities include the latest in simulation, analysis, and design software to support students' classroom and research efforts.

Distributed throughout the Engineering complex, the research facilities include a new Class 10 clean room in the Center for Smart Sensors and Integrated Microsystems for industrial-level manufacturing of microsensor systems; two, full-scale test sled for assessment of human response to automotive impacts; a full-scale cold room equipped for dynamic testing of engine systems in conditions as low as -40° C; atomic force and scanning electron microscopy facilities; a walk-in scale anechoic chamber for investigation of vibrations and noise, particularly in automobiles; a 2-story structures laboratory for testing multi-ton building components in many conditions, including earthquakes; a ballistics-research laboratory capable of assessing the injury biomechanics of live ammunition impacting body armor and non-lethal munitions; and full tissue culture and reactor facilities for development of tissue engineered constructs.

For Additional Information
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