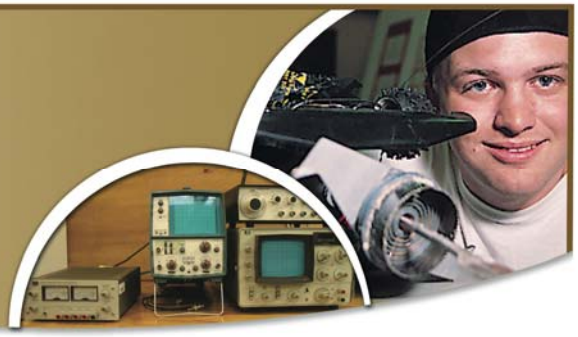
Engineering



The HMC engineering program prepares its students for the professional world and advanced study in various disciplines through broad-based, hands-on experience in engineering analysis, synthesis and practice. It's designed to produce graduates who are exceptionally competent and whose work is notable for its breadth and technical excellence, emphasizes an interdisciplinary approach to problem solving. Based on the premise that design is the distinguishing feature of engineering, it includes applied research as early as students' first year, a curriculum covering applied sciences, systems, and design and professional practice, as well as the Clinic Program—an internationally recognized model of experiential learning.

As a broad-based, hands-on experience in engineering analysis, synthesis and practice, we prepare students for professional practice, for advanced study in a specific engineering discipline, and for a lifetime of independent learning. Our graduates are fully aware of the impact of their work on society, nationally and globally. The program is based on the premise that design is the distinguishing feature of engineering. That's why we established the Clinic Program, now a nationally recognized model of experiential learning. And that's why we founded the Center for Design Education, an exceptional resource for students and faculty. The Center's workshops attract educators, researchers and designers from across the country and around the world.

Our Curriculum turns out exceptionally skilled, totally adaptable engineers, grounded in fundamental principles and sensitive to human needs. It's a general engineering curriculum; majors can emphasize a specialty by choosing their electives and their Clinic carefully, but the general idea is that the best undergraduate engineering education develops people who can do meaningful work in any field. So the curriculum is divided into three branches—applied science, systems, and design and professional practice—each offering rigorous analysis of theoretical principles and intensive hands-on experience. Courses in applied science establish a broad base of fundamental knowledge in the field; courses in systems offer a unified approach to engineering and practice in modeling, designing, and interpretation of engineering systems; and courses in design and professional practice allow students to work in teams, solving open-ended, externally-driven design projects—a process that culminates in a required three-semester Clinic experience. HMC engineering majors may spend a semester or a year in an exchange program. The curriculum is flexible enough that our majors have spent a semester or a year studying at domestic and international colleges and universities (Swarthmore College, Penn, RPI, the ESIEE in France, the University of Edinburgh in Scotland, Kogakuin University in Tokyo). Our bachelor of science degree is accredited by the Accreditation Board for Engineering and Technology.

Department Needs

The department's current infrastructure does not support the current academic program as it pertains to our experiential learning components. Specifically, our course in the art and technique of experimental investigations (E80) engages students in a field experience that requires expanded laboratory space for equipment maintenance and field support personnel. Engineering Clinic projects are becoming increasingly complex due to the multidisciplinary approach our sponsors are encouraging us to take. More projects now require shortened design periods followed by demonstrated design performance evaluations prior to client approval for manufacturing prototypes. Three major infrastructure needs are outlined as follows:

Material Testing and System Performance Facility

The department currently houses the necessary equipment for this facility, and financial support is needed for renovations of an existing space.

Rapid-Prototyping and Design Evaluation Facility

The department needs a facility to support rapid-prototyping of conceptual and preliminary designs in support of its design, clinic, and research programs. The immediate need is a laboratory space that can house 3-D printers and an environmental test chamber. The department currently has one 3-D printer and one environmental test chamber. There is a critical need for a second 3-D printer able to build larger scale models. ***Estimated Cost: $15,000 to $30,000.***

Manufacturing Facility

The department's needs in the area of manufacturing are expanding. Our ability to attract clinic projects and to deliver working designs now hinges – in large part - on our ability to manufacture. The department is developing plans to introduce design and manufacturing courses to support both common core and engineering core programs, and a study of our manufacturing needs has concluded that the college has sufficient equipment and facilities on campus. The department has a plan to renovate the current space (machinist and student spaces) that would result in expanded access and capacity to support academic programs using our existing equipment.

Renovation Funding Requirements

Engineering Classroom: The department has a plan to remodel and upgrade our classroom in Parsons 2358 and would welcome a collaborative effort in the conceptual design phases of this project. Specifically, the department would like to encourage the development of guidelines and requirements for teaching spaces in the college that could eventually result in a "standardized" set of technical and aesthetic elements for our classrooms. As it pertains to Parsons 2358, the department would entertain moving the entry and expanding the classroom, in addition to upgrading presentation and multimedia capabilities. ***Estimated cost - $35,000-$50,000***

Stockroom: The department has a plan to offer stockroom access for our students 24 hours/day, 7 days/week. The plan involves a renovation to our existing space in which the front area of the stockroom is stocked with basic (low cost) electronics and instrumentation. This is a needed upgrade due to the growing number of clinic projects requiring instrumentation and experimentation. Renovation plans include new counters and shelving for the front portion (all access for students), security cages that define the rear portion of the stockroom, and new office furniture for our stockroom staff. ***Estimated cost - $10,000***

Engineering Computing Facility: The department has a plan to improve our ability to service our students, the computing cluster, and provide a more functional and efficient work space for our students and systems administrator. Under our current agreement, the systems administrator supports both our program and CIS and the current work environment hinders our ability to respond to the growing needs on both sides. Renovation plans include new office furniture and partitions (high priority), new carpet and paint (lower priority). ***Estimated cost - $8,500***

Material Testing and System Performance Facility: The department has a plan to renovate Parsons B173 which currently houses two electromechanical material test load frames (for measuring static and dynamic material properties), a microforce test system (for evaluating new product and component designs), a large seismic shaker table (for the conduct of model and prototype dynamic testing below 100Hz), and a small frictionless slip table (for smaller scale testing below 100Hz) in a new Material Testing and System Performance Facility. These systems provide test and performance capabilities that span system performance and component evaluation needs for our core course in Materials Science, Clinic, and research programs. Renovation plans include installing entry door windows, interior paint, signage describing test station safety and point of contact information, and upgraded lighting. ***Estimated cost - $12,000***

Engineering Machine Shop:

(1) AgieCharmilles or Mitsubishi Wire EDM;
http://us.gfac.com/products/edm/wire.cfm
http://www.mitsubishi-world.com/index.php?option=com_content&task=view&id=72&Itemid=233
(2) AgieCharmilles or Mitsubishi Sinker EDM
(3) Mitsui Semi-Automatic Precision Grinder; http://www.mitsuihightec.com/msg-250h1.htm
(4) Waterjet or Laser Cutting Machine
(5) Miller Tig Welder; http://www.millerwelds.com/products/tig/dynasty_350/
(6) Miller Spot Welder; http://www.millerwelds.com/products/spotwelders/ssw_series__water-cooled_/
(7) Coordinate Measuring Machine; http://brownandsharpe.com/one
(8) Universal Tool & Cutter Grinder
(9) Hydraulic Tubing Bender with Dies