The University of Michigan Master of Engineering Template and Aerospace Engineering Related Programs

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Abstract

The College of Engineering at the University of Michigan now offers Master of Engineering degree programs under its own authority in addition to the graduate degrees offered by the College through the University's School of Graduate Studies. All such programs must conform to a particular template which is designed to ensure an amount of breadth across departmental and college boundaries and participation in a team project. The Department of Aerospace Engineering offers a Master of Engineering degree under its jurisdiction and is a partner with other departments in the College in three other programs. The Master of Engineering template and the four degree programs are briefly described.

Master of Engineering Template

The approval of a Master of Engineering Degree had to be sought at the State level through the State Council of University Presidents. This is a voluntary agreement aimed at avoiding unnecessary duplication of programs. The proposal had to define the nature and purpose of the degree program and justify the existence of still another graduate degree. To this end a template, or a set of guidelines, was developed which distinguished this degree from others already being offered and which also spoke to the need for the program. So that maximum flexibility was still available to the College the template contained rather broad guidelines as follows:

1. Depth in an engineering discipline (6 credit hours minimum).
Generally interpreted as a continuation at higher level of a disciplinary focus of the undergraduate program.

2. Breadth in engineering (6 credit hours minimum). Generally interpreted as engineering courses outside the disciplinary focus.

3 Breadth outside engineering (6 credit hours minimum). Recommended subject areas include business, law, economics, foreign languages and culture.

4. Team project (6 credit hours minimum). Must be industry relevant and preferably with major industry involvement.

5. Other as designated by the program (6 credit hours minimum).

Twenty four of the 30 credit hours must be graded, that is, not pass/fail, and at least 18 credit hours must be 500 level courses or higher. (500 level course are populated primarily by graduate students.)

Master of Engineering in Aerospace Engineering

The Master of Engineering in Aerospace Engineering degree is a graduate professional degree which provides breadth as well as depth in aerospace engineering and related areas, including non technical fields. It is administered by the Department of Aerospace Engineering.

The main goals of this degree are to: (1) To enhance the technical competence and depth of understanding in applied areas of gasdynamics, dynamics and control, structural mechanics, and engineering design; (2) To broaden this experience to include a wider range of application areas; (3) To develop a wider understanding of industrial and business practices and/or to enhance advanced language and cultural studies; and (4) To provide experience in team organization and project development and management.

Course elections consistent with the master template are arranged in the following categories:

1. Depth in aerospace engineering disciplines (9 credit hours):
Three courses in Aerospace Engineering.

2. Breadth across engineering disciplines (6 credit hours): Two courses outside Aerospace Engineering but in engineering (Typically, mechanical engineering, applied mechanics, electrical engineering, industrial and operations engineering, and materials science engineering).

3. Breadth beyond typical engineering disciplines (6 credit hours):
Two courses required. (Typically, mathematics, statistics, computer science, business and management, economics, advanced foreign language; also industrial and operations engineering or other engineering courses that emphasize business or management related subject areas.)

4. Team project experience (6 credit hours): One seminar course (1-3 credit hours), project courses (3-5 credit hours).

5. Other (3 credit hours): One course in any of the above categories.

A baccalaureate degree in engineering or related science is required for admission. Admission requirements and standards will be similar to those for the Master of Science in Engineering in Aerospace Engineering degree; however, relevant work experience will be given added weight for those with substantial work experience. The students may select options in various technical areas appropriate to their interests and backgrounds. Available options include computer aided design and manufacturing, materials and structures, applied aerodynamics, applied propulsion, and control system design. Other options can be prepared to fit individual cases.

Master of Engineering in Space Systems

The Master of Engineering in Space Systems degree is a graduate professional degree which provides a broad interdisciplinary education in the scientific, engineering, and management aspects of complex space systems. It is administered jointly by the Department of Aerospace Engineering and the Department of Atmospheric, Oceanic and Space Sciences.

The main goals of the M. Eng. in Space Systems degree are: (1) To provide a comprehensive knowledge of space science and engineering and their interrelationship; (2) To increase depth beyond the baccalaureate level in a space-related discipline; (3) To teach the systems approach to conceiving, designing, manufacturing, managing, and operating complex space systems; (4) To provide practical experience in space system design, project development, and management.

Course elections consistent with the master template are arranged in the following categories:

1. Depth in student's main discipline area (9 credit hours). Three courses relevant to space systems which add depth to primary disciplines in the undergraduate degree program. For example, an electrical engineering undergraduate would add graduate courses in control systems, communications, or computers, etc., while a aerospace engineering major would add structures, propulsion, or control systems, etc. Likewise, a science student (AOSS, physics, etc.) would seek additional depth in space science subjects.

2. Breadth by crossing engineering/science disciplinary boundaries (9 credit hours). Three courses relevant to space systems which add breadth to student's understanding of space systems. Students from engineering in category 1 would take courses in space science, while students from science in category 1 would take engineering courses.

3. Systems engineering, management, and operations. (6 credit hours).
Two courses which develop the systems approach to conceiving, designing, manufacturing, managing, and operating complex space systems.

4. Team project experience (6 credit hours). Two courses with project focus in space systems design. Projects would be chosen with industry and/or government involvement.

Graduates of baccalaureate programs in engineering and physical science are invited to apply. The undergraduate academic record and relevant work experience will be used in determining admission. A program of study will be designed for each student admitted to the program that accommodates different backgrounds while ensuring a high level of knowledge and competence.

Master of Engineering in Manufacturing

The Master of Engineering in Manufacturing degree is a graduate professional degree which provides a broad understanding of the tools of manufacturing and the manufacturing process. It is an interdepartmental program administered by the Director of the Program in Manufacturing and the Manufacturing Council consisting of representatives from the seven participating departments: Departments of Aerospace Engineering, Civil and Environmental Engineering, Chemical Engineering, Industrial and Operations engineering, Materials Science Engineering, Mechanical Engineering and Applied Mechanics, and Naval Architecture and Marine Engineering.

The main goal of the M. Eng. in Manufacturing is to prepare engineers to improve the quality and efficiency of manufacturing system by giving them advanced skills in their engineering discipline, breadth across engineering discipline and an understanding of the complete product development and manufacturing process, including management.

Course elections consistent with the master template are arranged in the following categories:

1. Manufacturing engineering core (9 credit hours). One course in each of the following areas: Manufacturing design/process integration; manufacturing processes and production; quality control.

2. Management and system core (9 credit hours). Three classes in some combination of organizational behavior, accounting and finance, marketing and strategy.

3. Engineering discipline (6 credit hours). Two manufacturing related course in their engineering discipline.

4. Manufacturing seminar and internship/project (6 credit hours).

Graduates of baccalaureate programs in engineering who have had at least two years of industrial experience are invited to apply. The undergraduate academic record and relevant work experience will be used in determining admission. A program of study will be designed for each student admitted to the program that accommodates different backgrounds while ensuring a high level of knowledge and competence at the end of the program.

Master of Engineering in Transportation

An interdepartmental Master of Engineering in Transportation has been approved. It will be administered by a Transportation Council with participation by several departments similar is many ways to the Master of Engineering in Manufacturing. Details are not available at this writing; however, they will be presented at the Annual Conference.