Graduate Programs

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Programs of Study/Specializations Available

Aerospace Engineering– MS (see page 170)
with Specializations in:
Research
Space Systems Engineering

Biomedical Engineering – MS, see page 175

Civil and Environmental Engineering – MS, see page 181

Computer Science – MS, see page 190

Electrical Engineering – MS, see page 194

Engineering – MS with Specializations in:
Biochemical Engineering
Bioengineering
Biomedical Engineering
Integrated Technology Management
Materials Engineering
Water Engineering

Fire Protection Engineering – MS

Industrial Engineering – MS, see page 199

Mechanical Engineering – MS, see page 205

Blended BS+MS Programs

Joint Programs:

Engineering Management Specialization, MBA/MS Engineering, see page 166

Transportation Planning Specialization, MCRP/MS Engineering, see page 166

Graduate Certificate Programs:

Fire Protection Engineering Applications

Fire Protection Engineering Science

Master of Science in Engineering

MS Engineering

General Characteristics

The Master of Science degree program in Engineering has the following objectives:

- Provide an empowering terminal professional degree for students who intend to become practicing engineers, retaining the strong laboratory emphasis and industrial interaction found in the BS curriculum.
- Provide preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.
- Provide job-entry education for the more complex and evolving interdisciplinary areas of engineering, such as research and development, innovative design, systems analysis and design, bio-engineering, biomedical engineering, manufacturing, mechatronics, and engineering management.
- Update and upgrade opportunities for practicing engineers.
- Allow graduates to maintain currency in their fields.

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted. Some programs impose higher GPA requirements. Applicants for most graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets program standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Contact the individual program graduate coordinator for details.

Program of Study

Each graduate student must prepare a formal study plan with his or her advisor early in the program, usually before the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Bioengineering, Biomedical Engineering, Integrated Technology Management, Materials Engineering, Water Engineering, or another individualized course of study.

Requirements

The broad curriculum requirements for the Master of Science degree in Engineering are:

a) a number of required units in the field of specialization, in many cases supplemented by analytical and technical breadth requirements;

b) additional units taken as advisor-approved electives;

c) at least 23 units of the 45 unit program at the 500 level;

d) at least 32 units taken "in residence."

In some specializations, two culminating requirement options are available: a thesis/project option, which requires coursework and an up-to-9 unit thesis or project with oral defense; or a non-thesis/project option, which involves additional coursework and a comprehensive examination. The non-thesis option is normally allowed only for students who have completed a senior project or have had significant prior engineering project experience.

Blended BS + MS Engineering Program

The blended program provides motivated students with an accelerated route to the MS Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility for Blended BS+MS Engineering
Students majoring in BS General Engineering, BS Computer Engineering, BS Manufacturing Engineering, and BS Materials Engineering may be eligible to pursue the blended program toward the MS Engineering with a specialization in Biochemical Engineering, Bioengineering, Biomedical Engineering, Materials Engineering, or Integrated Technology Management. They may also be able to pursue blended programs incorporating other MS degrees or specializations in the College of Engineering.

In addition, students in departments with their own master's degrees may be able to pursue masters degrees in other areas, or the MS Engineering degree via the blended program, based on agreements between their bachelors granting program and their target masters program.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee, chosen on the basis of the student's area of interest. Please see page 60 for eligibility criteria.

Program of Study
Some programs allow students to complete a capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in students' professional programs.

The blended program may allow students to earn graduate credit for several senior electives, effectively decreasing the summed unit requirements for both degrees. Requirements concerning shared units vary by degree program. Contact the program graduate coordinator for details.

Other Blended Programs
Blended BS+MS programs are also available in Aerospace Engineering, Biomedical Engineering, Civil and Environmental Engineering, Computer Science, Electrical Engineering, Industrial Engineering, and Mechanical Engineering. Additional information about these programs may be obtained from the individual departments.

MS Engineering, Specialization in BIOCHEMICAL ENGINEERING

	Units
Required Courses	37
Analytical methods for engineering (6)	
Advanced mathematics (3)	
ENGR 599 Design Project (Thesis) (2) (2) (5) *or* 9 units of approved technical electives *and* written comprehensive examination	
Select 19 units from the following:	
ME 541 Advanced Thermodynamics (4)	
ME 552 Advanced Heat Transfer I (4)	
ME 553 Advanced Heat Transfer II (4)	
ENVE 421 Mass Transfer Operations (4)	
ENGR 581, 582, 583 Biochemical Engr (4,4,4)	
Approved Electives	8
	45

MS Engineering, Specialization in BIOENGINEERING

	Units
Required Courses	33
ENGR 551 Advanced Topics in Bioengineering (4)	
MATE 530 Biomaterials (4)	
ENGR 581 Biochemical Engineering I (4)	
ENGR 599 Design Project (Thesis) (9)	
Select 12 units from the following:	
BIO 432	
CSC 471, 473, 474, 541	
ENGR 451, 582	
ENVE 443, 536	
IME 507	
MATE 425, 501	
ME 401, 504, 551, 552, 553, 554	
STAT 419, 512, 542	
Approved Engineering Electives	12
	45

MS Engineering, Specialization in BIOMEDICAL ENGINEERING

	Units
Required Courses	27
BMED 450 Special Topics in Bioengineering (4)	
BMED 460 Engineering Physiology (4)	
BMED 530 Biomaterials (4)	
BMED 550 Advanced Topics in Bioengineering (4)	
BMED 563 Biomedical Engineering Graduate Seminar (2)	
BMED 599 Design Project (Thesis) (9) (BMED 591/592 substitute for 2 or 4 units of BMED 599)	
Approved Engineering, Science and Mathematics Electives	18
	45

MS Engineering, Specialization in INTEGRATED TECHNOLOGY MANAGEMENT

The program goal is to develop "industry ready" graduates who will be integrators of engineering disciplines, industry concerns, and technology management. Many of the program courses involve actual integrated problems or opportunities from industrial organizations in a collaborative learning environment.

	Units
Required Courses	29/30
IME 417 Supply Chain/Logistics Management (4) *or* IME 430 Quality Engineering (4)	
IME 503 Applied Stat. Analysis for Engineers (4)	
IME 507 Graduate Seminar (2)(2)	
IME 556 Technological Project Management (4)	
IME 580 Manufacturing Systems (4)	
IME 596 Team Project/Internship (10) *or* IME 599 Design Project/Thesis (9)	
Approved Electives	16/15
	45

MS Engineering, Specialization in MATERIALS ENGINEERING

	Units
Required Courses	24
MATE 599 Design Project (Thesis) (2) (2) (5)	
Select 15 units from the following:	
MATE 425, 430, 440, 481, 501, 504, 510, 522, 540, 550, 555, 570, 571, 580, 590;	
MATE/BMED 530;	
MATE/CHEM 446;	
MATE/IME 458	
Approved Electives	21
	45

MS Engineering, Specialization in WATER ENGINEERING

	Units
Required Courses	35
Analytical methods for engineering (6)	
ECON 410 Public Finance/Cost-Benefit Analysis (4)	
BRAE 414 Irrigation Engineering (4)	
BRAE 532 Water Wells and Pumps (4)	
BRAE 533 Irrigation Project Design (4)	
CE 533 Adv Water Resources Engineering (4)	
BRAE/CE 599 Design Project (Thesis) (2) (2) (5) *or* 9 units of approved technical electives *and* written comprehensive examination	
Approved Elective Courses	10
Select 10 units from the following:	
BRAE 405, 435, 440;	
CE 434, 435, 440, 573;	
ENVE 438, 439, 535	
	45