

Mechanical Engineering

CHAIR

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Professor
Fracture mechanics, mechanics of solids, finite elements, composites

PROFESSORS

Muniswamappa Anjanappa
Controls, flexible manufacturing, mechatronics

Akhtar S. Khan
Experimental plasticity, fracture mechanics, dynamic behavior of materials, metal forming

Uri Tasch
Manufacturing, controls, robotics

Tim Topoleski
Biomechanics, biomaterials, fracture mechanics

ADJUNCT PROFESSOR

Christian von Kerczek
Theoretical and computational thermo/fluid mechanics

ASSOCIATE PROFESSORS

Dwayne Arola
Manufacturing, advanced engineering materials

Tony Farquhar
Biomechanics, composites, mechanical design

Charles Eggleton
Biomechanics, computational fluid mechanics

Liang Zhu
Biomechanics and heat transfer

Weidong Zhu
Dynamics and vibrations of machinery

ASSISTANT PROFESSORS

Marc Zupan
Materials, mechanics, MEMS, micro- and nanotechnologies

Anne Spence
Engineering education

Ronghui Ma
Heat transfer, fluid mechanics, MEMS

Dawn Bennett
Fluid mechanics, thermodynamics, micro-fluidics, MEMS

Courses in this program are listed under ENME.

Mechanical engineering focuses on the design and production of energy-producing systems and on mechanical devices or mechanisms. These systems and mechanisms are applied to fields ranging from biology, such as artificial hearts, to transport systems, such as cars and airplanes, and in manufacturing tools and plants. The mechanical engineering curriculum at UMBC, accredited by the Accreditation Board for Engineering and Technology (ABET), provides students thorough training in mathematics, physical sciences, engineering sciences

and engineering design. Mechanical engineering students also gain a broad education by completing a cross section of courses in the arts and humanities, social sciences, and language and culture in accordance with university General Foundation Requirements (GFR).

The ABET educational objectives of the undergraduate program in mechanical engineering are:

1) Our graduates will possess the technical skills and knowledge necessary to

practice mechanical engineering successfully.

2) Our graduates will be able to pursue graduate and/or professional education in mechanical engineering.

3) Our graduates will be informed and active and contributing citizens of the world at large, their nation, and, in particular, their community.

There are several ways for students to progress through the mechanical engineering program. A traditional four-year timetable (outlined below) provides the quickest path to completing the degree. Many students combine their mechanical engineering program with part-time work or community service. UMBC's Shriver Center helps students develop various ways to accomplish their goals.

Students may opt for part-time employment or internships. The Shriver Center also works with students to develop service internships outside of mechanical engineering, such as tutoring disadvantaged children.

The mechanical engineering department works closely with the Shriver Center to enable students to accomplish both their mechanical engineering education, as well as their service and experience objectives.

It is also possible and quite desirable to combine a mechanical engineering major with a second major, such as mathematics, physics, geography or various other fields. The undergraduate advisor in mechanical engineering helps students to arrange their course work to achieve such educational goals.

Career and Academic Paths

Recent graduates of UMBC's mechanical engineering program have secured starting engineering positions in both large and small firms, as well as in government laboratories. Some large firms that employ

UMBC graduates are BGE, Northrop Grumman Corporation, Black & Decker, Ford Motor Co. and Toyota of North America. Other graduates have secured professional positions in government laboratories, including the National Institute of Standards and Technology, the Naval Surface Weapons Center, the U.S. Army Aberdeen Proving Ground and NASA's Goddard Space Flight Center. The heating, ventilation and air conditioning industry is also a large employer of mechanical engineers. Many UMBC mechanical engineering graduates are pursuing both M.S. and Ph.D. degrees at major universities such as The Johns Hopkins University; University of California, Berkeley, Stanford University, Massachusetts Institute of Technology; Michigan State University, University of Cincinnati; University of Maryland, College Park; as well as UMBC. Many graduates working in nearby industries pursue part-time graduate work in mechanical engineering or engineering management at UMBC.

Academic Advising

Mechanical engineering students obtain academic advising in two stages. Students at the freshman and sophomore level (determined by the level of engineering courses taken and passed, not by the total number of credit hours taken) are advised by the Undergraduate Student Services in the College of Engineering and Information Technology.

When a student advances to the junior level, a mechanical engineering faculty member is assigned as a permanent advisor who takes over the formal academic advising. Students must meet with their faculty advisor at least once per semester to prepare pre-registration requirements for the following semester. At this time, the faculty advisor helps the student review his or her academic status and plan for an efficient continuation of the student's program.

The overall advising activity is supervised by the mechanical engineering undergraduate coordinator. The coordinator also grants all special permits that allow students to deviate from normal procedures.

Such permits are required for acceptance of transfer credits for engineering courses, permits to take courses at University of Maryland, College Park and many other items. The undergraduate coordinator or department chair has the final authority in granting such permits.

Admissions Requirements

Applicants who meet the admission requirements to the university and are prepared, by virtue of their high school background and placement tests, to enroll in ENGL 100, MATH 151, ENES 101 and CHEM 101 may designate mechanical engineering as their intended major. Students are admitted to mechanical engineering when they have passed all four of these courses with a minimum grade of "C" and an overall GPA of 2.5 or higher for all four courses. Students are not allowed to take any other engineering courses until this requirement is fulfilled.

Transfer students will be admitted into mechanical engineering upon completion of 28 transferable credit hours with a minimum GPA of 2.5 in the core courses equivalent to ENGL 100, ENES 101, MATH 151, CHEM 101, and all physics, chemistry, mathematics and engineering courses that are included for transfer credit.

Past experience has shown that for students to pursue an engineering education successfully immediately upon graduation from high school, they should have taken three years of high school mathematics, including algebra, geometry and trigonometry; one year of physics; and one year of chemistry. Students also should have obtained an

SAT score of 1200, with a minimum of 600 on the quantitative test.

Program Regulations

1. The mechanical engineering department publishes the *Mechanical Engineering Undergraduate Handbook*, which details the regulations, policies and opportunities in the department. The responsibility for proper registration and for satisfying stated prerequisites for any course must rest with the student, as does the responsibility for proper achievement in courses in which the student is enrolled. Each student is responsible for being thoroughly familiar with the provisions of *the University Undergraduate Catalog* and *Handbook*, including all the academic regulations.
2. Required courses in mathematics, physics and chemistry have highest priority, and it is strongly recommended that every engineering student registers for mathematics, chemistry, and physics each semester until he or she has satisfied these requirements.
3. To be eligible for a bachelor's degree in Mechanical Engineering, a student must have an overall average of at least a "C" (2.0) and a grade of "C" or better in all courses. Responsibility for knowing and meeting all degree requirements for graduation in any curriculum rests with the student.
4. To earn a B.S. in Mechanical Engineering from UMBC, a minimum of 24 credits of ENME courses must be taken and passed, each with a minimum grade of "C" at UMBC.

General Foundation Requirements

Engineering students graduating from UMBC must satisfy 28 credits of General Foundation Requirements. The distribution of these 28 credits among arts and humanities, social sciences, and language

and culture courses, are enumerated in the Undergraduate Catalog. In addition to these regulations, as part of their 28 GFR credits, mechanical engineering students are required to have at least one course in the arts and humanities sequence and one course in the social sciences sequence at the 200 level or above. Furthermore, one course in the arts and humanities sequence must be PHIL 251: Ethical Issues in Science, Engineering, and Information Technology.

Major Program

The freshman year in engineering is designed to lay a strong foundation in mathematics, physical sciences and the engineering sciences upon which the student later will develop a professional program during the sophomore, junior and senior years.

Students applying for admission to UMBC should take the mathematics placement test early enough so, if necessary, MATH 150: Pre-calculus Mathematics could be taken in the summer preceding the first regular semester. The placement test is administered by the Learning Resources Center, and students should make arrangements with them for the test. The test measures the student's preparation for MATH 151: Calculus and Analytic Geometry.

Students who are not prepared to schedule MATH 151 are advised to schedule MATH 150 in the summer session before the fall (first) semester.

At the beginning of the sophomore year, the student selects a primary field of engineering specialty. At UMBC, courses through the senior year are available in chemical and mechanical engineering and computer engineering.

Basic Freshman Curriculum

	Semester	
	I	II
General Foundation Requirements	3	-
ENGL 100: Composition	3	-
CHEM 101: Principles of Chemistry I	4	-
CHEM 102: Principles of Chemistry II	-	3
CHEM 102L: Introductory Chemistry Lab I	-	2
PHYS 121: Introductory Physics I	-	4
MATH 151, 152: Calculus and Analytic Geometry I, II	4	4
ENES 101, 110: Introductory Engineering Science, Statics	3	3
	17	16

Semester I II

Sophomore Year

	Semester	
	I	II
General Foundation Requirements		
Engineering Ethics and one other GFR	3	3
MATH 251: Multivariable Calculus	4	-
STAT 355: Statistics for Scientists and Engineers	4	-
MATH 225: Intro. to Differential Equations	-	3
PHYS 122: Intro. to Physics II	4	-
ENES 220: Mechanics of Materials	3	-
ENES 221: Engineering Dynamics	-	3
ENME 204: Intro. to Engineering Design	-	3
ENME 217: Engineering Thermodynamics	-	3
	18	15

Semester I II

Junior Year

	Semester	
	I	II
General Foundation Requirements	-	3
ENGL 393: Technical Writing	3	-
ENEE 302/CMPE 306: Principles of Electrical Engineering	4	-
ENME 303: Computer Programming	3	-
ENME 301: Structure and Properties of Engineering Materials	3	-
ENME 320: Fluid Mechanics	3	-
ENME 304: Machine Design	-	3
ENME 321: Transfer Processes	-	3
ENME 360: Vibrations	-	3
ENME 332L: Mechanics of Deformable Solids Lab	-	3
	16	15

Semester I II

Senior Year

	Semester	
	I	II
General Foundation Requirements	6	7*
ENME 432L: Fluids/Energy Lab	2	-
ENME 403: Automatic Controls	3	-
ENME 444: Mechanical Engineering System Design	-	3
Science or technical elective	3	-
Technical elective	3	3
ENME 482L: Vibrations and Controls Lab	-	2
	17	15

*GFR must include language 201 requirements, which carry four credit hours.

The science elective can be selected from any course, at the 300 level or higher, in biology, computer science, mathematics, physics, chemistry or any engineering field except mechanical engineering. Under certain circumstances, a science course at the 200 level may be used as this elective. Written approval must be obtained from the undergraduate coordinator before taking the science course toward the degree requirements. A mechanical engineering elective at the 400 level or above may be substituted for the science elective. The other technical electives must be 400-level mechanical engineering courses, one of which must be a design course.

Combined B.S./M.S. Program

This combined program is designed for completion in five years. Students are encouraged to plan on such an effort from the start. See the *Mechanical Engineering Undergraduate Handbook* for more information.

Special Opportunities

The mechanical engineering faculty strives to make research opportunities available to undergraduate students at any level. Many students are involved in research projects with faculty advisors. Such activities are particularly valuable and effective for students who aim to pursue their bachelor's and master's degrees in the combined B.S./M.S. program offered by the department.

Student Organizations

The mechanical engineering department offers various extracurricular activities to enhance students' professional development. Students may participate in student chapters of major professional organizations such as the American Society of Mechanical Engineers (ASME); the Society of Automotive Engineers (SAE); the American Society of Heat-

ing, Refrigeration and Air Conditioning Engineers (ASHRAE); the National Society of Black Engineers (NSBE); and the Society of Women Engineers (SWE). There is also a chapter of Tau Beta Pi, the national engineering honor society.

Other notable activities include technical competitive activities such as the Mini-Baja all-terrain vehicle competition and the Solar Splash solar-powered boat race.