

# MECHANICAL ENGINEERING, BSE

Mechanical engineering is one of the most general engineering fields. The engineer has the freedom to deal with virtually any aspect of the multi-faceted engineering process such as design, development, analysis, production and testing. The broad nature of the field also provides opportunities to work in various areas of interest ranging from energy conversion or environmental control to the production of transportation and construction equipment.

## Concentrations

- General mechanical engineering
- Thermal sciences
- Mechanical systems

## Research

Work with faculty engaged in leading-edge research in areas such as:

- Design optimization
- Nanotribology
- Technology innovation and entrepreneurship
- Sustainable design and manufacturing
- Marine robotics
- Biomimetic surfaces

## Career Paths

Materials engineers work primarily in engineering services, research and development, manufacturing and the federal government.

- Senior Mechanical Engineer
- Propulsion Engineer
- Process Engineer
- Mechanical Design Engineer
- Product Development Engineer
- Aerospace Structural Engineer

## Accreditation

The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET: <https://www.abet.org> (<https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.abet.org%2F&data=02%7C01%7Cebilicki%40uwm.edu%7C6375ad43fb2946154ce608d868a20d99%7C0bca7ac3fcb64efd89eb6de97603cf21%7C0%7C0%7C637374392516676446&sdata=HQcRF1xSAppdPYk%2BKroP652KILn3Fk6XJrFPgVVI7xDU%3D&reserved=0>).

## New Freshmen

Admission to the College of Engineering and Applied Science is based on an overall assessment of both academic and non-academic qualifications. The primary review factors for admission are the strength and quality of the high school curriculum, high school class percentile, grade point average, and the result of the ACT or SAT. Well-prepared freshman applicants will have four years of mathematics (including one-and-a-half years of algebra, one year of geometry, and one-half year of trigonometry) and four years of natural science (including biology, chemistry, and physics). The College also will consider non-academic qualifications such as leadership skills, diversity in personal background, work experience, motivation, and maturity.

Freshmen applicants will be considered for admission directly to the major or to intended status (Engineering-Intended or Computer Science-Intended). Admission directly to the major is selective.

## Transfer Students

Transfer student admission is based on an overall assessment of both academic and non-academic qualifications. For transfer applicants, the primary factors considered for admission are the grade point average on transferable courses and the level of curriculum completion. The College also will consider non-academic qualifications such as leadership skills, diversity in personal background, work experience, motivation, and maturity.

Transfer applicants will be considered for admission directly to the major or to intended status (Engineering-Intended or Computer Science-Intended).

## Admission to the Major

Students admitted to Engineering-Intended or Computer Science-Intended may apply for major status with their academic advisor at the time they believe they meet the requirements. The program may impose major status as a prerequisite for courses numbered 200 or above.

1. Complete first semester calculus with a C or better grade.
2. Complete GER Oral and Written Communication Part A.
3. Engineering majors must complete Chem 100 with a C or better grade (or satisfactory score on the placement test). Computer Science majors must complete CompSci 251 with a C or better grade.
4. Obtain a minimum grade point as set by the major department. A 3.00 GPA guarantees admission to any CEAS major.
5. Courses required by the major may be repeated only once. No more than two courses may be repeated.

Questions on admission to CEAS or choosing a major should be directed to the Office of Student Services, (414) 229-4667.

## Mechanical Engineering Curriculum

The minimum number of credits required to complete the Bachelor of Science in Engineering with a major in Mechanical Engineering is 128. Engineering students may apply for major status with their academic advisor at any time they believe they meet the requirements. Advancement to major is a graduation requirement. Programs may impose major status as a prerequisite for courses numbered 200 or above.

Code	Title	Credits
<b>Engineering Core</b>		
CIV ENG 201	Statics	3
CIV ENG 202	Dynamics	3
CIV ENG 303	Strength of Materials	4
EAS 200	Professional Seminar	1
ELECENG 301	Electrical Circuits I	3
MATLENG 201	Engineering Materials	4
MECHENG 101	Computational Tools for Engineers	2
MECHENG 110	Engineering Fundamentals I	4
MECHENG 111	Engineering Fundamentals II	4
MECHENG 301	Basic Engineering Thermodynamics	3
MECHENG 320	Introduction to Fluid Mechanics	3

## Major Requirements

MECHENG 321	Basic Heat Transfer	4
IND ENG 367	Introductory Statistics for Physical Sciences and Engineering Students	3
MATLENG 330	Materials and Processes in Manufacturing	3
MECHENG 323	Introduction to Fluid Mechanics	1
MECHENG 360	Mechanical Design I	3
MECHENG 366	Design of Machine Elements	4
MECHENG 370		2
MECHENG 438	Mechanical Engineering Experimentation	3
MECHENG 474	Introduction to Control Systems	4
MECHENG 479	Advanced Mechatronics	3
MECHENG 405 or MECHENG 496	Product Realization Senior Design Project	3

**Mathematics Requirement**<sup>1</sup>

MATH 231	Calculus and Analytic Geometry I	4
MATH 232	Calculus and Analytic Geometry II	4
MATH 233	Calculus and Analytic Geometry III	4
ELECENG 234	Analytical Methods in Engineering	4

**Chemistry Requirement**

Select one of the following: 5-10

CHEM 105	General Chemistry for Engineering (Suggested)	
CHEM 102 & CHEM 104	General Chemistry and General Chemistry and Qualitative Analysis	

**Physics Requirement**

PHYSICS 209 & PHYSICS 214	Physics I (Calculus Treatment) and Lab Physics I (Calculus Treatment)	5
PHYSICS 210 & PHYSICS 215	Physics II (Calculus Treatment) and Lab Physics II (Calculus Treatment)	5

**GER Distribution Requirement**

Arts		3
Humanities		3
Social Science		6
ENGLISH 310	Writing, Speaking, and Technoscience in the 21st Century	3

Cultural Diversity - Arts, Humanities, or Social Science course must also satisfy UWM Cultural Diversity Requirement

**English Composition Requirement**

Satisfied by one of the following: 0-6

Earning a satisfactory score on the English placement test or other appropriate test, as determined by the English Department; or

Earning a grade of C or higher in ENGLISH 102; or

Transferring a grade of C or higher in a course equivalent to ENGLISH 102 or higher expository writing course; or

**Foreign Language Requirement**

Satisfied by one of the following: 0-8

Two years of a single foreign language in high school; or

Two semesters of a single foreign language in college; or

Demonstrate ability by examination.

<sup>1</sup> MATH 221, MATH 222 and two free elective credits may substitute for MATH 231, MATH 232 and MATH 233.

## Technical Electives

Select a minimum of 15 credits of technical electives from Groups A, B, and C as indicated below.

Code	Title	Credits
<b>Group A Technical Electives</b>		
Select at least 6 credits from the following:		6-9
MECHENG 402	Thermo-Fluid Engineering	
MECHENG 420	Intermediate Fluid Mechanics	
MECHENG 462	Intermediate Design of Machinery	
MECHENG 463	Introduction to Finite Elements	
MECHENG 475	Vibrations in Mechanical Design	
<b>Group B Technical Electives</b>		
Select at least 6 credits from the following:		6-9
CIV ENG 401	Intermediate Strength of Materials	
IND ENG 455	Operations Research I	
MATH 413	Introduction to Numerical Analysis	
MATH 601	Advanced Engineering Mathematics I	
MATLENG 380	Engineering Basis for Materials Selection	
MATLENG 410	Mechanical Behavior of Materials	
MECHENG 405	Product Realization <sup>1</sup>	
MECHENG 411	Heat Transfer	
MECHENG 415	Modern Thermomanufacturing Processes	
MECHENG 423	Applied Fluid Mechanics	
MECHENG 425	Aerodynamics of Wind Turbines	
MECHENG 430	Energy Modeling	
MECHENG 432	Internal Combustion Engines	
MECHENG 434	Air Conditioning System Design	
MECHENG 435	Power Plant Theory and Design	
MECHENG 436	Solar Engineering	
MECHENG 455	Processing of Plastics	
MECHENG 456	Metal Casting Engineering	
MECHENG 457	Engineering Composites	
MECHENG 460	Nanomaterials and Nanomanufacturing	
MECHENG 465	Friction and Wear	
MECHENG 466	Mechanics of Composite Materials	
MECHENG 469	Introduction to Biomechanical Engineering	
MECHENG 472	Introduction to Wind Energy	
MECHENG 476	Introduction to Robotics	
MECHENG 490	Topics in Mechanical Engineering:	
MECHENG 574	Intermediate Control Systems	
MECHENG 584	Biodynamics of Human Motion	
MECHENG 699	Independent Study <sup>2</sup>	
<b>Group C Technical Electives</b>		
Select up to 3 credits from the following:		0-3
BUS ADM 447	Entrepreneurship	
EAS 1	Engineering Co-op Work Period <sup>3</sup>	

EAS 497	Study Abroad:
IND ENG 360	Engineering Economic Analysis
MECHENG 490	Topics in Mechanical Engineering:
MECHENG 542	Introduction to Technology Entrepreneurship
MECHENG 543	Introduction to Technology Management and Innovation
MECHENG 544	New Product Development
MECHENG 546	Global Innovation Management
MECHENG 548	Technology Venturing Project

- 1 Credits for group B count if course not used as a substitution for MECHENG 496.
- 2 Students who earn 3 or more credits of MECHENG 699 may use only 3 of those credits as approved Free Technical Electives.
- 3 Students who earn 3 or more credits of Co-op may use 3 of those credits as approved technical electives.

## Minimum Requirements

Students must maintain an average GPA of at least 2.00 on all work attempted at the University and in all courses offered by the College. Students majoring in biomedical engineering, computer engineering, computer science, industrial engineering, and materials engineering must maintain an average GPA of at least 2.00 in all 300-level and above courses in the student's major department. Students majoring in civil engineering, electrical engineering, and mechanical engineering must maintain an average GPA of at least 2.50 in all 300-level and above courses in the major department. Transferable courses will be included as appropriate. Advancement to major status is required for graduation.

In order to provide maximum flexibility while preserving the institutional identity of a UWM degree, the College requires residence:

1. during the last 30 credits, or
2. during 45 of the last 60 credits, or
3. during any 90 credits of a student's undergraduate career.

At least 15 credits of advanced work in the major must be completed in residence at UWM.

A student who does not maintain continuous registration during the academic year and is re-admitted to the College must meet the program and graduation requirements in effect at the time of re-entry.

Degree and major requirements must be completed within 10 years of initial enrollment at UW-Milwaukee. Should students not complete the major within the 10-year time frame, the students will switch to the most current degree and major requirements. A new 10-year time frame would then begin.

## Dual Majors

Students wishing to major in more than one field can do so in two ways:

1. Complete the requirements for more than one major before receiving a degree from the College. In this case, the degree will list both majors.
2. Be admitted to the College as a second degree candidate (after earning a bachelor's degree in any field), providing University and College entrance requirements are met. Such a student must meet

all undergraduate degree requirements in the College and present a minimum of 30 credits beyond the previous bachelor's degree.

## Concurrent Registration at Other Institutions

CEAS students wishing to establish concurrent enrollment at another institution must obtain prior permission from their academic advisor.

## Student Academic Appeals

Students may appeal an academic action to the Office of Student Services. An appeal is a request for an exception to an established policy or rule. The content of each appeal is carefully reviewed in order to reach a decision. Appeals should be submitted in writing to the Office of Student Services. The appeals committee considers individual cases concerning the degree requirements and other academic rules and regulations established by the College of Engineering and Applied Science faculty.

The College of Engineering and Applied Science has established written procedures for undergraduate student academic grievances. Copies of the grievance procedure are available in the Office of Student Services. As a first step, students must discuss the grievance with the faculty member or administrator as soon as possible to attempt to resolve the issue, but not later than 30 days after the action that prompted the grievance/appeal.

## Computer Science and Engineering Programs

Detailed descriptions of the CEAS undergraduate programs are provided in this catalog. All courses are not offered every semester. A few technical elective courses may be offered only once every three to four semesters. In addition, since computer science and engineering curricula are continually evolving to keep current, students are encouraged to consult with their advisors to plan each semester's list of classes. Part-time students should always maintain a plan that looks ahead two to three semesters to avoid scheduling difficulties.

The curricula outlined in the pages are applicable to new students entering CEAS in fall 2016 or later. Students who enrolled in computer science or engineering programs prior to that date should consult with the appropriate previous editions of this catalog for information about their program requirements. As a general rule, when program changes occur, continuing students have the choice of continuing in their existing program or following the new requirements. Occasionally, a program change will be required of all students regardless of their date of matriculation, so long as it does not increase the total credits needed for graduation.

These program descriptions represent the minimum requirements for graduation from UWM in computer science or engineering. In all cases, it is important that students consult with their advisor before making course selections to avoid errors in programming.

## Academic Advising

The Office of Student Services in the College of Engineering and Applied Science, located in Room E386 of the Engineering and Mathematical Sciences Building, offers undergraduate students academic advising from professional advisors who are familiar with the curriculum, College requirements, and the special needs of engineering and computer science students. These advisors provide services such as freshman orientation,

course selection, program planning, and credit transfer evaluation. Students are assigned to a permanent professional advisor as soon as they are accepted into the College, and are urged to confer with their advisor at least once each semester. Students also are assigned to a faculty advisor who provides technical expertise specific to the student's area of study.

We understand that it can be a delicate balance managing school, work, family, and active social lives. The College of Engineering and Applied Science advisors are here to help you achieve that balance.

You will be assigned a professional academic advisor upon being admitted to the College of Engineering & Applied Science. Your advisor will work with you throughout your undergraduate experience, providing guidance on:

- course registration,
- graduation planning,
- career preparation,
- and serving as a liaison to the many other resources available on our campus.

Advisors are also a great source of information on student organizations, tutoring and scholarship opportunities.

In addition to professional academic advisors, you will also have access to faculty advisors. These advisors can provide insights into the technical aspects of the engineering and computer science curricula while mentoring you as you define your professional goals.

## Honors in the College of Engineering and Applied Science

### Dean's Honor List

GPA of 3.500 or above, earned on a full-time student's GPA on 12 or more graded credits in a given semester.

### Honors Degree and Honors Degree with Thesis

Granted to graduating seniors who complete Honors College requirements, as listed in the Honors College (<http://catalog.uwm.edu/opportunities-resources/honors-college/>) section of this site.

### Commencement Honors

Students with a cumulative GPA of 3.500 or above, based on a minimum of 40 graded UWM credits earned prior to the final semester, will receive all-university commencement honors and be awarded the traditional gold cord at the December or May Honors Convocation. Please note that for honors calculation, the GPA is **not** rounded and is truncated at the third decimal (e.g., 3.499).

### Final Honors

Earned on a minimum of 60 graded UWM credits: Cum Laude - 3.500 or above; Magna Cum Laude - 3.650 or above; Summa Cum Laude - 3.800 or above.

## Joint Programs with Other Campuses

### Pre-engineering

Qualified students may enroll in coordinated pre-engineering programs at UW-Green Bay, UW-Parkside, and UW-Waukesha for two years of pre-engineering coursework. These coordinated programs ensure equivalent

coursework, appropriate advising, and early access to the Cooperative Education Program at UWM.

### Dual Degree Programs

Qualified students may enroll in coordinated dual degree programs at Alverno College, Carroll University, UW-Eau Claire, UW-Green Bay, UW-La Crosse, UW-Oshkosh, UW-Stevens Point, UW-Whitewater and Wisconsin Lutheran College. Students in these programs will earn a bachelor's degree at both universities in five years. Students transfer to UWM after three years at the partner university. For more information, contact the Office of Student Services at (414) 229-4667.

## Joint Programs with Wisconsin Technical Colleges

### Gateway Technical College

An agreement with GTC allows those students having associate degrees in the Electrical Engineering - Technology the opportunity to be given credit for courses required in the UWM bachelor of science in engineering program. For more information, contact the Office of Student Services at (414) 229-4667.

### Milwaukee Area Technical College

An agreement with MATC allows joint admission and enrollment at MATC and CEAS. Qualified students may take English, mathematics, chemistry, and general education courses at MATC. The program ensures equivalent coursework and appropriate advising. Students complete a bachelor of science degree in engineering or computer science at UWM.

### Waukesha County Technical College

An agreement with WCTC allows those students having associate degrees in the Industrial Occupations Division at WCTC the opportunity to be given credit for courses required in the UWM bachelor of science in engineering or bachelor of science in computer science program. For more information, contact the Office of Student Services at (414) 229-4667.