MECHANICAL ENGINEERING, BS

The Department of Mechanical Engineering (ME) within the University of Wisconsin–Madison College of Engineering is the home of two undergraduate degree programs (mechanical engineering and engineering mechanics, including an option in aerospace engineering) and two graduate degree programs (mechanical engineering and engineering mechanics). The department's faculty conducts research in the areas of advanced manufacturing, biomechanics, computation & data-driven engineering, energy systems, solid & fluid mechanics, and robotics, controls, & sensing. This combination of topics fosters synergies with respect to polymers, mechatronics, aerospace, thermal, materials, additive manufacturing, and fluids. The mechanical engineering undergraduate program has been ranked in the top twelve, and the mechanical engineering graduate program has been ranked in the top seven, among public universities, according to U.S. News and World Report 2022 rankings.

HOW TO GET IN

HOW TO GET IN

ADMISSION TO THE COLLEGE AS A FIRST-YEAR STUDENT

Students applying to UW–Madison (https://www.admissions.wisc.edu/apply/) need to indicate an engineering major (https://engineering.wisc.edu/degrees-programs/undergraduate/) as their first choice in order to be considered for direct admission to the College of Engineering. Being directly admitted to a major means students will start in the program of their choice in the College of Engineering and will need to meet progression requirements (https://engineering.wisc.edu/student-services/undergraduate-student-advising/progression/) at the end of the first year to guarantee advancement in that program.

CROSS-CAMPUS TRANSFER TO ENGINEERING

UW–Madison students in other schools and colleges on campus must meet minimum admission requirements (https://engineering.wisc.edu/admissions/undergraduate/cross-campus-students/) for admission consideration to engineering degree programs. Cross-campus admission is competitive and selective, and the grade point average expectations may increase as demand trends change. The student's overall academic record at UW–Madison is also considered. Students apply to their intended engineering program by submitting the online application by stated deadlines for spring and fall. The College of Engineering offers an online information tutorial and drop-in advising (https://engineering.wisc.edu/admissions/undergraduate/cross-campus-students/) for students to learn about the cross-campus transfer process.

OFF-CAMPUS TRANSFER TO ENGINEERING

With careful planning, students at other accredited institutions can transfer coursework that will apply toward engineering degree requirements at UW–Madison. Off-campus transfer applicants are considered for direct admission to the College of Engineering by applying to the Office of Admissions with an engineering major listed as their first choice. Those who are admitted to their intended engineering program must meet progression requirements (https://engineering.wisc.edu/admissions/undergraduate/transfer-from-off-campus/) at the point of transfer or within their first two semesters at UW–Madison to guarantee advancement in that program. A minimum of 30 credits in residence in the College of Engineering is required after transferring, and all students must meet all requirements for their major in the college. Transfer admission to the College of Engineering is competitive and selective, and students who have exceeded the 80 credit limit at the time of application are not eligible to apply.

The College of Engineering has dual degree programs with select four-year UW System campuses. Eligible dual degree applicants are not subject to the 80 credit limit.

Off-campus transfer students are encouraged to discuss their interests, academic background, and admission options with the Transfer & Academic Program Manager in the College of Engineering: ugtransfer@engr.wisc.edu or 608-262-2473.

SECOND BACHELOR'S DEGREE

The College of Engineering does not accept second undergraduate degree applications. Second degree student (https://engineering.wisc.edu/admissions/undergraduate/adult-students-second-degree-students/)s (https://engineering.wisc.edu/student-services/undergraduate-student-advising/) might explore the Biological Systems Engineering program at UW–Madison, an undergraduate engineering degree elsewhere, or a graduate program in the College of Engineering.

REQUIREMENTS

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatestudytext) section of the *Guide*.

General Education	• Breadth—Humanities/Literature/Arts: 6 credits • Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth—Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

SUMMARY OF REQUIREMENTS

The following curriculum applies to students admitted to the Mechanical Engineering degree program.

Code	Title	Credits
Mathematics and Statistics		19
Basic Science		13-14
Non–Mechanical Engineering		6
Mechanical Engineering Core		54
Technical Electives		12
Math/Science Electives		3
Communication Skills		6
Liberal Studies		15
Total Credits		*Minimum 128*

MATHEMATICS/STATISTICS [1]

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
MATH 222	Calculus and Analytic Geometry 2	4
MATH 234	Calculus--Functions of Several Variables	4
MATH 320	Linear Algebra and Differential Equations	3
STAT 324	Introductory Applied Statistics for Engineers	3
or I SY E 210	Introduction to Industrial Statistics	
Total Credits		**19**

[1] All students must have the equivalent of the above courses. If the above requirement is fulfilled with fewer than 19 credits, additional math/science credits may be needed to meet the math/science auxiliary credit condition.
Transfer students may fulfill the statistics requirement with other statistics courses having a calculus prerequisite and the approval of the mechanical engineering department via a Course Substitution Form.

BASIC SCIENCE [1]

Code	Title	Credits
Select one of the following:		4-5
CHEM 103	General Chemistry I	
CHEM 109	Advanced General Chemistry	
COMP SCI 220	Data Science Programming I	4
PHYSICS 202	General Physics [2]	5
Total Credits		**13-14**

[1] Basic science courses, excluding Computer Science courses, are included in the math/science auxiliary credit condition.
[2] Students following the normal M E course sequence need not take PHYSICS 201 General Physics to satisfy the prerequisites for PHYSICS 202 General Physics.

NON-MECHANICAL ENGINEERING

Code	Title	Credits
E M A 201	Statics (with a grade of C or better)	3
M S & E 350	Introduction to Materials Science	3
Total Credits		**6**

MECHANICAL ENGINEERING CORE

Code	Title	Credits
E M A 202	Dynamics (with a grade of C or better)	3
E M A 303	Mechanics of Materials (with a grade of C or better)	3
M E 201	Introduction to Mechanical Engineering	3
M E 231	Geometric Modeling for Design and Manufacturing	3
M E/E M A 307	Mechanics of Materials Lab	1
M E 310	Manufacturing: Polymer Processing and Engineering	3
M E 311	Manufacturing: Metals and Automation	3
M E 331	Computer-Aided Engineering	3
M E 340	Dynamic Systems	3
M E 342	Design of Machine Elements	3
M E 351 & M E 352	Interdisciplinary Experiential Design Projects I and Interdisciplinary Experiential Design Projects II	6
M E 361	Thermodynamics (with a grade of C or better)	3
M E 363	Fluid Dynamics	3
M E 364	Elementary Heat Transfer	3
M E 368	Engineering Measurements and Instrumentation	4
M E 370	Energy Systems Laboratory	3
M E 376	Introduction to Mechatronics	4
Total Credits		**54**

TECHNICAL ELECTIVES

Code	Title	Credits
The mechanical engineering curriculum requires a total of 12 credits of technical electives. A minimum of 3 of those 12 credits must be from formal M E courses numbered 400 and higher. A formal course is defined as a class that meets regularly in a lecture format to study a selected topic. The educational mission is assisted with homework and exams. Formal courses include online courses but do not include seminar, survey, independent study, research, topics, or similar courses.		12
Additional technical electives may include formal courses in engineering, mathematics, physics, chemistry, statistics, and computer science courses numbered 400 and higher. Course choices may impact the math/science auxiliary credit condition. INTEREGR and E P D courses are limited to those listed below. The following courses are also accepted as technical electives:		

ANAT&PHY 335	Physiology	5
BSE 351		
BSE 364	Engineering Properties of Food and Biological Materials	3
BSE/ENVIR ST 367	Renewable Energy Systems	3
CBE 320	Introductory Transport Phenomena	4
CBE 326	Momentum and Heat Transfer Operations	3
CHEM 341	Elementary Organic Chemistry	3
CHEM 343	Organic Chemistry I	3
CHEM 345	Organic Chemistry II	3
CIV ENGR 311	Hydroscience	3
CIV ENGR 320	Environmental Engineering	3
CIV ENGR/ G L E 330	Soil Mechanics	3
CIV ENGR 340	Structural Analysis I	3
CIV ENGR 370	Transportation Engineering	3
CIV ENGR 392	Building Information Modeling (BIM)	3
CIV ENGR 415	Hydrology	3
CNSR SCI 301	Consumer Analytics	3
CNSR SCI 555	Consumer Design Strategies & Evaluation	3
CNSR SCI 657	Consumer Behavior	3
COMP SCI 300	Programming II	3
COMP SCI 320	Data Science Programming II	4
COMP SCI/ E C E 354	Machine Organization and Programming	3
DS 341	Design Thinking for Transformation	3
E C E 320	Electrodynamics II	3
E C E 330	Signals and Systems	3
E C E 340	Electronic Circuits I	3
E C E 342	Electronic Circuits II	3
E C E/ COMP SCI 352	Digital System Fundamentals	3
E C E 353	Introduction to Microprocessor Systems	3
E C E/ COMP SCI 354	Machine Organization and Programming	3
E C E 355	Electromechanical Energy Conversion	3
E C E 356	Electric Power Processing for Alternative Energy Systems	3
E P 272		1
E P D 660	Core Competencies of Sustainability	3
INFO SYS 371	Technology of Computer-Based Business Systems	3
INTEREGR 303	Applied Leadership Competencies in Engineering	3
I SY E 315	Production Planning and Control	3
I SY E 323	Operations Research-Deterministic Modeling	3
I SY E 348	Introduction to Human Factors Engineering Laboratory	1
I SY E/PSYCH 349	Introduction to Human Factors	3
MATH 321	Applied Mathematical Analysis	3
MATH 322	Applied Mathematical Analysis	3
M E 273	Engineering Problem Solving with EES	1
M S & E 330	Thermodynamics of Materials	4
M S & E 332	Macroprocessing of Materials	3
M S & E 352	Materials Science-Transformation of Solids	3
NAV SCI 301	Naval Engineering	3
N E 305	Fundamentals of Nuclear Engineering	3
PHYSICS 205	Modern Physics for Engineers	3
PHYSICS 241	Introduction to Modern Physics	3
PHYSICS 311	Mechanics	3
PHYSICS 321	Electric Circuits and Electronics	4
PHYSICS 322	Electromagnetic Fields	3
PHYSICS 325	Optics	4
STAT 311	Introduction to Theory and Methods of Mathematical Statistics I	3
STAT 312	Introduction to Theory and Methods of Mathematical Statistics II	3
STAT 333	Applied Regression Analysis	3
STAT 349	Introduction to Time Series	3
STAT 351	Introductory Nonparametric Statistics	3
Up to 3 technical elective credits may be obtained for non-formal courses such as independent study courses (M E 489, M E 491, M E 492, and other engineering independent study courses numbered 399 and higher); Cooperative Education (M E 1); and E P D 690, "Wisconsin Engineer Magazine." Students may propose a course that they feel will benefit their mechanical engineering education path. To be a strong candidate, the proposed course should have pre-requisites of two physics or calculus courses. For these courses, the ME curriculum committee will review the request and if approved, recommend a DARS substitution.		

MATH/SCIENCE ELECTIVES

Code	Title	Credits
The mechanical engineering curriculum requires 3 credits of math/science electives. CHEM 104 or CHEM 109, any formal course listed as a biological science and numbered 100 or higher, any non-engineering formal course listed with physical or natural science breadth and numbered 200 or higher will satisfy this requirement. If the math/science auxiliary credit condition is met with additional coursework, the math/science elective requirement may be met with a formal course offered by an engineering department numbered 200 and above (except INTEREGR and E P D).		3
Total Credits		**3**

COMMUNICATION SKILLS

Code	Title	Credits
ENGL 100	Introduction to College Composition	3
or LSC 100	Science and Storytelling	

or COM ARTS 100	Introduction to Speech Composition	
or ESL 118	Academic Writing II	
INTEREGR 397	Engineering Communication	3
Total Credits		**6**

LIBERAL ELECTIVES

Code	Title	Credits
The Mechanical Engineering curriculum requires 15 credits of liberal elective courses. See College of Engineering Liberal Studies Requirements for details.		
Complete Requirements (http://guide.wisc.edu/undergraduate/engineering/#requirementstext)		15
Total Credits		**15**

ADDITIONAL INFORMATION

Students fulfilling all course requirements with fewer than 128 credits must comply with the credit minimum by taking additional free elective credits. Students must meet the math/science auxiliary credit condition with a minimum of 30 credits. Students in good academic standing may take free elective courses pass/fail (see the College of Engineering Official Regulations (http://guide.wisc.edu/undergraduate/engineering/#policiesandregulationstext) for details). Pass/fail courses do not count toward specific degree requirements.

Independent Studies and projects courses:

Code	Title	Credits
M E 291	Undergraduate Mechanical Engineering Projects	1-3
M E 299	Independent Study	1-3
M E 489	Honors in Research	1-3
M E 491	Mechanical Engineering Projects I	1-3
M E 492	Mechanical Engineering Projects II	1-3

Students must have a cumulative 2.5 GPA or a 3.0 GPA for their previous two semesters and have written permission to enroll from their research advisor.

For information on credit loads, adding or dropping courses, course substitutions, pass/fail, auditing courses, dean's honor list, repeating courses, probation, and graduation, see the College of Engineering Official Regulations (http://guide.wisc.edu/undergraduate/engineering/#policiesandregulationstext).

HONORS IN RESEARCH PROGRAM

The ME Department's Undergraduate Honors in Research Program allows students to participate in the creation of new knowledge and experience the excitement of the research process. Students in the program write and submit a senior thesis. Admission requirements include:

- At least two semesters completed on the Madison campus with a cumulative GPA of at least 3.5;
- Majoring in Mechanical Engineering;
- Approval of an appropriate professor who will serve as the thesis advisor.

The "Honors in Research" designation will be awarded to graduates who meet the following requirements:

- Satisfaction of the requirements for an undergraduate degree in Mechanical Engineering;
- A cumulative GPA of at least 3.3;
- Completion of a total of at least 6 credits of M E 489 Honors in Research;
- Receive a final grade of at least "B" in M E 489;
- Completion of senior thesis.

Students must certify completion of the program with their M E 489 advisor the term they intend to graduate. To certify program completion students must complete the appropriate form and submit to student services.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree	To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency	Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. “In residence” credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.
Quality of Work	Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

LEARNING OUTCOMES

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

FOUR-YEAR PLAN

FOUR-YEAR PLAN

SAMPLE FOUR-YEAR PLAN

First Year

Fall	Credits	Spring	Credits
MATH 221	5	MATH 222	4
CHEM 103 or 109[1]	4	E M A 201[2]	3
M E 201	3	M E 231	3
or Communications A		Communications A or	3
Liberal Studies Elective	3	M E 201	
		Liberal Studies Elective	3
	15		**16**

Second Year

Fall	Credits	Spring	Credits
E M A 303[2]	3	E M A 202[2]	3
MATH 234	4	MATH 320	3
M E/E M A 307	1	PHYSICS 202	5
COMP SCI 220	4	M S & E 350	3
Liberal Studies Elective	3	STAT 324 or I SY E 210	3
	15		**17**

Third Year

Fall	Credits	Spring	Credits
M E 331	3	M E 342	3
M E 361[2]	3	M E 363	3
M E 340	3	INTEREGR 397	3
Math/Science Elective	3	M E 376	4
M E 310	3	M E 311	3
Liberal Studies Elective	3		
	18		**16**

Fourth Year

Fall	Credits	Spring	Credits
M E 351	3	M E 352	3
M E 364	3	M E 370	3
M E 368	4	Technical Elective	3
Technical Elective	3	Technical Elective	3
Technical Elective	3	Liberal Studies Elective	3
	16		**15**

Total Credits 128

1 CHEM 109 Advanced General Chemistry may be taken in place of CHEM 103 General Chemistry I. If CHEM 103 is taken, students may need to take additional free electives to meet the minimum number of credits required for the degree.

2 E M A 201 Statics, E M A 202 Dynamics, E M A 303 Mechanics of Materials, and M E 361 Thermodynamics each require a minimum grade of C.

ADVISING AND CAREERS

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ADVISING

Every College of Engineering undergraduate has an assigned academic advisor (https://engineering.wisc.edu/student-services/undergraduate-student-advising/). Academic advisors support and coach students through their transition to college and their academic program all the way through graduation.

Advisors help students navigate the highly structured engineering curricula and course sequencing, working with them to select courses each semester.

When facing a challenge or making a plan toward a goal, students can start with their academic advisor. There are many outstanding resources at UW–Madison, and academic advisors are trained to help students navigate these resources. Advisors not only inform students about the various resources, but they help reduce the barriers between students and campus resources to help students feel empowered to pursue their goals and communicate their needs.

Students can find their assigned advisor in their MyUW Student Center.

ENGINEERING CAREER SERVICES

Engineering Career Services (https://ecs.wisc.edu) (ECS) assists students in finding work-based learning experiences such as co-ops and summer internships, exploring and applying to graduate or professional school, and finding full-time professional employment.

ECS offers two large career fairs per year, assists students with resume building and developing interviewing skills, hosts skill-building workshops, and meets one-on-one with students to discuss offer negotiations.

Students are encouraged to engage with the ECS office early in their academic careers. For more information on ECS programs and workshops, visit: https://ecs.wisc.edu.

PEOPLE

PEOPLE

PROFESSORS

Darryl Thelen (Chair)
Mark Anderson
Riccardo Bonazza
Curt Bronkhorst
Christian Franck
Jaal Ghandhi
Sage Kokjohn
Dan Negrut
Gregory F. Nellis
Frank Pfefferkorn
Xiaoping Qian
Douglas Reindl
David Rothamer
Scott T. Sanders
Krishnan Suresh
Mario F. Trujillo
Lih-sheng Turng

Fabian Waleffe
Michael Zinn

ASSOCIATE PROFESSORS

Peter Adamczyk
Lianyi Chen
Melih Eriten
Jennifer Franck
Katherine Fu
Corinne Henak
Ying Li
Franklin Miller
Sangkee Min
Jacob Notbohm
Wenxiao Pan
James Pikul
Pavana Prabhakar
Shiva Rudraraju
Alejandro Roldan-Alzate
Ramathasan Thevamaran

ASSISTANT PROFESSORS

Yunus Alapan
Joseph Andrews
Eric Kazyak
Allison Mahvi
Luca Mastropasqua
Josh Roth
Dakota Thompson
Mike Wagner
Michael Wehner
Jinlong Wu
Xiaobin Xiong
Xiangru Xu
Wei Wang
Lei Zhou

LECTURERS, TEACHING FACULTY, AND TEACHING PROFESSORS

Arganthael Berson
Glenn Bower
Michael Cheadle
Michael De Cicco
Jennifer Detlor
Antonio Hernandez
Randy Jackson
Andrew Mikkelson
Sonny Nimityongskul
Jason Oakley
Lennon Rodgers
Mike Sracic
Graham Wabiszewski

See also Mechanical Engineering Faculty Directory (https://directory.engr.wisc.edu/me/faculty/).

ACCREDITATION

ACCREDITATION

Accredited by the Engineering Accreditation Commission ofABET, https://www.abet.org, under the commission's General Criteria and Program Criteria for Mechanical and Similarly Named Engineering Programs.

PROGRAM#EDUCATIONAL OBJECTIVES#FOR THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

We recognize that our graduates will choose to use the knowledge and skills that they have acquired during their undergraduate years to pursue a wide variety of career and life goals, and we encourage this diversity of paths. Whatever path our graduates may choose, we expect them to be meeting the following objectives at least three to five years after graduation:

1. They will exhibit a fundamental understanding of broader engineering disciplines with strong skills in mechanical engineering, problem solving, leadership, teamwork, and communication.
2. They will use these skills to contribute to their organizations and communities.
3. They will make thoughtful, well-informed decisions in their career and life.
4. They will demonstrate a continuing commitment to and interest in their own and other's education.

Note: Undergraduate Student Outcomes, number of degrees conferred, and enrollment data are made publicly available at the Mechanical Engineering#Undergraduate Program website. (In this Guide, the program's Student Outcomes are available through the "Learning Outcomes" tab.)