ENGINEERING MECHANICS, BS

for the degree of Bachelor of Science in Engineering Mechanics

The Engineering Mechanics program at Illinois is a major that focuses on the principles of mechanics that underpin design and engineering in diverse industries including materials, energy, biotechnology, civil, and aerospace to name a few. Students learn rigorous mathematical, scientific, and engineering principles in subject areas such as statics, dynamics, strength of materials, and fluid dynamics. Further, Engineering Mechanics students learn how to apply these basic principles in modern engineering design through laboratory and project work. The program also benefits from a cohesive secondary field which students can tailor to fit their academic and career objectives. Engineering Mechanics is well suited for students with an interest in analysis and design, and physical principles.

Current Program Educational Objectives (https://mechse.illinois.edu/undergraduate/#ABET)

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Graduation Requirements

Minimum hours required for graduation: 128 hours.

Minimum Overall GPA: 2.0
Minimum Technical GPA: 2.0

TGPA is required for required Engineering courses and any technical elective courses. See **Technical GPA (https://go.grainger.illinois.edu/TechnicalGPA/)** to clarify requirements.

University Requirements

Minimum of 40 hours of upper-division coursework, generally at the 300- or 400-level. These hours can be drawn from all elements of the degree. Students should consult their academic advisor for additional guidance in fulfilling this requirement.

The university and residency requirements can be found in the Student Code (https://studentcode.illinois.edu/article3/part8/3-801/) (§ 3-801) and in the Academic Catalog (http://catalog.illinois.edu/general-information/degree-general-education-requirements/).

General Education Requirements

Follows the campus General Education (Gen Ed) requirements (https://courses.illinois.edu/gened/DEFAULT/DEFAULT/). Some Gen Ed requirements may be met by courses required and/or electives in the program.

Code	Title	Hours
Composition I		4-6
Advanced Composition		3
fulfilled by TAM 324, ME 470		
Humanities & the Arts (6 hours)		6
Natural Sciences & Technology (6 hours)		6
fulfilled by CHEM 102, CHEM 104, PHYS 211, PHYS 212		
Social & Behavioral Sciences (6 hours)		6
Cultural Studies: Non-Western Cultures (1 course)		3
Cultural Studies: US Minority Cultures (1 course)		3
Cultural Studies: Western/Comparative Cultures (1 course)		3
Quantitative Reasoning (2 courses, at least one course must be Quantitative Reasoning I)		6-10
fulfilled by MATH 220 or MATH 221; and MATH 231, MATH 241, PHYS 211, PHYS 212		
Language Requirement (Completion of the third semester or equivalent of a language other than English is required)		0-15

Major Requirements

Orientation and Professional Development

Code	Title	Hours
ENG 100	Grainger Engineering Orientation Seminar (External transfer students take ENG 300.)	1
TAM 195	Mechanics in the Modern World	1
ME 290	Seminar	0
Total Hours		**2**

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I	1
CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II	1
MATH 221	Calculus I (MATH 220 may be substituted. MATH 220 is appropriate for students with no background in calculus. 4 of 5 credit hours count towards degree.)	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications	3
MATH 441	Differential Equations	3
MATH 442	Intro Partial Diff Equations	3
PHYS 211	University Physics: Mechanics	4
PHYS 212	University Physics: Elec & Mag	4
PHYS 213	Univ Physics: Thermal Physics	2
PHYS 214	Univ Physics: Quantum Physics	2
Total Hours		**40**

Engineering Mechanics Technical Core

Code	Title	Hours
CS 101	Intro Computing: Engrg & Sci (CS 124 or ECE 220 may be substituted.)	3
ECE 205	Electrical and Electronic Circuits (ECE 110 and either ECE 210 or ECE 211 may be substituted.)	3
ME 170	Computer-Aided Design	3
ME 200	Thermodynamics	3
ME 470	Senior Design Project	3

TAM 211	Statics	3
TAM 212	Introductory Dynamics	3
TAM 251	Introductory Solid Mechanics	3
TAM 252	Solid Mechanics Design	1
TAM 270	Design for Manufacturability	3
TAM 324	Behavior of Materials	4
TAM 335	Introductory Fluid Mechanics	4
TAM 412	Intermediate Dynamics	4
TAM 445	Continuum Mechanics	4
TAM 470	Computational Mechanics	3
Total Hours		**47**

Secondary Field Option Electives

Code	Title	Hours
Secondary field electives selected from departmentally approved courses for Secondary Field Options. Each secondary field generally specifies two required courses and two additional courses from a list of approved elective courses. For each of the secondary fields, the required and approved elective courses specified for each are listed below. To add flexibility to the program and to accommodate particular interests, the student may fashion an individualized secondary field option. The only requirements are that the courses be related to mechanics, form a coherent and cohesive group, include at least two engineering courses, and total at least 12 hours of advanced-level coursework that are distinct from required courses in the Engineering Mechanics curriculum. This can include 500-level courses, if the student has the adequate preparation, for any of the secondary field elective courses. Each student must formally declare their choice of secondary field with a Mechanical Science and Engineering Undergraduate Programs Office advisor using a Secondary Field Options form.		**12**
Biomechanics		
Required Courses		
MCB 150	Molecular & Cellular Basis of Life	4
MCB 151	Molec & Cellular Laboratory	1
TAM 461	Cellular Biomechanics	4
Approved Courses		
ECE 473	Fund of Engrg Acoustics	3 or 4
ECE 380	Biomedical Imaging	3
ME 481	Whole-Body Musculoskel Biomech	3 or 4
ME 482	Musculoskel Tissue Mechanics	3 or 4
ME 483	Mechanobiology	4
BIOP 401	Introduction to Biophysics	3
TAM 497	Independent Study	1 to 3
Computational Mechanics		
Required Courses		
CS 357	Numerical Methods I	3
ME 471	Finite Element Analysis	3 or 4
Approved Courses		
CS 450	Numerical Analysis	3 or 4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
TAM 497	Independent Study	1 to 3
Engineering Science and Applied Mathematics		
Required Courses		
MATH 446	Applied Complex Variables	3-4
or MATH 448	Complex Variables	
Any 400 level MATH course, excluding MATH 415, MATH 441, and MATH 442		3 or 4
Approved Courses		
AE 353	Aerospace Control Systems	3
AE 402	Orbital Mechanics	3 or 4
CEE 491	Decision and Risk Analysis	3 or 4
ECE 329	Fields and Waves I	3
ECE 330	Power Ckts & Electromechanics	3
ECE 473	Fund of Engrg Acoustics	3 or 4
PHYS 402	Light	3 or 4
TAM 497	Independent Study	1 to 3
Experimental Mechanics		
Required Courses		
TAM 456	Experimental Stress Analysis	3
ECE 206	Electrical and Electronic Circuits Lab	1
Approved Courses		
CS 357	Numerical Methods I	3
ECE 473	Fund of Engrg Acoustics	3 or 4
ME 360	Signal Processing	3.5
PHYS 402	Light	3 or 4
TAM 497	Independent Study	1 to 3
Fluid Mechanics		
Required Courses		
TAM 435	Intermediate Fluid Mechanics	4
ME 410	Intermediate Gas Dynamics	3 or 4
Approved Courses		
AE 412	Viscous Flow & Heat Transfer	4
CEE 451	Environmental Fluid Mechanics	3
CEE 453	Urban Hydrology and Hydraulics	4
ECE 473	Fund of Engrg Acoustics	3 or 4
ME 412	Numerical Thermo-Fluid Mechs	2 to 4
TAM 497	Independent Study	1 to 3
Mechanics of Materials		
Required Courses		
TAM 424	Mechanics of Structural Metals	3 or 4
TAM 428	Mechanics of Composites	3
Approved Courses		
CEE 310	Transportation Engineering	3
MSE 401	Thermodynamics of Materials	3
MSE 455	Macromolecular Solids	3
MSE 489	Matl Select for Sustainability	3 or 4
NPRE 330	Materials in Nuclear Engineering	3
TAM 497	Independent Study	1 to 3
Solid Mechanics		
Required Courses		
TAM 424	Mechanics of Structural Metals	3 or 4
TAM 451	Intermediate Solid Mechanics	4
Approved Courses		
CEE 360	Structural Engineering	3
CEE 460	Steel Structures I	3

CEE 461	Reinforced Concrete I	3
CS 357	Numerical Methods I	3
ECE 473	Fund of Engrg Acoustics	3 or 4
TAM 497	Independent Study	1 to 3

Free Electives

Code	Title	Hours
Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives, so that there are at least 128 credit hours earned toward the degree. (https://go.grainger.illinois.edu/FreeElectives/)		11
Total Hours of Curriculum to Graduate		**128**

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Sample Sequence

This sample sequence is intended to be used only as a guide for degree completion. All students should work individually with their academic advisors to decide the actual course selection and sequence that works best for them based on their academic preparation and goals. Enrichment programming such as study abroad, minors, internships, and so on may impact the structure of this four-year plan. Course availability is not guaranteed during the semester indicated in the sample sequence. The curriculum sequence can also be viewed via dynamic and static curricular maps (https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/engineering-mechanics-map/), which include prerequisite sequencing.

Students must fulfill their Language Other Than English requirement by successfully completing a third level of a language other than English. See the corresponding section on the Degree and General Education Requirements *(*http://catalog.illinois.edu/general-information/degree-general-education-requirements/*).* ME 470 and TAM 324 will each satisfy a core course requirement and the Campus General Education Advanced Composition requirement.

Free Electives: Additional course work, subject to the Grainger College of Engineering restrictions to Free Electives *(*https://go.grainger.illinois.edu/FreeElectives/*), so that there are at least 128 credit hours earned toward the degree.*

First Year

First Semester	Hours
TAM 195	1
MATH 221 (MATH 220 may be substituted)	4
CHEM 102	3
CHEM 103	1
ENG 100	1
ME 170 (or Composition I)	3
Free Elective course	3
	16

Total Hours 16

First Year

Second Semester	Hours
CS 101 (CS 124 or ECE 220 may be substituted)	3
MATH 231	3
PHYS 211	4
Composition I or ME 170	4
General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation)	3
	17

Total Hours 17

Second Year

First Semester	Hours
MATH 257	3
TAM 211	3
TAM 270	3
CHEM 104	3
CHEM 105	1
ME 290	0
General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation)	3
	16

Total Hours 16

Second Year

Second Semester	Hours
MATH 241	4
PHYS 212	4
TAM 212	3
TAM 251	3
TAM 252	1
	15

Total Hours 15

Third Year

First Semester	Hours
MATH 441	3
ME 200	3
ECE 205 (ECE 110 and either ECE 210 or ECE 211 may be substituted)	3
TAM 335	4
Language Other Than English (3rd level)	4
	17

Total Hours 17

Third Year

Second Semester	Hours
MATH 442	3
TAM 324	4
PHYS 213	2
PHYS 214	2
Free Elective course	4
	15

Total Hours 15

Fourth Year

First Semester	Hours
ME 470 (or Secondary Field elective course)	3
TAM 470	3
Secondary Field elective course	3
Secondary Field elective course	3
General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation)	3
	15

Total Hours 15

Fourth Year

Second Semester	Hours
TAM 412	4
TAM 445	4
Secondary Field elective course or ME 470	3
Secondary Field elective course	3
General Education course (Choose a Humanities or Social/ Behavioral Science course)	3
	17

Total Hours 17

Total Hours: 128

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Student learning outcomes are aligned with the learning outcomes required by the ABET accreditation process.

Engineering Mechanics graduates will have:

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.

Current Student Learning Outcomes (https://mechse.illinois.edu/undergraduate/#ABET)

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Mechanical Science & Engineering (https://mechse.illinois.edu/)

B.S. in Engineering Mechanics (https://mechse.illinois.edu/undergraduate/bs-engineering-mechanics/)
Mechanical Science & Engineering Faculty (https://mechse.illinois.edu/people/faculty/all-faculty/)

The Grainger College of Engineering (https://grainger.illinois.edu/)

The Grainger College of Engineering Admissions (https://grainger.illinois.edu/admissions/)