

# ENGINEERING MECHANICS, BS

for the degree of Bachelor of Science in Engineering Mechanics

The Engineering Mechanics program at Illinois (accredited by the Engineering Accreditation Commission of ABET (<https://www.abet.org/>)) 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/>)

for the degree of Bachelor of Science in Engineering Mechanics

## Graduation Requirements

Minimum Technical GPA (<https://go.grainger.illinois.edu/TechnicalGPA/>): **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.

**Minimum Overall GPA: 2.0**

**Minimum hours required for graduation: 128 hours**

**General education: Students must complete the Campus General Education requirements including the campus general education language requirement. ME 470 and TAM 324 will each satisfy a core course requirement and the Campus General Education Advanced Composition requirement.**

## 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
<b>Total Hours</b>		<b>2</b>

## 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
<b>Total Hours</b>		<b>40</b>

## 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
<b>Total Hours</b>		<b>47</b>

## 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	Molec & 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
CS 457	Numerical Methods II	3
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. ( <a href="https://go.grainger.illinois.edu/FreeElectives/">https://go.grainger.illinois.edu/FreeElectives/</a> )		11
<b>Total Hours of Curriculum to Graduate</b>		<b>128</b>

for the degree of Bachelor of Science in Engineering Mechanics

**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	Second Semester	Hours
TAM 195		1 CS 101 (CS 124 or ECE 220 may be substituted.)	3
MATH 221 (MATH 220 may be substituted)		4 MATH 231	3
CHEM 102		3 PHYS 211	4
CHEM 103		1 General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)	3
ENG 100		1 ME 170 or Composition I course	3-4
Composition I course or ME 170		4-3	
Free elective course		3	
		<b>17</b>	<b>16</b>

**Second Year**

First Semester	Hours	Second Semester	Hours
TAM 211		3 TAM 212	3
MATH 257		3 MATH 241	4
CHEM 104		3 PHYS 212	4
CHEM 105		1 TAM 251	3
TAM 270		3 TAM 252	1
ME 290		0	
General Education course (choose a Humanities or Social/Behavioral Science course with Cultural Studies designation)		3	
		<b>16</b>	<b>15</b>

**Third Year**

First Semester	Hours	Second Semester	Hours
TAM 335		4 TAM 324	4
MATH 441		3 TAM 412	4
ME 200		3 PHYS 213	2

ECE 205 (ECE 110 and either ECE 210 or ECE 211 may be substituted)	3	PHYS 214	2
Language Other Than English (3rd level) course	4	TAM 445	4
		<b>17</b>	<b>16</b>

**Fourth Year**

First Semester	Hours	Second Semester	Hours
MATH 442		3 Secondary Field elective course or ME 470	3
ME 470 (or Secondary Field elective course)		3 Secondary Field Eelective 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
General Education course (choose a Humanities or Social/Behavioral Science course)		3 Free elective course	4
		<b>15</b>	<b>16</b>

**Total Hours 128**

*for the degree of Bachelor of Science Major in Engineering Mechanics*

Student learning outcomes are based on learning outcomes in line with 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.

*for the degree of Bachelor of Science in Engineering Mechanics*

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Mechanical Science & Engineering Website (<http://mechse.illinois.edu/>)  
Mechanical Science & Engineering Faculty (<https://mechse.illinois.edu/people/faculty/>)

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

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