

ENGINEERING MECHANICS, BS

for the degree of Bachelor of Science in Engineering Mechanics

department website: <http://mechse.illinois.edu/>
department faculty: Mechanical Science & Engineering Faculty (<https://mechse.illinois.edu/people/faculty/>)
overview of college admissions & requirements: The Grainger College of Engineering (<https://grainger.illinois.edu/admissions/>)
college website: <https://grainger.illinois.edu/>
Current Program Educational Objectives: <https://mechse.illinois.edu/undergraduate> (<https://mechse.illinois.edu/undergraduate/>)

The Engineering Mechanics program at Illinois (accredited by the Engineering Accreditation Commission of ABET, 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.

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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 (<https://courses.illinois.edu/gened/DEFAULT/DEFAULT/>) **requirements including the campus general education language requirement. Specific Advanced Composition courses required for this degree are listed below.**

Orientation and Professional Development

Code	Title	Hours
ENG 100	Engineering Orientation ¹	0
TAM 195	Mechanics in the Modern World	1
ME 290	Seminar	0
Total Hours		1

Foundational Mathematics and Science

Code	Title	Hours
CHEM 102	General Chemistry I	3
CHEM 103	General Chemistry Lab I ²	1

CHEM 104	General Chemistry II	3
CHEM 105	General Chemistry Lab II ²	1
MATH 221	Calculus I ³	4
MATH 231	Calculus II	3
MATH 241	Calculus III	4
MATH 257	Linear Algebra with Computational Applications ⁴	3
MATH 441	Differential Equations ⁵	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 ⁶	3
ECE 205	Electrical and Electronic Circuits ⁷	3
ME 170	Computer-Aided Design	3
ME 200	Thermodynamics	3
ME 470	Senior Design Project ⁸	3
TAM 211	Statics	3
TAM 212	Introductory Dynamics ⁹	3
TAM 251	Introductory Solid Mechanics	3
TAM 252	Solid Mechanics Design	1
TAM 270	Design for Manufacturability	3
TAM 324	Behavior of Materials ⁸	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	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 445		
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 431	Materials in Nuclear Engrg	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

Electives

Code	Title	Hours
	The Grainger College of Engineering Liberal Education course list, or additional courses from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts ¹⁰	6
	Free electives. Additional unrestricted course work, subject to certain exceptions as noted by the College, so that there are at least 128 credit hours earned toward the degree. ¹¹	6

Total Hours of Curriculum to Graduate **128**

¹ External transfer students take ENG 300 instead.

² CHEM 103 (<http://catalog.illinois.edu/search/?P=CHEM%20103>) requirement waived for students who received test-based credit (AP, IB, or proficiency) for CHEM 102 (<http://catalog.illinois.edu/search/?P=CHEM%20102>), similarly CHEM 105 (<http://catalog.illinois.edu/search/?P=CHEM%20105>) requirement waived for students who received test-based credit for CHEM 104 (<http://catalog.illinois.edu/search/?P=CHEM%20104>). Students are still required to have 128 hours minimum to graduate.

³ MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.

⁴ MATH 415 (<http://catalog.illinois.edu/search/?P=MATH%20415>) may be substituted for students entering prior to Fall 2021.

- ⁵ Transfer or incoming students with credit upon admission to the Engineering Mechanics program may substitute MATH 284 (<http://catalog.illinois.edu/search/?P=MATH%20284>) or MATH 285 (<http://catalog.illinois.edu/search/?P=MATH%20285>) with a grade of B+ or higher.
- ⁶ CS 124 or CS 125 (<http://catalog.illinois.edu/search/?P=CS%20125>) or ECE 220 (<http://catalog.illinois.edu/search/?P=ECE%20220>) may be substituted.
- ⁷ ECE 110 (<http://catalog.illinois.edu/search/?P=ECE%20110>) and ECE 210 (<http://catalog.illinois.edu/search/?P=ECE%20210>) (or ECE 211 (<http://catalog.illinois.edu/search/?P=ECE%20211>)) combined may be substituted.
- ⁸ Advanced Composition satisfied by completing TAM 324 and ME 470.
- ⁹ Transfers and Physics minor/dual degree students may substitute PHYS 325 (<http://catalog.illinois.edu/search/?P=PHYS%20325>).
- ¹⁰ The Grainger College of Engineering approved liberal education course list can be found here (<https://go.grainger.illinois.edu/LiberalEducation/>). Note that these credit hours could carry the required cultural studies designation required for campus general education requirements.
- ¹¹ The Grainger College of Engineering restrictions to free electives can be found here (<https://go.grainger.illinois.edu/FreeElectives/>).

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Suggested Sequence

The curriculum sequence below is a suggested sequence, as all Grainger Engineering students work with a department academic advisor to achieve their educational goals, specific to their needs and preparation. Dynamic and Static curricular maps, which include prerequisite and corequisite sequencing, can be found here (<https://grainger.illinois.edu/academics/undergraduate/majors-and-minors/engineering-mechanics-map/>).

First Year

First Semester	Hours
TAM 195 Mechanics in the Modern World	1
ENG 100 Engineering Orientation	0
MATH 221 Calculus I	4
CHEM 102 General Chemistry I	3
CHEM 103 General Chemistry Lab I	1
RHET 105 Writing and Research or ME 170 ²	4-3
General education elective ³	3
Semester Hours	16-15
Second Semester	
MATH 231 Calculus II	3
CS 101 Intro Computing: Engrg Sci	3
PHYS 211 University Physics: Mechanics	4
ME 170 Computer-Aided Design or RHET 105 ²	3-4
General education elective ³	3
Semester Hours	16-17

Second Year

First Semester

MATH 257 Linear Algebra with Computational Applications	3
CHEM 104 General Chemistry II	3
CHEM 105 General Chemistry Lab II	1
TAM 211 Statics	3
TAM 270 Design for Manufacturability	3
ME 290 Seminar	0
General education elective ³	3
Semester Hours	16

Second Semester

MATH 241 Calculus III	4
PHYS 212 University Physics: Elec Mag	4
TAM 212 Introductory Dynamics	3
TAM 251 Introductory Solid Mechanics	3
TAM 252 Solid Mechanics Design	1
General education elective ³	3
Semester Hours	18

Third Year

First Semester

MATH 441 Differential Equations	3
ECE 205 Electrical and Electronic Circuits	3
ME 200 Thermodynamics	3
TAM 335 Introductory Fluid Mechanics	4
Free Elective	3
Semester Hours	16

Second Semester

PHYS 213 Univ Physics: Thermal Physics	2
PHYS 214 Univ Physics: Quantum Physics	2
TAM 324 Behavior of Materials	4
TAM 412 Intermediate Dynamics	4
TAM 445 Continuum Mechanics	4
Semester Hours	16

Fourth Year

First Semester

ME 470 Senior Design Project (or Secondary field elective) ⁴	3
MATH 442 Intro Partial Diff Equations	3
TAM 470 Computational Mechanics	3
Secondary field elective ⁴	3
General education elective ³	3
Semester Hours	15

Second Semester

Secondary Field Elective (or ME 470) ⁴	3
Secondary field elective ⁴	6
General education elective ³	3
Free elective	3
Semester Hours	15
Total Hours:	128

- ¹ *MATH 220 may be substituted, with four of the five credit hours applying toward the degree. MATH 220 is appropriate for students with no background in calculus.*
- ² *RHET 105 (or an alternative Composition I sequence) is taken either in the first or second semester of the first year, according to the student's UIN (Spring if your UIN is Odd). ME 170 is taken the other semester. Composition I guidelines can be found at <http://catalog.illinois.edu/general-information/degree-general-education-requirements/> under *Written Communication Requirement*.*
- ³ *Students must take 6 hours from the campus General Education Social and Behavioral Sciences list, 6 hours from campus General Education Humanities and the Arts list, and 6 hours from a liberal education list approved by the college or from the campus General Education lists for Social and Behavioral Sciences or Humanities and the Arts. Students must also complete the campus cultural studies requirement by completing (i) one western/comparative culture(s) course, (ii) one non-western culture(s) course, and (iii) one U.S. Minority Culture(s) course from the General Education cultural studies lists. Most students select general education courses that simultaneously satisfy these cultural studies requirements.*
- ⁴ *Select with departmental approval or choose from departmentally pre-approved list of Secondary Field Electives (<http://mechanical.illinois.edu/undergraduate/bs-engineering-mechanics/#EMSecondaryFields>).*