

MECHANICAL ENGINEERING, BS

for the degree of Bachelor of Science in Mechanical Engineering

The Mechanical Engineering program at Illinois is one of the most diverse engineering majors and plays a major role in advancing almost every industry. Students study physical principles behind how forces act on bodies of solids or fluids and the interaction of these bodies with their environments through exchanges of energy. Further, Mechanical Engineering students learn how to apply these basic principles to design, manufacture, and control machines and complex systems. Examples include systems that apply loads, transport matter and energy, and convert one form of energy to another. Mechanical Engineering is a broad major that is well suited for students interested in the engineering underpinnings of the modern world around them.

Current Program Educational Objectives

for the degree of Bachelor of Science in Mechanical Engineering

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 ME 470 | |
| | Humanities & the Arts (6 hours) | 6 |
| | Natural Sciences & Technology (6 hours) | 6 |

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| | fulfilled by CHEM 102, PHYS 211, PHYS 212 | |
| | Social & Behavioral Sciences (6 hours) | 6 |
| | fulfilled by ECON 102 or ECON 103, and any other course approved as Social & Behavioral Sciences | |
| | 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, MATH 285, 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 |
| ME 290 | Seminar | 0 |
| Total Hours | | 1 |

Introductory Economics Elective

| Code | Title | Hours |
|--------------------|--------------------------|----------|
| ECON 102 | Microeconomic Principles | 3 |
| or ECON 103 | Macroeconomic Principles | |
| Total Hours | | 3 |

Foundational Mathematics and Science

| Code | Title | Hours |
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| CHEM 102 | General Chemistry I | 3 |
| CHEM 103 | General Chemistry Lab I | 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 285 | Intro Differential Equations | 3 |
| PHYS 211 | University Physics: Mechanics | 4 |
| PHYS 212 | University Physics: Elec & Mag | 4 |
| Total Hours | | 29 |

Mechanical Engineering 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 |
| ECE 206 | Electrical and Electronic Circuits Lab | 1 |

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| ME 170 | Computer-Aided Design | 3 | ABE 498 | Special Topics (As Approved) | 1 to 4 |
| ME 270 | Design for Manufacturability | 3 | ADV 462 | Computational Advertising Infrastructure | 3 or 4 |
| ME 200 | Thermodynamics | 3 | ADV 492 | Tech and Advertising Campaigns | 3 |
| ME 310 | Fundamentals of Fluid Dynamics | 4 | AE 352 | Aerospace Dynamical Systems | 3 |
| ME 320 | Heat Transfer | 4 | AE 402 | Orbital Mechanics | 3 or 4 |
| ME 330 | Engineering Materials | 4 | AE 403 | Spacecraft Attitude Control | 3 or 4 |
| ME 340 | Dynamics of Mechanical Systems | 3.5 | AE 410 | Computational Aerodynamics | 3 or 4 |
| ME 360 | Signal Processing | 3.5 | AE 412 | Viscous Flow & Heat Transfer | 4 |
| ME 370 | Mechanical Design I | 3 | AE 416 | Applied Aerodynamics | 3 or 4 |
| ME 371 | Mechanical Design II | 3 | AE 419 | Aircraft Flight Mechanics | 3 or 4 |
| ME 470 | Senior Design Project | 3 | AE 420 | Finite Element Analysis | 3 or 4 |
| TAM 210 | Introduction to Statics | 2 | AE 428 | Mechanics of Composites | 3 |
| TAM 212 | Introductory Dynamics | 3 | AE 433 | Aerospace Propulsion | 3 or 4 |
| TAM 251 | Introductory Solid Mechanics | 3 | AE 434 | Rocket Propulsion | 3 or 4 |
| Total Hours | | 52 | AE 435 | Electric Space Propulsion | 3 or 4 |
| Technical Electives | | | AE 442 | Aerospace Systems Design I | 3 |
| Code | Title | Hours | AE 443 | Aerospace Systems Design II | 3 |
| Science elective(s), chosen from one of the following: | | 4 | AE 451 | Aeroelasticity | 3 or 4 |
| CHEM 104 & CHEM 105 | General Chemistry II and General Chemistry Lab II | | AE 452 | Introduction to Nonlinear Dynamics and Vibrations | 4 |
| MCB 150 | Molecular & Cellular Basis of Life | | AE 454 | Systems Dynamics & Control | 3 or 4 |
| PHYS 213 & PHYS 214 | Univ Physics: Thermal Physics and Univ Physics: Quantum Physics | | AE 456 | Global Nav Satellite Systems | 4 |
| Statistics elective, one course chosen from: | | 3 | AE 460 | Aerodynamics & Propulsion Lab | 2 |
| IE 300 | Analysis of Data | | AE 461 | Structures & Control Lab | 2 |
| STAT 400 | Statistics and Probability I | | AE 468 | Optical Remote Sensing | 3 |
| MechSE electives chosen from the departmentally approved list below. | | 6 | AE 480 | Hypersonic Aerothermodynamics | 3 or 4 |
| All 400 level ME courses, except 470 and potentially 497, 498 (As Approved) | | | AE 482 | Introduction to Robotics | 4 |
| All 400 level TAM courses, except potentially 497, 498 (As Approved) | | | AE 483 | Autonomous Systems Lab | 2 |
| Technical electives chosen from the departmentally approved list below. | | 6 | AE 485 | Spacecraft Environment and Interactions | 3 or 4 |
| ABE 361 | Functional Analysis and Design of Agricultural Machine Systems | 3 | AE 497 | Independent Study (As Approved) | 1 to 4 |
| ABE 430 | Project Management (As Approved) | 2 | AE 498 | Special Topics (As Approved) | 1 to 4 |
| ABE 436 | Renewable Energy Systems | 3 or 4 | ANSC 445 | Statistical Methods | 4 |
| ABE 445 | Statistical Methods | 4 | ASRM 402 | Actuarial Statistics II | 4 |
| ABE 452 | Engineering for Disaster Resilience (As Approved) | 3 or 4 | ASRM 410 | Investments and Financial Markets | 3 or 4 |
| ABE 454 | Environmental Soil Physics | 3 | ASRM 450 | Methods of Applied Statistics | 3 or 4 |
| ABE 455 | Erosion and Sediment Control | 2 | ASRM 451 | Basics of Statistical Learning | 3 or 4 |
| ABE 456 | Land & Water Resources Engrg | 3 or 4 | ASRM 453 | Applied Bayesian Analysis | 3 or 4 |
| ABE 457 | NPS Pollution Processes | 2 | ASRM 461 | Loss Models | 4 |
| ABE 459 | Drainage and Water Management | 3 or 4 | ASRM 469 | Casualty Actuarial Mathematics | 3 or 4 |
| ABE 466 | Engineering Off-Road Vehicles | 3 | ASRM 471 | Life Contingencies I | 4 |
| ABE 469 | Capstone Design Experience | 4 | ASRM 472 | Life Contingencies II | 3 |
| ABE 476 | Indoor Air Quality Engineering | 4 | ATMS 301 | Atmospheric Thermodynamics | 3 |
| ABE 483 | Engineering Properties of Food Materials | 3 | ATMS 302 | Atmospheric Dynamics I | 3 |
| ABE 488 | Bioprocessing Biomass for Fuel | 4 | ATMS 304 | Radiative Transfer-Remote Sens | 3 |
| ABE 497 | Independent Study (As Approved) | 1 to 4 | ATMS 306 | Cloud Physics | 3 |
| | | | ATMS 312 | Atmospheric Dynamics II | 3 |
| | | | ATMS 405 | Boundary Layer Processes | 4 |
| | | | ATMS 406 | Tropical Meteorology | 4 |
| | | | ATMS 410 | Radar Remote Sensing | 4 |
| | | | ATMS 411 | Satellite Remote Sensing | 4 |
| | | | ATMS 420 | Atmospheric Chemistry | 4 |
| | | | ATMS 424 | Atmospheric Convection | 4 |

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| BADM 460 | Business Process Modeling | 3 | CEE 437 | Water Quality Engineering | 3 |
| BADM 461 | Tech, Eng, & Mgt Final Project | 4 | CEE 438 | Science & Environmental Policy | 4 |
| BIOC 406 | Gene Expression & Regulation | 3 | CEE 440 | Fate Cleanup Environ Pollutant | 4 |
| BIOC 446 | Physical Biochemistry | 3 | CEE 442 | Environmental Engineering Principles, Physical | 4 |
| BIOC 455 | Technqs Biochem & Biotech | 4 | CEE 443 | Env Eng Principles, Chemical | 4 |
| BIOE 380 | Biomedical Imaging | 3 | CEE 444 | Env Eng Principles, Biological | 4 |
| BIOE 414 | Biomedical Instrumentation | 3 | CEE 447 | Atmospheric Chemistry | 4 |
| BIOE 415 | Biomedical Instrumentation Lab | 2 | CEE 449 | Environmental Engineering Lab | 3 |
| BIOE 416 | Biosensors | 3 | CEE 450 | Surface Hydrology | 3 |
| BIOE 427 | Biomedical Ultrasound Imaging | 3 | CEE 451 | Environmental Fluid Mechanics | 3 |
| BIOE 430 | Intro Synthetic Biology | 3 or 4 | CEE 452 | Hydraulic Analysis and Design | 3 |
| BIOE 461 | Cellular Biomechanics | 4 | CEE 453 | Urban Hydrology and Hydraulics | 4 |
| BIOE 467 | Biophotonics | 3 | CEE 457 | Groundwater | 3 |
| BIOE 476 | Tissue Engineering | 3 | CEE 458 | Water Resources Field Methods | 4 |
| BIOE 479 | Cancer Nanotechnology | 3 | CEE 460 | Steel Structures I | 3 |
| BIOE 480 | Magnetic Resonance Imaging | 3 or 4 | CEE 461 | Reinforced Concrete I | 3 |
| BIOE 481 | Whole-Body Musculoskel Biomech | 3 or 4 | CEE 462 | Steel Structures II | 3 or 4 |
| BIOE 482 | Musculoskel Tissue Mechanics | 3 or 4 | CEE 463 | Reinforced Concrete II | 3 or 4 |
| BIOE 485 | Computational Mathematics for Machine Learning and Imaging | 4 | CEE 465 | Design of Structural Systems | 3 |
| BIOE 497 | Individual Study (As Approved) | 1 to 4 | CEE 467 | Masonry Structures | 3 or 4 |
| BIOE 498 | Special Topics (As Approved) | 1 to 4 | CEE 468 | Prestressed Concrete | 3 or 4 |
| BIOP 401 | Introduction to Biophysics | 3 | CEE 469 | Wood Structures | 3 or 4 |
| BIOP 419 | Brain, Behavior & Info Process | 3 | CEE 470 | Structural Analysis | 4 |
| BIOP 432 | Photosynthesis | 3 | CEE 471 | Structural Mechanics | 3 or 4 |
| CEE 310 | Transportation Engineering | 3 | CEE 472 | Structural Dynamics I | 3 or 4 |
| CEE 320 | Construction Engineering | 3 | CEE 473 | Wind Effects on Structures | 4 |
| CEE 330 | Environmental Engineering | 3 | CEE 474 | Mechanics of Additive Manufacturing | 3 or 4 |
| CEE 340 | Energy and Global Environment | 3 | CEE 483 | Soil Mechanics and Behavior | 4 |
| CEE 350 | Water Resources Engineering | 3 | CEE 484 | Applied Soil Mechanics | 3 or 4 |
| CEE 360 | Structural Engineering | 3 | CEE 490 | Computer Methods | 3 or 4 |
| CEE 380 | Geotechnical Engineering | 3 | CEE 491 | Decision and Risk Analysis | 3 or 4 |
| CEE 398 | Special Topics (As Approved) | 0 to 4 | CEE 497 | Independent Study (As Approved) | 1 to 16 |
| CEE 401 | Concrete Properties & 3D Print | 4 | CEE 498 | Special Topics (As Approved) | 1 to 4 |
| CEE 405 | Asphalt Materials I | 3 or 4 | CHBE 413 | Data Science for Chemistry and Engineering | 4 |
| CEE 406 | Pavement Design I | 3 or 4 | CHBE 422 | Mass Transfer Operations | 4 |
| CEE 407 | Airport Design | 3 or 4 | CHBE 424 | Chemical Reaction Engineering | 3 |
| CEE 408 | Railroad Transportation Engrg | 3 or 4 | CHBE 451 | Transport Phenomena | 3 |
| CEE 409 | Railroad Track Engineering | 3 or 4 | CHBE 453 | Electrochemical Engineering | 2 or 3 |
| CEE 410 | Railway Signaling & Control | 3 or 4 | CHBE 458 | Synthetic Nanomaterials | 3 |
| CEE 411 | RR Project Design & Constr | 3 or 4 | CHBE 459 | Polymer Rheology | 3 |
| CEE 412 | High-Speed Rail Engineering | 3 or 4 | CHBE 461 | Functional Materials Assembly | 3 |
| CEE 415 | Geometric Design of Roads | 4 | CHBE 471 | Biochemical Engineering | 3 or 4 |
| CEE 416 | Traffic Capacity Analysis | 3 or 4 | CHBE 472 | Techniques in Biomolecular Eng | 3 or 4 |
| CEE 417 | Urban Transportation Planning (As Approved) | 4 | CHBE 473 | Biomolecular Engineering | 3 or 4 |
| CEE 418 | Public Transportation Systems | 3 or 4 | CHBE 474 | Metabolic Engineering | 3 or 4 |
| CEE 419 | Transportation Economics | 4 | CHBE 475 | Tissue Engineering | 3 |
| CEE 420 | Construction Productivity | 3 or 4 | CHBE 476 | Biotransport | 3 |
| CEE 421 | Construction Planning | 3 or 4 | CHBE 478 | Bioenergy Technology | 3 |
| CEE 422 | Construction Cost Analysis | 3 or 4 | CHEM 232 | Elementary Organic Chemistry I | 3 or 4 |
| CEE 434 | Environmental Systems I | 3 | CHEM 233 | Elementary Organic Chem Lab I | 2 |

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| CHEM 236 | Fundamental Organic Chem I | 4 | CS 431 | Embedded Systems | 3 or 4 |
| CHEM 237 | Structure and Synthesis | 2 | CS 433 | Computer System Organization | 3 or 4 |
| CHEM 312 | Inorganic Chemistry | 3 | CS 436 | Computer Networking Laboratory | 3 or 4 |
| CHEM 315 | Instrumental Chem Systems Lab | 2 | CS 437 | Topics in Internet of Things | 3 or 4 |
| CHEM 317 | Inorganic Chemistry Lab | 3 | CS 438 | Communication Networks | 3 or 4 |
| CHEM 332 | Elementary Organic Chem II | 4 | CS 439 | Wireless Networks | 3 or 4 |
| CHEM 420 | Instrumental Characterization | 2 | CS 440 | Artificial Intelligence | 3 or 4 |
| CHEM 436 | Fundamental Organic Chem II | 3 | CS 441 | Applied Machine Learning | 3 or 4 |
| CHEM 437 | Organic Chemistry Lab | 3 | CS 442 | Trustworthy Machine Learning | 3 or 4 |
| CHEM 440 | Physical Chemistry Principles | 4 | CS 443 | Reinforcement Learning | 3 or 4 |
| CHEM 442 | Physical Chemistry I | 4 | CS 444 | Deep Learning for Computer Vision | 3 or 4 |
| CHEM 444 | Physical Chemistry II | 4 | CS 445 | Computational Photography | 3 or 4 |
| CHEM 445 | Physical Principles Lab I | 2 | CS 446 | Machine Learning | 3 or 4 |
| CHEM 447 | Physical Principles Lab II | 2 | CS 447 | Natural Language Processing | 3 or 4 |
| CHEM 452 | Data Science for Chemistry and Engineering | 4 | CS 448 | Audio Computing Laboratory | 3 or 4 |
| CHEM 460 | Green Chemistry | 3 or 4 | CS 450 | Numerical Analysis | 3 or 4 |
| CHEM 472 | Physical Biochemistry | 3 | CS 460 | Security Laboratory | 3 or 4 |
| CHEM 480 | Polymer Chemistry | 3 or 4 | CS 461 | Computer Security I | 4 |
| CHEM 482 | Polymer Physics | 3 or 4 | CS 463 | Computer Security II | 3 or 4 |
| CHEM 483 | Solid State Structural Anlys | 4 | CS 465 | User Interface Design | 4 |
| CHEM 488 | Surfaces and Colloids | 3 or 4 | CS 466 | Introduction to Bioinformatics | 3 or 4 |
| CHEM 497 | Individual Study Senior (As Approved) | 1 to 3 | CS 467 | Social Visualization | 3 or 4 |
| CPSC 489 | Photosynthesis | 3 | CS 468 | Tech and Advertising Campaigns | 3 |
| CS 225 | Data Structures | 4 | CS 469 | Computational Advertising Infrastructure | 3 or 4 |
| CS 233 | Computer Architecture | 4 | CS 473 | Algorithms | 4 |
| CS 242 | Programming Studio | 3 | CS 474 | Logic in Computer Science | 3 or 4 |
| CS 340 | Introduction to Computer Systems | 3 | CS 475 | Formal Models of Computation | 3 or 4 |
| CS 341 | System Programming | 4 | CS 476 | Program Verification | 3 or 4 |
| CS 357 | Numerical Methods I | 3 | CS 477 | Formal Software Development Methods | 3 or 4 |
| CS 374 | Introduction to Algorithms & Models of Computation | 4 | CS 481 | Advanced Topics in Stochastic Processes & Applications | 3 or 4 |
| CS 407 | Cryptography | 3 or 4 | CS 482 | Simulation | 3 or 4 |
| CS 409 | The Art of Web Programming | 3 or 4 | CS 483 | Applied Parallel Programming | 4 |
| CS 410 | Text Information Systems | 3 or 4 | CS 484 | Parallel Programming | 3 or 4 |
| CS 411 | Database Systems | 3 or 4 | CS 498 | Special Topics (As Approved) | 1 to 4 |
| CS 412 | Introduction to Data Mining | 3 or 4 | CSE 401 | Numerical Analysis | 3 or 4 |
| CS 413 | Intro to Combinatorics | 3 or 4 | CSE 402 | Parallel Progrmg: Sci & Engrg | 3 or 4 |
| CS 414 | Multimedia Systems | 3 or 4 | CSE 408 | Applied Parallel Programming | 4 |
| CS 415 | Game Development | 3 or 4 | CSE 412 | Numerical Thermo-Fluid Mechs | 2 to 4 |
| CS 418 | Interactive Computer Graphics | 3 or 4 | CSE 414 | Algorithms | 4 |
| CS 419 | Production Computer Graphics | 3 or 4 | CSE 422 | Computer System Organization | 3 or 4 |
| CS 420 | Parallel Progrmg: Sci & Engrg | 3 or 4 | CSE 423 | Operating Systems Design | 3 or 4 |
| CS 421 | Programming Languages & Compilers | 3 or 4 | CSE 426 | Software Engineering I | 3 or 4 |
| CS 422 | Programming Language Design | 3 or 4 | CSE 427 | Interactive Computer Graphics | 3 or 4 |
| CS 423 | Operating Systems Design | 3 or 4 | CSE 428 | Statistical Computing | 3 or 4 |
| CS 424 | Real-Time Systems | 3 or 4 | CSE 429 | Software Engineering II | 3 or 4 |
| CS 425 | Distributed Systems | 3 or 4 | CSE 440 | Statistical Data Management | 3 or 4 |
| CS 426 | Compiler Construction | 3 or 4 | CSE 441 | Introduction to Optimization | 3 or 4 |
| CS 427 | Software Engineering I | 3 or 4 | CSE 448 | Advanced Data Analysis | 4 |
| CS 428 | Software Engineering II | 3 or 4 | CSE 450 | Computational Mechanics | 3 or 4 |
| CS 429 | Software Engineering II, ACP | 3 | CSE 451 | Finite Element Analysis | 3 or 4 |
| | | | CSE 461 | Computational Aerodynamics | 3 or 4 |

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| CSE 485 | Atomic Scale Simulations | 3 or 4 | ECE 460 | Optical Imaging | 4 |
| ECE 329 | Fields and Waves I | 3 | ECE 461 | Digital Communications | 3 |
| ECE 330 | Power Ckts & Electromechanics | 3 | ECE 462 | Logic Synthesis | 3 |
| ECE 333 | Green Electric Energy | 3 | ECE 463 | Digital Communications Lab | 2 |
| ECE 340 | Semiconductor Electronics | 3 | ECE 464 | Power Electronics | 3 |
| ECE 342 | Electronic Circuits | 3 | ECE 467 | Biophotonics | 3 |
| ECE 343 | Electronic Circuits Laboratory | 1 | ECE 468 | Optical Remote Sensing | 3 |
| ECE 350 | Fields and Waves II | 3 | ECE 469 | Power Electronics Laboratory | 2 |
| ECE 374 | Introduction to Algorithms & Models of Computation | 4 | ECE 470 | Introduction to Robotics | 4 |
| ECE 380 | Biomedical Imaging | 3 | ECE 472 | Biomedical Ultrasound Imaging | 3 |
| ECE 385 | Digital Systems Laboratory | 3 | ECE 473 | Fund of Engrg Acoustics | 3 or 4 |
| ECE 391 | Computer Systems Engineering | 4 | ECE 476 | Power System Analysis | 3 |
| ECE 395 | Advanced Digital Projects Lab | 2 or 3 | ECE 478 | Formal Software Development Methods | 3 or 4 |
| ECE 401 | Signal Processing | 4 | ECE 479 | IoT and Cognitive Computing | 4 |
| ECE 402 | Electronic Music Synthesis | 3 | ECE 480 | Magnetic Resonance Imaging | 3 or 4 |
| ECE 403 | Audio Engineering | 3 | ECE 481 | Nanotechnology | 4 |
| ECE 407 | Cryptography | 3 or 4 | ECE 482 | Digital IC Design | 3 |
| ECE 408 | Applied Parallel Programming | 4 | ECE 483 | Analog IC Design | 3 |
| ECE 410 | Neural Circuits and Systems | 3 or 4 | ECE 486 | Control Systems | 4 |
| ECE 411 | Computer Organization & Design | 4 | ECE 487 | Intro Quantum Electr for EEs | 3 |
| ECE 414 | Biomedical Instrumentation | 3 | ECE 488 | Compound Semicond & Devices | 3 |
| ECE 415 | Biomedical Instrumentation Lab | 2 | ECE 489 | Robot Dynamics and Control | 4 |
| ECE 416 | Biosensors | 3 | ECE 490 | Introduction to Optimization | 3 or 4 |
| ECE 417 | Multimedia Signal Processing | 4 | ECE 491 | Numerical Analysis | 3 or 4 |
| ECE 418 | Image & Video Processing | 4 | ECE 492 | Parallel Progrmg: Sci & Engrg | 3 or 4 |
| ECE 419 | Security Laboratory | 3 or 4 | ECE 493 | Advanced Engineering Math | 3 or 4 |
| ECE 420 | Embedded DSP Laboratory | 2 | ECE 495 | Photonic Device Laboratory | 3 |
| ECE 422 | Computer Security I | 4 | ECE 498 | Special Topics in ECE (As Approved) | 1 to 4 |
| ECE 424 | Computer Security II | 3 or 4 | ECON 302 | Inter Microeconomic Theory (As Approved) | 3 |
| ECE 425 | Intro to VLSI System Design | 3 | EPSY 456 | Human Performance and Cognition in Context (As Approved) | 3 or 4 |
| ECE 428 | Distributed Systems | 3 or 4 | ES 470 | Fuel Cells & Hydrogen Sources | 3 |
| ECE 431 | Electric Machinery | 4 | ES 475 | Wind Power Systems | 3 or 4 |
| ECE 435 | Computer Networking Laboratory | 3 or 4 | ETMA 430 | Project Management (As Approved) | 2 |
| ECE 437 | Sensors and Instrumentation | 3 | GEOL 450 | Investigating the Earth's Interior | 3 |
| ECE 438 | Communication Networks | 3 or 4 | GEOL 451 | Environmental Geophysics | 4 |
| ECE 439 | Wireless Networks | 3 or 4 | GEOL 454 | Introduction to Seismology | 3 or 4 |
| ECE 441 | Physcs & Modeling Semicond Dev | 3 | GEOL 460 | Geochemistry | 3 |
| ECE 443 | LEDs and Solar Cells | 4 | IB 421 | Photosynthesis | 3 |
| ECE 444 | IC Device Theory & Fabrication | 4 | IE 310 | Deterministic Models in Optimization | 3 |
| ECE 447 | Active Microwave Ckt Design | 3 | IE 311 | Operations Research Lab | 1 |
| ECE 448 | Artificial Intelligence | 3 or 4 | IE 330 | Industrial Quality Control | 3 |
| ECE 449 | Machine Learning | 3 or 4 | IE 340 | Human Factors | 4 |
| ECE 451 | Adv Microwave Measurements | 3 | IE 360 | Facilities Planning and Design | 3 |
| ECE 452 | Electromagnetic Fields | 3 | IE 361 | Production Planning & Control | 3 |
| ECE 453 | Wireless Communication Systems | 4 | IE 370 | Stochastic Processes and Applications | 3 |
| ECE 454 | Antennas | 3 | IE 371 | Simulation Modeling with Applications for Industrial Engineering | 3 |
| ECE 455 | Optical Electronics | 3 or 4 | IE 400 | Design & Anlys of Experiments | 3 or 4 |
| ECE 456 | Global Nav Satellite Systems | 4 | IE 410 | Advanced Topics in Stochastic Processes & Applications | 3 or 4 |
| ECE 457 | Microwave Devices & Circuits | 3 | IE 411 | Optimization of Large Systems | 3 or 4 |
| ECE 458 | Applic of Radio Wave Propag | 3 | IE 412 | OR Models for Mfg Systems | 3 or 4 |
| ECE 459 | Communications Systems | 3 | | | |

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| IE 413 | Simulation | 3 or 4 | MSE 304 | Electronic Properties of Matls | 3 |
| IE 420 | Financial Engineering | 3 or 4 | MSE 307 | Materials Laboratory I | 3 |
| IE 430 | Economic Found of Quality Syst | 3 or 4 | MSE 308 | Materials Laboratory II | 3 |
| IE 431 | Design for Six Sigma | 3 | MSE 401 | Thermodynamics of Materials | 3 |
| IE 434 | Deep Learning: Mathematics and Applications | 3 or 4 | MSE 402 | Kinetic Processes in Materials | 3 |
| IE 445 | Human Performance and Cognition in Context (As Approved) | 3 or 4 | MSE 403 | Synthesis of Materials | 3 |
| IE 497 | Independent Study (As Approved) | 1 to 4 | MSE 405 | Microstructure Determination | 3 |
| IE 498 | Special Topics (As Approved) | 1 to 4 | MSE 406 | Thermal-Mech Behavior of Matls | 3 |
| MATH 314 | Introduction to Higher Mathematics | 4 | MSE 420 | Ceramic Materials & Properties | 3 |
| MATH 347 | Fundamental Mathematics | 3 | MSE 421 | Ceramic Processing | 3 or 4 |
| MATH 357 | Numerical Methods I | 3 | MSE 422 | Electrical Ceramics | 3 |
| MATH 403 | Euclidean Geometry | 3 or 4 | MSE 440 | Mechanical Behavior of Metals | 3 |
| MATH 412 | Graph Theory | 3 or 4 | MSE 441 | Metals Processing | 3 |
| MATH 413 | Intro to Combinatorics | 3 or 4 | MSE 443 | Design of Engineering Alloys | 3 |
| MATH 414 | Mathematical Logic | 3 or 4 | MSE 450 | Polymer Science & Engineering | 3 or 4 |
| MATH 417 | Intro to Abstract Algebra | 3 or 4 | MSE 453 | Plastics Engineering | 3 |
| MATH 418 | Intro to Abstract Algebra II | 3 or 4 | MSE 455 | Macromolecular Solids | 3 |
| MATH 423 | Differential Geometry | 3 or 4 | MSE 456 | Mechanics of Composites | 3 |
| MATH 424 | Honors Real Analysis | 3 | MSE 457 | Polymer Chemistry | 3 or 4 |
| MATH 425 | Honors Advanced Analysis | 3 | MSE 458 | Polymer Physics | 3 or 4 |
| MATH 427 | Honors Abstract Algebra | 3 | MSE 460 | Electronic Materials I | 3 |
| MATH 428 | Honors Topics in Mathematics (As Approved) | 3 | MSE 461 | Electronic Materials II | 3 |
| MATH 432 | Set Theory and Topology | 3 or 4 | MSE 464 | Magnetic Materials and their Applications | 3 or 4 |
| MATH 442 | Intro Partial Diff Equations | 3 or 4 | MSE 466 | Electrochemical Energy Conversion | 3 |
| MATH 444 | Elementary Real Analysis | 3 or 4 | MSE 470 | Design and Use of Biomaterials | 3 |
| MATH 446 | Applied Complex Variables | 3 or 4 | MSE 473 | Biomolecular Materials Science | 3 |
| MATH 447 | Real Variables | 3 or 4 | MSE 474 | Biomaterials and Nanomedicine | 3 |
| MATH 448 | Complex Variables | 3 or 4 | MSE 480 | Surfaces and Colloids | 3 or 4 |
| MATH 450 | Numerical Analysis | 3 or 4 | MSE 481 | Electron Microscopy | 3 or 4 |
| MATH 453 | Number Theory | 3 or 4 | MSE 485 | Atomic Scale Simulations | 3 or 4 |
| MATH 464 | Statistics and Probability II | 3 or 4 | MSE 487 | Materials for Nanotechnology | 3 or 4 |
| MATH 466 | Applied Random Processes | 3 or 4 | MSE 488 | Optical Materials | 3 or 4 |
| MATH 473 | Algorithms | 4 | MSE 489 | Matl Select for Sustainability | 3 or 4 |
| MATH 475 | Formal Models of Computation | 3 or 4 | MSE 497 | Independent Study (As Approved) | 1 to 4 |
| MATH 481 | Vector and Tensor Analysis | 3 or 4 | MSE 498 | Special Topics (As Approved) | 1 to 4 |
| MATH 482 | Linear Programming | 3 or 4 | NE 410 | Neural Circuits and Systems | 3 or 4 |
| MATH 484 | Nonlinear Programming | 3 or 4 | NEUR 419 | Brain, Behavior & Info Process | 3 |
| MATH 487 | Advanced Engineering Math | 3 or 4 | NPRE 321 | Introduction to Plasmas and Applications | 3 |
| MATH 489 | Dynamics & Differential Eqns | 3 or 4 | NPRE 330 | Materials in Nuclear Engineering | 3 |
| MATH 490 | Advanced Topics in Mathematics (As Approved) | 1 to 4 | NPRE 402 | Nuclear Power Engineering | 3 or 4 |
| MATH 492 | Undergraduate Research in Math (As Approved) | 1 to 3 | NPRE 412 | Nuclear Power Econ & Fuel Mgmt | 3 or 4 |
| MCB 401 | Cellular Physiology | 3 | NPRE 413 | Nuclear Separations and Fuel Reprocessing | 2 or 3 |
| MCB 402 | Sys & Integrative Physiology | 3 | NPRE 421 | Plasma and Fusion Science | 3 |
| MCB 406 | Gene Expression & Regulation | 3 | NPRE 423 | Plasma Laboratory | 2 |
| MCB 419 | Brain, Behavior & Info Process | 3 | NPRE 429 | Plasma Engineering | 3 |
| MCB 446 | Physical Biochemistry | 3 | NPRE 435 | Radiological Imaging | 3 |
| MCB 450 | Introductory Biochemistry | 3 | NPRE 441 | Radiation Protection | 4 |
| MCB 493 | Special Topics Mol Cell Biol (As Approved) | 1 to 4 | NPRE 442 | Radioactive Waste Management | 3 |
| | | | NPRE 445 | Interaction of Radiation with Matter | 4 |
| | | | NPRE 448 | Nuclear Syst Engrg & Design | 4 |
| | | | NPRE 449 | Nuclear Systems Engineering and Design | 3 |

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| NPRE 451 | NPRE Laboratory | 3 |
| NPRE 452 | Advanced Radiological Science Lab | 2 or 4 |
| NPRE 455 | Neutron Diffusion & Transport | 4 |
| NPRE 457 | Safety Anlys Nucl Reactor Syst | 3 or 4 |
| NPRE 461 | Probabilistic Risk Assessment | 3 or 4 |
| NPRE 498 | Special Topics (As Approved) | 1 to 4 |
| NRES 445 | Statistical Methods | 4 |
| PHYS 329 | Atmospheric Dynamics I | 3 |
| PHYS 330 | Atmospheric Dynamics II | 3 |
| PHYS 370 | Introduction to Quantum Information and Computing | 3 |
| PHYS 401 | Classical Physics Lab | 3 |
| PHYS 402 | Light | 3 or 4 |
| PHYS 403 | Modern Experimental Physics | 4 or 5 |
| PHYS 404 | Electronic Circuits | 4 or 5 |
| PHYS 427 | Thermal & Statistical Physics | 4 |
| PHYS 435 | Electromagnetic Fields I | 3 |
| PHYS 436 | Electromagnetic Fields II | 3 |
| PHYS 446 | Modern Computational Physics | 3 |
| PHYS 460 | Condensed Matter Physics | 4 |
| PHYS 466 | Atomic Scale Simulations | 3 or 4 |
| PHYS 470 | Subatomic Physics | 4 |
| PHYS 475 | Introduction to Biophysics | 3 or 4 |
| PHYS 485 | Atomic Phys & Quantum Theory | 3 |
| PHYS 486 | Quantum Physics I | 4 |
| PHYS 487 | Quantum Physics II | 4 |
| PHYS 496 | Communicating in Physics—Writing Papers and Giving Talks (As Approved) | 3 |
| PHYS 497 | Individual Study (As Approved) | 1 to 4 |
| PHYS 498 | Special Topics in Physics (As Approved) | 1 to 4 |
| PSYC 358 | Human Factors | 4 |
| PSYC 456 | Human Performance and Cognition in Context (As Approved) | 3 or 4 |
| SE 400 | Engineering Law (As Approved) | 3 or 4 |
| SE 402 | Comp-Aided Product Realization | 3 or 4 |
| SE 411 | Reliability Engineering | 3 or 4 |
| SE 412 | Nondestructive Evaluation | 3 or 4 |
| SE 413 | Engineering Design Optimization | 3 or 4 |
| SE 420 | Digital Control Systems | 4 |
| SE 422 | Robot Dynamics and Control | 4 |
| SE 423 | Mechatronics | 3 |
| SE 424 | State Space Design for Control | 3 |
| SE 450 | Decision Analysis I (As Approved) | 3 or 4 |
| SE 497 | Independent Study (As Approved) | 0 to 4 |
| SE 498 | Special Topics (As Approved) | 1 to 4 |
| STAT 409 | Actuarial Statistics II | 4 |
| STAT 410 | Statistics and Probability II | 3 or 4 |
| STAT 420 | Methods of Applied Statistics | 3 or 4 |
| STAT 424 | Design of Experiments | 3 or 4 |
| STAT 425 | Statistical Modeling I | 3 or 4 |
| STAT 426 | Statistical Modeling II | 3 or 4 |
| STAT 428 | Statistical Computing | 3 or 4 |
| STAT 429 | Time Series Analysis | 3 or 4 |

| | | |
|----------|---|--------|
| STAT 430 | Topics in Applied Statistics (As Approved) | 3 or 4 |
| STAT 431 | Applied Bayesian Analysis | 3 or 4 |
| STAT 432 | Basics of Statistical Learning | 3 or 4 |
| STAT 433 | Stochastic Processes | 3 or 4 |
| STAT 434 | Survival Analysis | 3 or 4 |
| STAT 437 | Unsupervised Learning | 3 or 4 |
| STAT 440 | Statistical Data Management | 3 or 4 |
| STAT 443 | Professional Statistics (As Approved) | 3 or 4 |
| STAT 448 | Advanced Data Analysis | 4 |
| STAT 480 | Big Data Analytics | 3 or 4 |
| TE 461 | Technology Entrepreneurship (As Approved) | 3 |
| TMGT 460 | Business Process Modeling | 3 |
| TMGT 461 | Tech, Eng, & Mgt Final Project | 4 |
| UP 430 | Urban Transportation Planning (As Approved) | 4 |

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 |

for the degree of Bachelor of Science in Mechanical Engineering

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/mechanical-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/>). One of the SBS courses must be an introductory economics course (ECON 102 or ECON 103). ME 470 will 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 |
| ENG 100 | 1 |
| MATH 221 (MATH 220 may be substituted) | 4 |
| CHEM 102 | 3 |
| CHEM 103 | 1 |
| ECON 102 or 103 | 3 |
| ME 170 (or Composition I) | 3 |
| | 15 |

Total Hours 15

| 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 |
| Science elective course | 4 |
| | 18 |

Total Hours 18

| Second Year | |
|-----------------------|--------------|
| First Semester | Hours |
| ME 270 | 3 |
| MATH 241 | 4 |
| PHYS 212 | 4 |
| MATH 257 | 3 |
| TAM 210 | 2 |
| ME 290 | 0 |
| | 16 |

Total Hours 16

| Second Year | |
|--|--------------|
| Second Semester | Hours |
| ME 200 | 3 |
| MATH 285 | 3 |
| ECE 205 (ECE 110 and either ECE 210 or ECE 211 may be substituted) | 3 |
| TAM 212 | 3 |
| TAM 251 | 3 |
| | 15 |

Total Hours 15

| Third Year | |
|-----------------------|--------------|
| First Semester | Hours |
| ME 310 | 4 |
| ME 340 | 3.5 |
| ECE 206 | 1 |
| ME 330 | 4 |

| | |
|--------|-------------|
| ME 370 | 3 |
| | 15.5 |

Total Hours 15.5

| Third Year | |
|---|--------------|
| Second Semester | Hours |
| ME 320 | 4 |
| ME 360 | 3.5 |
| ME 371 | 3 |
| General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation) | 3 |
| Language Other Than English (3rd level) | 4 |
| | 17.5 |

Total Hours 17.5

| Fourth Year | |
|---|--------------|
| First Semester | Hours |
| Statistics elective course | 3 |
| MechSE elective course | 3 |
| ME 470 (or Technical elective course) | 3 |
| General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation) | 3 |
| Free Elective course | 3 |
| | 15 |

Total Hours 15

| Fourth Year | |
|---|--------------|
| Second Semester | Hours |
| MechSE elective course | 3 |
| Technical elective course or ME 470 | 3 |
| Technical elective course | 3 |
| General Education course (Choose a Humanities or Social/ Behavioral Science course with Cultural Studies designation) | 3 |
| Free Elective course | 4 |
| | 16 |

Total Hours 16**Total Hours: 128**

for the degree of Bachelor of Science Major in Mechanical Engineering

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

Mechanical Engineering 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

for the degree of Bachelor of Science in Mechanical Engineering

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

B.S. in Mechanical Engineering (<https://mechse.illinois.edu/undergraduate/bs-mechanical-engineering/>)

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/>)