Twin Cities Campus

Mechanical Engineering B.M.E.

Mechanical Engineering

College of Science and Engineering

- Program Type: Baccalaureate
- Requirements for this program are current for Fall 2020
- Required credits to graduate with this degree: 124
- Required credits within the major: 108 to 110
- The co-operative work training option to the program requires two or three semesters of supervised work at a corporate host site.
- Degree: Bachelor of Mechanical Engineering

The Department of Mechanical Engineering is committed to offering undergraduate and graduate education of the highest quality in mechanical engineering, to conducting significant basic and applied research in selected areas, and to providing professional service to the appropriate constituencies of a major land grant university.

Mechanical engineering is involved in most technological activities of society and dominates many, including automotive, transportation, materials handling, environmental and pollution control systems, refrigeration and cryogenics, power systems design, automation, system dynamics and control, computer-aided design and manufacturing, capital equipment design, and consumer products production. A mechanical engineer may be engaged in design, development, research, testing, manufacturing, administration, marketing, consulting, or education.

The program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org.

Program Delivery

This program is available:

- via classroom (the majority of instruction is face-to-face)

Admission Requirements

Students must complete 8 courses before admission to the program.

Freshman and transfer students students are usually admitted to pre-major status before admission to this major

For information about University of Minnesota admission requirements, visit the Office of Admissions website.

Required prerequisites

Mathematics

Honors math (MATH 1571H, 1572H, 2573H, 2574H) may be taken in place of the listed courses.
MATH 1271 - Calculus I [MATH] (4.0 cr)
or MATH 1371 - CSE Calculus I [MATH] (4.0 cr)
MATH 1272 - Calculus II (4.0 cr)
or MATH 1372 - CSE Calculus II (4.0 cr)
MATH 2263 - Multivariable Calculus (4.0 cr)
or MATH 2374 - CSE Multivariable Calculus and Vector Analysis (4.0 cr)

Physical Sciences

CHEM 1061 - Chemical Principles I [PHYS] (3.0 cr)
or CHEM 1071H - Honors Chemistry I [PHYS] (3.0 cr)
CHEM 1065 - Chemical Principles I Laboratory [PHYS] (1.0 cr)
or CHEM 1075H - Honors Chemistry I Laboratory [PHYS] (1.0 cr)
PHYS 1301W - Introductory Physics for Science and Engineering I [PHYS, WI] (4.0 cr)
or PHYS 1401V - Honors Physics I [PHYS, WI] (4.0 cr)
PHYS 1302W - Introductory Physics for Science and Engineering II [PHYS, WI] (4.0 cr)
or PHYS 1402V - Honors Physics II [PHYS, WI] (4.0 cr)

Statics and Dynamics

AEM 2021 - Statics and Dynamics (4.0 cr)
or take the following course pair
AEM 2011 - Statics (3.0 cr)
AEM 2012 - Dynamics (3.0 cr)

Material or Thermal Science

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MATS 2001 - Introduction to the Science of Engineering Materials (3.0 cr)
or ME 3331 - Thermodynamics (3.0 cr)

General Requirements

All students are required to complete general University and college requirements including writing and liberal education courses. For more information about University-wide requirements, see the liberal education requirements.Required courses for the major or minor in which a student receives a D grade (with or without plus or minus) do not count toward the major or minor (including transfer courses).

Program Requirements

Linear Algebra & Differential Equations

MATH 2373 - CSE Linear Algebra and Differential Equations (4.0 cr)
or MATH 2243 - Linear Algebra and Differential Equations (4.0 cr)

Major Courses

CSCI 1113 - Introduction to C/C++ Programming for Scientists and Engineers (4.0 cr)
MATS 2002 - Introduction to the Science of Engineering Materials Laboratory (1.0 cr)
AEM 3031 - Deformable Body Mechanics (3.0 cr)
EE 3005 - Fundamentals of Electrical Engineering (4.0 cr)
EE 3006 - Fundamentals of Electrical Engineering Laboratory (1.0 cr)
IE 3521 - Statistics, Quality, and Reliability (4.0 cr)
ME 2011 - Introduction to Engineering (4.0 cr)
ME 3221 - Fundamentals of Design & Manufacturing (4.0 cr)
ME 3222 - Mechanisms & Machine Design (4.0 cr)
ME 3281 - System Dynamics and Control (4.0 cr)
ME 3332 - Fluid Mechanics (3.0 cr)
ME 3333 - Heat Transfer (3.0 cr)
ME 4031W - Basic Mechanical Measurements Laboratory [WI] (4.0 cr)
ME 4054W - Design Projects [WI] (4.0 cr)
ME 4053 - Mechanical Engineering Modeling (4.0 cr)
MATS 2001 - Introduction to the Science of Engineering Materials (3.0 cr)
or ME 3331 - Thermodynamics (3.0 cr)

Major Course Elective

ME 4131W - Indoor Environment & Energy Laboratory [WI] (4.0 cr)
or ME 4231 - Motion Control Laboratory (4.0 cr)
or ME 4232 - Fluid Power Control Lab (4.0 cr)
or ME 4331 - Thermal Energy Engineering Laboratory (4.0 cr)
or ME 4431W - Energy Conversion Systems Laboratory [WI] (4.0 cr)

ME Technical Electives

Complete 8 ME technical elective credits.
Take 8 or more credit(s) from the following:

Environmental

Take 0 or more credit(s) from the following:

- ME 5101 - Vapor Power Cycles (4.0 cr)
- ME 5103 - Thermal Environmental Engineering (4.0 cr)
- ME 5113 - Aerosol/Particle Engineering (4.0 cr)
- ME 5133 - Aerosol Measurement Laboratory (4.0 cr)
- ME 5312 - Solar Thermal Technologies (4.0 cr)

•Design & Manufacturing

Take 0 or more credit(s) from the following:

- ME 5221 - Computer-Assisted Product Realization (4.0 cr)
- ME 5223 - Materials in Design (4.0 cr)
- ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
- ME 5241 - Computer-Aided Engineering (4.0 cr)
- ME 5243 - Advanced Mechanism Design (4.0 cr)
- ME 5247 - Applied Stress Analysis (4.0 cr)
- ME 5248 - Vibration Engineering (4.0 cr)
- ME 5281 - Feedback Control Systems (4.0 cr)
- ME 5286 - Robotics (4.0 cr)

•Thermal Sciences

(Power & Propulsion, Thermodynamics, Heat Transfer, Fluid Mechanics)

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Take 0 or more credit(s) from the following:
- ME 5101 - Vapor Power Cycles (4.0 cr)
- ME 5312 - Solar Thermal Technologies (4.0 cr)
- ME 5332 - Intermediate Fluid Mechanics (4.0 cr)
- ME 5341 - Case Studies in Thermal Engineering and Design (4.0 cr)
- ME 5344 - Thermodynamics of Fluid Flow With Applications (4.0 cr)
- ME 5351 - Computational Heat Transfer (4.0 cr)
- ME 5446 - Introduction to Combustion (4.0 cr)
- ME 5461 - Internal Combustion Engines (4.0 cr)
- ME 5462 - Gas Turbines (4.0 cr)
- ME 5666 - Modern Thermodynamics (4.0 cr)

•ME EIP

Students in the ME EIP program are required to include ME 3041 and 4043W in their technical electives. ME 4044 is strongly recommended.
- ME 3041 - Industrial Assignment I (2.0 cr)

ME 4043W - Industrial Assignment II [WI] (4.0 cr)
ME 4044 - Industrial Assignment III (2.0 cr)

Specialization Elective

The specialization elective is any 3 or 4 credit class offered at the University of Minnesota at the 3XXX level or above which (1) complements your career goals in mechanical engineering in some way, (2) is substantive, (3) has content which is not overly redundant with any of your other classes, and (4) is not being used to fulfill a liberal education core or theme requirement.
Take 1 or more course(s) totaling 3 - 4 credit(s) from the following:
- AEM 4202 - Aerodynamics (4.0 cr)
- AEM 4203 - Aerospace Propulsion (4.0 cr)
- AEM 4247 - Hypersonic Aerodynamics (3.0 cr)
- AEM 4253 - Computational Fluid Mechanics (3.0 cr)
- AEM 4301 - Orbital Mechanics (3.0 cr)
- AEM 4303W - Flight Dynamics and Control [WI] (3.0 cr)
- AEM 4305 - Spacecraft Attitude Dynamics and Control (3.0 cr)
- AEM 4501 - Aerospace Structures (3.0 cr)
- AEM 4502 - Computational Structural Analysis (3.0 cr)
- AEM 4511 - Mechanics of Composite Materials (3.0 cr)
- AEM 4581 - Mechanics of Solids (3.0 cr)
- AEM 5247 - Hypersonic Aerodynamics (3.0 cr)
- AEM 5253 - Computational Fluid Mechanics (3.0 cr)
- AEM 5321 - Modern Feedback Control (3.0 cr)
- AEM 5401 - Intermediate Dynamics (3.0 cr)
- AEM 5451 - Optimal Estimation (3.0 cr)
- AEM 5501 - Continuum Mechanics (3.0 cr)
- AEM 5503 - Theory of Elasticity (3.0 cr)
- AEM 5581 - Mechanics of Solids (3.0 cr)
- AEM 5651 - Aeroelasticity (3.0 cr)
- BBE 4013 - Transport in Biological Processes II (3.0 cr)
- BBE 4301 - Applied Surface and Colloid Science (3.0 cr)
- BBE 4333 *{Inactive}*(4.0 cr)
- BBE 4523 - Ecological Engineering Design (3.0 cr)
- BBE 4533 - Sustainable Waste Management Engineering (3.0 cr)
- BBE 4608 - Environmental and Industrial Microbiology (3.0 cr)
- BBE 4713 - Biological Process Engineering (3.0 cr)
- BBE 4723 - Food Process Engineering (3.0 cr)
- BBE 5001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products (4.0 cr)
- BBE 5301 - Applied Surface and Colloid Science (3.0 cr)
- BBE 5302 - Biodegradation of Bioproducts (3.0 cr)
- BBE 5303 - Introduction to Bio-based Materials Science (3.0 cr)
- BBE 5305 - Pulp and Paper Technology (3.0 cr)
- BBE 5333 *{Inactive}*(4.0 cr)
- BBE 5404 - Biopolymers and Biocomposites Engineering (3.0 cr)
- BBE 5608 - Environmental and Industrial Microbiology (3.0 cr)
- BBE 5713 - Biological Process Engineering (3.0 cr)
- BBE 5723 - Food Process Engineering (3.0 cr)
- BBE 5733 - Renewable Energy Technologies (3.0 cr)
- BBE 5743 - Nanobioengineering & Nanobiotechnology (3.0 cr)
- BBE 5753 - Air Quality and Pollution Control Engineering (3.0 cr)
- BMEN 5001 - Advanced Biomaterials (3.0 cr)
- BMEN 5041 - Tissue Engineering (3.0 cr)

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- BMEN 5101 - Advanced Bioelectricity and Instrumentation (3.0 cr)
- BMEN 5111 - Biomedical Ultrasound (3.0 cr)
- BMEN 5201 - Advanced Biomechanics (3.0 cr)
- BMEN 5311 - Advanced Biomedical Transport Processes (3.0 cr)
- BMEN 5321 - Microfluidics in Biology and Medicine (3.0 cr)
- BMEN 5351 - Cell Engineering (3.0 cr)
- BMEN 5401 - Advanced Biomedical Imaging (3.0 cr)
- BMEN 5411 - Neural Engineering (3.0 cr)
- BMEN 5412 - Neuromodulation (3.0 cr)
- BMEN 5413 - Neural Decoding and Interfacing (3.0 cr)
- BMEN 5421 - Introduction to Biomedical Optics (3.0 cr)
- BMEN 5501 - Biology for Biomedical Engineers (3.0 cr)
- BMEN 5701 - Cancer Bioengineering (3.0 cr)
- CEGE 4121 - Computer Applications II (3.0 cr)
- CEGE 4311 - Rock Mechanics (4.0 cr)
- CEGE 4351 - Groundwater Mechanics (3.0 cr)
- CEGE 4352 - Groundwater Modeling (3.0 cr)
- CEGE 4401 - Steel and Reinforced Concrete Design (4.0 cr)
- CEGE 4411 - Matrix Structural Analysis (3.0 cr)
- CEGE 4412 - Reinforced Concrete II (3.0 cr)
- CEGE 4413 - Steel Design II (3.0 cr)
- CEGE 4501 - Hydrologic Design (4.0 cr)
- CEGE 4502 - Water and Wastewater Treatment (3.0 cr)
- CEGE 4511 - Hydraulic Structures (3.0 cr)
- CEGE 5211 - Highway Design & Traffic Operations (4.0 cr)
- CEGE 5212 - Transportation Policy, Planning, and Deployment (3.0 cr)
- CEGE 5213 - Transit Planning and Management (3.0 cr)
- CEGE 5253 *{Inactive}*(4.0 cr)
- CEGE 5351 - Advanced Engineering Mathematics I (3.0 cr)
- CEGE 5411 - Applied Structural Mechanics (3.0 cr)
- CEGE 5414 - Prestressed Concrete Design (3.0 cr)
- CEGE 5415 - Masonry Structures (3.0 cr)
- CEGE 5511 - Urban Hydrology and Water Quality (4.0 cr)
- CEGE 5541 - Environmental Water Chemistry (3.0 cr)
- CEGE 5542 - Experimental Methods in Environmental Engineering (3.0 cr)
- CEGE 5543 - Introductory Environmental Fluid Mechanics (4.0 cr)
- CHEM 4001 - Chemistry of Biomass and Biomass Conversion to Fuels and Products [ENV] (4.0 cr)
- CHEM 4011 - Mechanisms of Chemical Reactions (3.0 cr)
- CHEM 4021 - Computational Chemistry (3.0 cr)
- CHEM 4066 *{Inactive}*(3.0 cr)
- CHEM 4201 - Materials Chemistry (3.0 cr)
- CHEM 4214 - Polymers (3.0 cr)
- CHEM 4221 - Introduction to Polymer Chemistry (3.0 cr)
- CHEM 4301 - Applied Surface and Colloid Science (3.0 cr)
- CHEM 4321 - Organic Synthesis (3.0 cr)
- CHEM 4322 - Advanced Organic Chemistry (3.0 cr)
- CHEM 4352 - Physical Organic Chemistry (3.0 cr)
- CHEM 4361 - Interpretation of Organic Spectra (3.0 cr)
- CHEM 4411 - Introduction to Chemical Biology (3.0 cr)
- CHEM 4412 - Chemical Biology of Enzymes (3.0 cr)
- CHEM 4501 - Introduction to Thermodynamics, Kinetics, and Statistical Mechanics (3.0 cr)
- CHEM 4502 - Introduction to Quantum Mechanics and Spectroscopy (3.0 cr)
- CHEM 4511W - Advanced Physical Chemistry Lab [WI] (3.0 cr)
- CHEM 4701 - Inorganic Chemistry (3.0 cr)
- CHEM 4715 - Physical Inorganic Chemistry (3.0 cr)
- CHEM 4725 - Organometallic Chemistry (3.0 cr)
- CHEM 4735 - Bioinorganic Chemistry (3.0 cr)
- CHEM 4745 - Advanced Inorganic Chemistry (3.0 cr)
- CHEM 5210 - Materials Characterization (4.0 cr)
- CHEM 5245 *{Inactive}*(3.0 cr)
- CHEM 5755 - X-Ray Crystallography (4.0 cr)
- CHEN 3701 - Introduction to Biomolecular Engineering (3.0 cr)
- CHEN 4501W - Chemical Engineering Design [WI] (4.0 cr)
- CHEN 4601 - Process Control (3.0 cr)
- CHEN 4701 - Applied Math (3.0 cr)
- CHEN 4704 - Advanced Undergraduate Physical Rate Processes I: Transport (3.0 cr)

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•CHEN 4707 *{Inactive}*(3.0 cr)
•CHEN 4708 - Advanced Undergraduate Chemical Rate Processes: Analysis of Chemical Reactors (3.0 cr)
•CHEN 5531 *{Inactive}*(3.0 cr)
•CHEN 5751 - Biochemical Engineering (3.0 cr)
•CHEN 5753 - Advanced Biomedical Transport Processes (3.0 cr)
•CHEN 5771 - Colloids and Dispersions (3.0 cr)
•CSCI 4011 - Formal Languages and Automata Theory (4.0 cr)
•CSCI 4041 - Algorithms and Data Structures (4.0 cr)
•CSCI 4041H *{Inactive}*(4.0 cr)
•CSCI 4061 - Introduction to Operating Systems (4.0 cr)
•CSCI 4131 - Internet Programming (3.0 cr)
•CSCI 4203 - Computer Architecture (4.0 cr)
•CSCI 4211 - Introduction to Computer Networks (3.0 cr)
•CSCI 4511W - Introduction to Artificial Intelligence [WI] (4.0 cr)
•CSCI 4611 - Programming Interactive Computer Graphics and Games (3.0 cr)
•CSCI 4707 - Practice of Database Systems (3.0 cr)
•CSCI 5103 - Operating Systems (3.0 cr)
•CSCI 5105 - Introduction to Distributed Systems (3.0 cr)
•CSCI 5106 - Programming Languages (3.0 cr)
•CSCI 5115 - User Interface Design, Implementation and Evaluation (3.0 cr)
•CSCI 5117 - Developing the Interactive Web (3.0 cr)
•CSCI 5123 - Recommender Systems (3.0 cr)
•CSCI 5143 - Real-Time and Embedded Systems (3.0 cr)
•CSCI 5161 - Introduction to Compilers (3.0 cr)
•CSCI 5204 - Advanced Computer Architecture (3.0 cr)
•CSCI 5211 - Data Communications and Computer Networks (3.0 cr)
•CSCI 5221 - Foundations of Advanced Networking (3.0 cr)
•CSCI 5231 *{Inactive}*(3.0 cr)
•CSCI 5271 - Introduction to Computer Security (3.0 cr)
•CSCI 5302 - Analysis of Numerical Algorithms (3.0 cr)
•CSCI 5304 - Computational Aspects of Matrix Theory (3.0 cr)
•CSCI 5403 *{Inactive}*(3.0 cr)
•CSCI 5421 - Advanced Algorithms and Data Structures (3.0 cr)
•CSCI 5451 - Introduction to Parallel Computing: Architectures, Algorithms, and Programming (3.0 cr)
•CSCI 5461 - Functional Genomics, Systems Biology, and Bioinformatics (3.0 cr)
•CSCI 5471 - Modern Cryptography (3.0 cr)
•CSCI 5481 - Computational Techniques for Genomics (3.0 cr)
•CSCI 5511 - Artificial Intelligence I (3.0 cr)
•CSCI 5512 - Artificial Intelligence II (3.0 cr)
•CSCI 5521 - Machine Learning Fundamentals (3.0 cr)
•CSCI 5523 - Introduction to Data Mining (3.0 cr)
•CSCI 5525 - Machine Learning: Analysis and Methods (3.0 cr)
•CSCI 5552 - Sensing and Estimation in Robotics (3.0 cr)
•CSCI 5561 - Computer Vision (3.0 cr)
•CSCI 5607 - Fundamentals of Computer Graphics 1 (3.0 cr)
•CSCI 5608 - Fundamentals of Computer Graphics II (3.0 cr)
•CSCI 5609 - Visualization (3.0 cr)
•CSCI 5611 - Animation & Planning in Games (3.0 cr)
•CSCI 5619 - Virtual Reality and 3D Interaction (3.0 cr)
•CSCI 5707 - Principles of Database Systems (3.0 cr)
•CSCI 5708 - Architecture and Implementation of Database Management Systems (3.0 cr)
•CSCI 5715 - From GPS, Google Maps, and Uber to Spatial Data Science (3.0 cr)
•CSCI 5801 - Software Engineering I (3.0 cr)
•CSCI 5802 - Software Engineering II (3.0 cr)
•EE 3161 - Semiconductor Devices (3.0 cr)
•EE 3601 - Transmission Lines, Fields, and Waves (3.0 cr)
•EE 4111 - Advanced Analog Electronics Design (4.0 cr)
•EE 4301 - Digital Design With Programmable Logic (4.0 cr)
•EE 4341 - Embedded System Design (4.0 cr)
•EE 4363 - Computer Architecture and Machine Organization (4.0 cr)
•EE 4389W - Introduction to Predictive Learning [WI] (3.0 cr)
•EE 4501 - Communications Systems (3.0 cr)
•EE 4541 - Digital Signal Processing (3.0 cr)
•EE 4607 - Wireless Hardware System Design (3.0 cr)
•EE 5121 - Transistor Device Modeling for Circuit Simulation (3.0 cr)
•EE 5141 - Introduction to Microsystem Technology (4.0 cr)

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- EE 5163 - Semiconductor Properties and Devices I (3.0 cr)
- EE 5164 - Semiconductor Properties and Devices II (3.0 cr)
- EE 5171 - Microelectronic Fabrication (3.0 cr)
- EE 5181 - Micro and Nanotechnology by Self Assembly (3.0 cr)
- EE 5231 - Linear Systems and Control (3.0 cr)
- EE 5235 - Robust Control System Design (3.0 cr)
- EE 5239 - Introduction to Nonlinear Optimization (3.0 cr)
- EE 5251 - Optimal Filtering and Estimation (3.0 cr)
- EE 5301 - VLSI Design Automation I (3.0 cr)
- EE 5302 - VLSI Design Automation II (3.0 cr)
- EE 5323 - VLSI Design I (3.0 cr)
- EE 5324 - VLSI Design II (3.0 cr)
- EE 5327 - VLSI Design Laboratory (3.0 cr)
- EE 5329 - VLSI Digital Signal Processing Systems (3.0 cr)
- EE 5333 - Analog Integrated Circuit Design (3.0 cr)
- EE 5340 - Introduction to Quantum Computing and Physical Basics of Computing (3.0 cr)
- EE 5351 - Applied Parallel Programming (3.0 cr)
- EE 5355 - Algorithmic Techniques for Scalable Many-core Computing (3.0 cr)
- EE 5364 - Advanced Computer Architecture (3.0 cr)
- EE 5371 - Computer Systems Performance Measurement and Evaluation (3.0 cr)
- EE 5381 *{Inactive}*(3.0 cr)
- EE 5391 *{Inactive}*(3.0 cr)
- EE 5393 - Circuits, Computation, and Biology (3.0 cr)
- EE 5501 - Digital Communication (3.0 cr)
- EE 5531 - Probability and Stochastic Processes (3.0 cr)
- EE 5542 - Adaptive Digital Signal Processing (3.0 cr)
- EE 5545 - Digital Signal Processing Design (3.0 cr)
- EE 5549 - Digital Signal Processing Structures for VLSI (3.0 cr)
- EE 8551 - Multirate Signal Processing and Applications (3.0 cr)
- EE 5561 - Image Processing and Applications: From linear filters to artificial intelligence (3.0 cr)
- EE 5581 - Information Theory and Coding (3.0 cr)
- EE 5583 - Error Control Coding (3.0 cr)
- EE 5585 - Data Compression (3.0 cr)
- EE 5601 - Introduction to RF/Microwave Engineering (3.0 cr)
- EE 5602 - RF/Microwave Circuit Design (3.0 cr)
- EE 5611 - Plasma-Aided Manufacturing (4.0 cr)
- EE 5613 - RF/Microwave Circuit Design Laboratory (2.0 cr)
- EE 5616 - Antennas: Theory, Analysis, and Design (3.0 cr)
- EE 5624 - Optical Electronics (4.0 cr)
- EE 5640 - Introduction to Nano-Optics (3.0 cr)
- EE 5649 - Infrared Devices and Technology (3.0 cr)
- EE 5653 - Physical Principles of Magnetic Materials (3.0 cr)
- EE 5655 - Magnetic Recording (3.0 cr)
- EE 5657 - Physical Principles of Thin Film Technology (4.0 cr)
- EE 5670 - Spintronic Devices (3.0 cr)
- EE 5721 - Power Generation Operation and Control (3.0 cr)
- EE 5725 *{Inactive}*(3.0 cr)
- EE 5741 - Advanced Power Electronics (3.0 cr)
- EE 5811 - Biological Instrumentation (3.0 cr)
- ESCI 4402 - Biogeochemical Cycles in the Ocean (3.0 cr)
- ESCI 4501 - Structural Geology (3.0 cr)
- ESCI 4602 - Sedimentology and Stratigraphy (3.0 cr)
- ESCI 4702 - General Hydrogeology (4.0 cr)
- ESCI 5102 - Climate Change and Human History (3.0 cr)
- ESCI 5203 - Mineral and Rock Physics (3.0 cr)
- ESCI 5204 - Geostatistics and Inverse Theory (3.0 cr)
- ESCI 5205 *{Inactive}*(3.0 cr)
- ESCI 5302 - Isotope Geology (3.0 cr)
- ESCI 5351 *{Inactive}*(3.0 cr)
- ESCI 5353 - Electron Microprobe Theory and Practice (3.0 cr)
- ESCI 5402 - Science and Politics of Global Warming (3.0 cr)
- ESCI 5502 *{Inactive}*(3.0 cr)
- ESCI 5503 - Advanced Petrology (3.0 cr)
- ESCI 5504W *{Inactive}*[WI] (3.0 cr)
- ESCI 5601W *{Inactive}*[WI] (4.0 cr)
- ESCI 5705 - Limnogeology and Paleoenvironment (3.0 cr)

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- HSCI 5244 - Nature's History: Science, Humans, and the Environment (3.0 cr)
- HSCI 5246 - History of (Un)Natural Disasters (3.0 cr)
- HSCI 5331 - Technology and American Culture (3.0 cr)
- HSCI 5332 - Science in the Shaping of America (3.0 cr)
- HSCI 5401 - Ethics in Science and Technology (3.0 cr)
- HSCI 5421 - Engineering Ethics (3.0 cr)
- HSCI 5611 - Enlightenment, Revolution, and the Rise of Modern Science (3.0 cr)
- IE 5511 - Human Factors and Work Analysis (4.0 cr)
- IE 5513 - Engineering Safety (4.0 cr)
- IE 5522 - Quality Engineering and Reliability (4.0 cr)
- IE 5531 - Engineering Optimization I (4.0 cr)
- IE 5532 - Stochastic Models (4.0 cr)
- IE 5541 - Project Management (4.0 cr)
- IE 5551 - Production and Inventory Systems (4.0 cr)
- IE 5553 - Simulation (4.0 cr)
- MATH 3283W - Sequences, Series, and Foundations: Writing Intensive [WI] (4.0 cr)
- MATH 4151 *{Inactive}*(3.0 cr)
- MATH 4152 - Elementary Mathematical Logic (3.0 cr)
- MATH 4242 - Applied Linear Algebra (4.0 cr)
- MATH 4281 - Introduction to Modern Algebra (4.0 cr)
- MATH 4428 - Mathematical Modeling (4.0 cr)
- MATH 4512 - Differential Equations with Applications (3.0 cr)
- MATH 4567 - Applied Fourier Analysis (4.0 cr)
- MATH 4603 - Advanced Calculus I (4.0 cr)
- MATH 4604 - Advanced Calculus II (4.0 cr)
- MATH 4653 - Elementary Probability (4.0 cr)
- MATH 4707 - Introduction to Combinatorics and Graph Theory (4.0 cr)
- MATH 5165 - Mathematical Logic I (4.0 cr)
- MATH 5166 *{Inactive}*(4.0 cr)
- MATH 5248 - Cryptology and Number Theory (4.0 cr)
- MATH 5251 - Error-Correcting Codes, Finite Fields, Algebraic Curves (4.0 cr)
- MATH 5285H - Honors: Fundamental Structures of Algebra I (4.0 cr)
- MATH 5286H - Honors: Fundamental Structures of Algebra II (4.0 cr)
- MATH 5335 - Geometry I (4.0 cr)
- MATH 5336 *{Inactive}*(4.0 cr)
- MATH 5345H - Honors: Introduction to Topology (4.0 cr)
- MATH 5378 - Differential Geometry (4.0 cr)
- MATH 5385 - Introduction to Computational Algebraic Geometry (4.0 cr)
- MATH 5445 - Mathematical Analysis of Biological Networks (4.0 cr)
- MATH 5447 - Theoretical Neuroscience (4.0 cr)
- MATH 5467 - Introduction to the Mathematics of Image and Data Analysis (4.0 cr)
- MATH 5525 - Introduction to Ordinary Differential Equations (4.0 cr)
- MATH 5535 - Dynamical Systems and Chaos (4.0 cr)
- MATH 5583 - Complex Analysis (4.0 cr)
- MATH 5587 - Elementary Partial Differential Equations I (4.0 cr)
- MATH 5588 - Elementary Partial Differential Equations II (4.0 cr)
- MATH 5615H - Honors: Introduction to Analysis I (4.0 cr)
- MATH 5616H - Honors: Introduction to Analysis II (4.0 cr)
- MATH 5651 - Basic Theory of Probability and Statistics (4.0 cr)
- MATH 5652 - Introduction to Stochastic Processes (4.0 cr)
- MATH 5654 - Prediction and Filtering (4.0 cr)
- MATH 5705 - Enumerative Combinatorics (4.0 cr)
- MATH 5707 - Graph Theory and Non-enumerative Combinatorics (4.0 cr)
- MATH 5711 - Linear Programming and Combinatorial Optimization (4.0 cr)
- MATS 3013 - Electrical and Magnetic Properties of Materials (3.0 cr)
- MATS 3801 - Structural Characterization Lab (4.0 cr)
- MATS 3851W - Materials Properties Lab [WI] (4.0 cr)
- MATS 4212 - Ceramics (3.0 cr)
- MATS 4221 - Materials Performance (4.0 cr)
- MATS 4301W - Materials Processing [WI] (4.0 cr)
- MATS 5353 *{Inactive}*(3.0 cr)
- MATS 5517 - Microscopy of Materials (3.0 cr)
- MATS 5531 *{Inactive}*(3.0 cr)
- MATS 5771 - Colloids and Dispersions (3.0 cr)
- ME 4131W - Indoor Environment & Energy Laboratory [WI] (4.0 cr)
- ME 4232 - Fluid Power Control Lab (4.0 cr)

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- ME 4331 - Thermal Energy Engineering Laboratory (4.0 cr)
- ME 4431W - Energy Conversion Systems Laboratory [WI] (4.0 cr)
- ME 5101 - Vapor Power Cycles (4.0 cr)
- ME 5103 - Thermal Environmental Engineering (4.0 cr)
- ME 5113 - Aerosol/Particle Engineering (4.0 cr)
- ME 5133 - Aerosol Measurement Laboratory (4.0 cr)
- ME 5221 - Computer-Assisted Product Realization (4.0 cr)
- ME 5223 - Materials in Design (4.0 cr)
- ME 5228 - Introduction to Finite Element Modeling, Analysis, and Design (4.0 cr)
- ME 5241 - Computer-Aided Engineering (4.0 cr)
- ME 5243 - Advanced Mechanism Design (4.0 cr)
- ME 5247 - Applied Stress Analysis (4.0 cr)
- ME 5248 - Vibration Engineering (4.0 cr)
- ME 5281 - Feedback Control Systems (4.0 cr)
- ME 5286 - Robotics (4.0 cr)
- ME 5312 - Solar Thermal Technologies (4.0 cr)
- ME 5332 - Intermediate Fluid Mechanics (4.0 cr)
- ME 5341 - Case Studies in Thermal Engineering and Design (4.0 cr)
- ME 5344 - Thermodynamics of Fluid Flow With Applications (4.0 cr)
- ME 5351 - Computational Heat Transfer (4.0 cr)
- ME 5446 - Introduction to Combustion (4.0 cr)
- ME 5461 - Internal Combustion Engines (4.0 cr)
- ME 5462 - Gas Turbines (4.0 cr)
- ME 5666 - Modern Thermodynamics (4.0 cr)
- PHYS 4001 - Analytical Mechanics (4.0 cr)
- PHYS 4002 - Electricity and Magnetism (4.0 cr)
- PHYS 4101 - Quantum Mechanics (4.0 cr)
- PHYS 4201 - Statistical and Thermal Physics (3.0 cr)
- PHYS 4211 - Introduction to Solid-State Physics (3.0 cr)
- PHYS 4303 - Electrodynamics and Waves (3.0 cr)
- PHYS 4511 - Introduction to Nuclear and Particle Physics (3.0 cr)
- PHYS 4611 - Introduction to Space Physics (3.0 cr)
- PHYS 4621 - Introduction to Plasma Physics (3.0 cr)
- PHYS 4811 - Introduction to General Relativity (3.0 cr)
- PHYS 4911 - Introduction to Biopolymer Physics (3.0 cr)
- PHYS 5001 - Quantum Mechanics I (4.0 cr)
- PHYS 5002 - Quantum Mechanics II (4.0 cr)
- PHYS 5011 - Classical Physics I (4.0 cr)
- PHYS 5012 - Classical Physics II (4.0 cr)
- PHYS 5022 - Relativity, Cosmology, and the Universe (4.0 cr)
- PHYS 5041 - Mathematical Methods for Physics (4.0 cr)
- PHYS 5081 - Introduction to Biopolymer Physics (3.0 cr)
- PHYS 5201 - Thermal and Statistical Physics (3.0 cr)
- PHYS 5401 *{Inactive}*(4.0 cr)
- PHYS 5402 *{Inactive}*(4.0 cr)
- PHYS 5621 - Introduction to Plasma Physics (3.0 cr)
- PHYS 5701 - Solid-State Physics for Engineers and Scientists (4.0 cr)
- STAT 5021 - Statistical Analysis (4.0 cr)
- STAT 5031 *{Inactive}*(4.0 cr)
- STAT 5101 - Theory of Statistics I (4.0 cr)
- STAT 5102 - Theory of Statistics II (4.0 cr)
- STAT 5201 - Sampling Methodology in Finite Populations (3.0 cr)
- STAT 5302 - Applied Regression Analysis (4.0 cr)
- STAT 5303 - Designing Experiments (4.0 cr)
- STAT 5401 - Applied Multivariate Methods (3.0 cr)
- STAT 5421 - Analysis of Categorical Data (3.0 cr)
- STAT 5511 - Time Series Analysis (3.0 cr)
- STAT 5601 - Nonparametric Methods (3.0 cr)
- STAT 5701 - Statistical Computing (3.0 cr)
- BMEN 3311 - Biomaterials (3.0 cr)
  BMEN 3315 - Biomaterials Lab (1.0 cr)
- CEGE 5551 - Environmental Microbiology (3.0 cr)
  CEGE 5552 - Environmental Microbiology Laboratory (1.0 cr)
- CHEM 4101 - Modern Instrumental Methods of Chemical Analysis (3.0 cr)
  CHEM 4111W - Modern Instrumental Methods of Chemical Analysis Lab [WI] (2.0 cr)
- CHEN 4214 - Polymers (3.0 cr)

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CHEN 4223W - Polymer Laboratory [WI] (2.0 cr)
•EE 4161W - Energy Conversion and Storage [WI] (3.0 cr)
EE 4163 - Energy Conversion and Storage Laboratory (1.0 cr)
•EE 4233 - State Space Control System Design (3.0 cr)
EE 4237 - State Space Control Laboratory (1.0 cr)
•EE 4701 - Electric Drives (3.0 cr)
EE 4703 - Electric Drives Laboratory (1.0 cr)
•EE 4721 - Introduction to Power System Analysis (3.0 cr)
EE 4722 - Power System Analysis Laboratory (1.0 cr)
•EE 4741 - Power Electronics (3.0 cr)
EE 4743 - Switch-Mode Power Electronics Laboratory (1.0 cr)
•EE 5621 - Physical Optics (3.0 cr)
EE 5622 - Physical Optics Laboratory (1.0 cr)
•EE 5627 - Optical Fiber Communication (3.0 cr)
EE 5628 *{Inactive}*(1.0 cr)
•EE 5705 - Electric Drives in Sustainable Energy Systems (3.0 cr)
EE 5707 - Electric Drives in Sustainable Energy Systems Laboratory (1.0 cr)

Biology
BIOL 1009 - General Biology [BIOL] (4.0 cr)
or BIOL 1001 - Introductory Biology: Evolutionary and Ecological Perspectives [BIOL] (4.0 cr)

Upper Division Writing Intensive within the major
Students are required to take one upper division writing intensive course within the major. If that requirement has not been satisfied within the core major requirements, students must choose one course from the following list. Some of these courses may also fulfill other major requirements.
Take 0 - 1 course(s) from the following:
•ME 4031W - Basic Mechanical Measurements Laboratory [WI] (4.0 cr)
•ME 4043W - Industrial Assignment II [WI] (4.0 cr)
•ME 4054W - Design Projects [WI] (4.0 cr)
•ME 4131W - Indoor Environment & Energy Laboratory [WI] (4.0 cr)
•ME 4431W - Energy Conversion Systems Laboratory [WI] (4.0 cr)

Program Sub-plans
A sub-plan is not required for this program.

EIP
ME EIP program (engineering intern program or co-op program) is available during the last two years of study. Upper division status and a satisfactory GPA are required for admission. The co-op program provides applied engineering training in selected established industries during semesters of supervised assignments that alternate with semesters of University studies.

Students in the ME EIP program (engineering intern program or co-op program) may register for three industrial assignment courses. ME 3041 (2 credits), ME 4043W (4 credits), and ME 4044 (2 credits) for a total of 8 credits. ME 4044 is optional. These courses count toward the technical elective credit requirement.

Students register for industrial assignments as they would for regular classes. Requirements for the course include writing a summary of an article in a technical journal, attending a workshop (ME 3041, ME 4043W), submitting a report draft, and writing a final report. The course grade is based on writing; work performance cannot be considered in assigning a grade. The second industrial assignment, ME 4043W, is oriented toward solving a design problem and fulfills a 4-credit intensive writing course requirement. Cooperation from company personnel is required in accomplishing most reports, particularly the ME 4043W reports.

Internship
ME 3041 - Industrial Assignment I (2.0 cr)
ME 4043W - Industrial Assignment II [WI] (4.0 cr)
ME 4044 - Industrial Assignment III (2.0 cr)

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