# Mechanical Engineering

## 1. University Requirements: (23-24)
- Writing, Rhetoric and American Cultures (WRA) 4
- Integrative Studies in Humanities (IAH) 8
- IAH 201-210 and IAH 211 or > 8
- Integrative Studies in Social Sciences (ISS) 8
- ISS 2XX and ISS 3XX
- Bioscience (one of the following): BS 161, ENT 205, IBIO 150, MMG 141, MMG 201, PLB 105, PSL 250 3-4

## 2. College Requirements: (32)
- *CEM 141 General Chemistry 4*
- *CSE 231 Introduction to Programming I 4*
- *EGR 100 Introduction to Engineering Design 2*
- *MTH 132 Calculus I 3*
- *MTH 133 Calculus II 4*
- MTH 234 Multivariable Calculus 4
- MTH 235 Differential Equations 3
- *PHY 183 Physics for Scientists & Engineers I 4*
- *PHY 184 Physics for Scientists & Engineers II 4*

*College Admission Requirement*

## 3. Major Requirements: (65)

### a. Complete all of the following courses: (13)
- CE 221 Statics 3
- CEM 161 Chemistry Laboratory I 1
- ECE 345 Electronic Instrumentation and Systems 3
- MSE 250 Materials Science and Engineering 3
- STT 351 Probability and Statistics for Engineering 3

### b. Complete all of the following courses: (40)
- ME 201 Thermodynamics 3
- ME 222 Mechanics of Deformable Solids 3
- ME 280 Graphic Communications 2
- ME 300 Professional Issues in Mechanical Eng 1
- ME 333 Fluid Mechanics (W) 3
- ME 333L Fluid Mechanics Lab 1
- ME 361 Dynamics 3
- ME 370 Mechanical Design & Manufacturing I 3
- ME 391 Mechanical Engineering Analysis 3
- ME 410 Heat Transfer 3
- ME 412 Heat Transfer Laboratory (W) 2
- ME 452 Control Systems (W) 3
- ME 452L Vibrations and Controls Laboratory 1
- ME 461 Mechanical Vibrations 3
- ME 470 Mechanical Design & Manufacturing II 3
- ME 481 Mechanical Engr Design Projects (W) 3

### c. Senior Electives: (9)
Complete a minimum of nine credits from the following:
- ME 413 Cryogenic Systems Analysis 3
- ME 414 Mechanical Design of Cryogenic Systems 3
- ME 416 Computer Asstd Design of Thermal Sys 3
- ME 417 Design of Alternative Energy Systems 3
- ME 422 Introduction to Combustion 3
- ME 423 Intermed Mech of Deformable Solids 3
- ME 425 Experimental Mechanics 3
- ME 426 Introduction to Composite Materials 3
- ME 433 Intro to Computational Fluid Dynamics 3
- ME 440 Aerospace Propulsion 3
- ME 441 Aerodynamics and Aircraft Performance 3
- ME 442 Turbomachinery 3
- ME 444 Automotive Engines 3
- ME 445 Automotive Powertrain Design 3
- ME 456 Mechatronics 3
- ME 464 Intermediate Dynamics 3
- ME 465 Computer Aided Optimal Design 3
- ME 475 Computer Aided Design of Structures 3
- ME 477 Manufacturing Processes 3
- ME 478 Product Development 3
- ME 490 Independent Study in Mechanical Engr 1-4
- ME 491 Selected Topics in Mechanical Engr 1-4
- ME 494 Biofluid Mechanics and Heat Transfer 3
- ME 495 Tissue Mechanics 3
- ME 496 Biomechanical Analysis of Human Movement 3
- ME 497 Biomechanical Design in Product Dev 3

### d. Design-Intensive Senior Electives: (3) Complete a minimum of three additional credits from:
- ME 414 Mechanical Design of Cryogenic Systems 3
- ME 416 Computer Asstd Design of Thermal Sys 3
- ME 417 Design of Alternative Energy Systems 3
- ME 442 Turbomachinery 3
- ME 445 Automotive Powertrain Design 3
- ME 456 Mechatronics 3
- ME 465 Computer Aided Optimal Design 3
- ME 475 Computer Aided Design of Structures 3
- ME 478 Product Development 3
- ME 497 Biomechanical Design in Product Dev 3

Courses used to fulfill item 3.c. may not be used to fulfill 3.d.
Concentrations:
The Department offers concentrations in aerospace engineering, automotive powertrain, biomedical engineering, computational design, cryogenic engineering, energy, engineering mechanics, global engineering, and manufacturing engineering to students wishing an area of specialization in their degree. The concentrations are available to, but not required of, any student enrolled in the Bachelor of Science degree program in Mechanical Engineering. NOTE: Completing the Bachelor of Science degree in Mechanical Engineering with a concentration may require more than 128 credits. Upon completion of the required courses for one of these concentrations, certification will appear on the student's official transcript.

Aerospace Engineering Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with an aerospace engineering concentration, students must complete the requirements for the B.S. degree, including the following:

All of the following courses: (6)
ME 440 Aerospace Propulsion 3
ME 441 Aerodynamics & Aircraft Performance 3

One of the following courses: (3)
ME 423 Intermediate Mech of Deformable Solids 3
ME 426 Introduction to Composite Materials 3
ME 456 Mechatronics 3
ME 475 Computer Aided Design of Structures 3

One of the following courses: (3)
ME 422 Introduction to Combustion 3
ME 433 Intro to Computational Fluid Dynamics 3
ME 442 Turbomachinery 3

Automotive Powertrain Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with an automotive powertrain concentration, students must complete the requirements for the B.S. degree, including the following:

All of the following: (9)
ME 422 Intro to Combustion 3
ME 444 Automotive Engines 3
ME 445 Automotive Powertrain Design 3

One of the following: (3)
ME 433 Intro to Computational Fluid Dynamic 3
ME 442 Turbomachinery 3

Biomedical Engineering Concentration: (16)
To earn a Bachelor of Science degree in Mechanical Engineering with a biomedical engineering concentration, students must complete the requirements for the B.S. degree, including the following:

Both of the following courses: (7)
BS 161 Cell and Molecular Biology 3
PSL 250 Introductory Physiology 4

Nine credits from the following courses: (9)
BE 444 Biosensors for Medical Diagnostics 3
ECE 445 Biomedical Instrumentation 3
ME 494 Biofluid Mechanics and Heat Transfer 3
ME 495 Tissue Mechanics 3
ME 496 Biomechanical Analysis of Human Movement 3
ME 497 Biomechanical Design in Product Dev 3
MSE 425 Biomaterials and Biocompatibility 3

Students who select BE 444, ECE 445, and/or MSE 425 may request to apply these course credits towards fulfillment of the Mechanical Engineering Major Senior-Elective requirement (item 3c)

Computational Design Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with a computational design concentration, students must complete the requirements for the B.S. degree, including the following:

All of the following courses: (9)
ME 416 Computer Assisted Design of Thermal Systems 3
ME 433 Intro to Computational Fluid Dynamics 3
ME 475 Computer Aided Design of Structures 3

One of the following courses: (3)
ME 417 Design of Alternative Energy Systems 3
ME 445 Automotive Powertrain Design 3
ME 456 Mechatronics 3
ME 465 Computer Aided Optimal Design 3

Cryogenic Engineering Concentration: (12)
To earn a Bachelor of Science degree in Mechanical Engineering with a cryogenic engineering concentration, students must complete the requirements for the B.S. degree, including the following:

All of the following: (12)
ME 413 Cryogenic Systems Analysis 3
ME 414 Mechanical Design of Cryogenic Systems 3
ME 416 Computer Assisted Design of Thermal Systems 3
ME 442 Turbomachinery 3
**Energy Concentration: (12)**
To earn a Bachelor of Science degree in Mechanical Engineering with an energy concentration, students must complete the requirements for the B.S. degree, including the following:

**All of the following courses: (6)**

- ME 416  Computer Assisted Design of Thermal Systems 3
- ME 417  Design of Alternative Energy Systems 3

**Two of the following courses: (6)**

- ME 422  Introduction to Combustion 3
- ME 440  Aerospace Propulsion 3
- ME 442  Turbomachinery 3
- ME 444  Automotive Engines 3

**Engineering Mechanics Concentration: (12)**
To earn a Bachelor of Science degree in Mechanical Engineering with an engineering mechanics concentration, students must complete the requirements for the B.S. degree, including the following:

**All of the following: (12)**

- ME 423  Intermediate Mechanics of Deform Solids 3
- ME 425  Experimental Mechanics 3
- ME 464  Intermediate Dynamics 3
- ME 475  Computer Aided Design of Structures 3

**Manufacturing Engineering Concentration: (13)**
To earn a Bachelor of Science degree in Mechanical Engineering with a manufacturing engineering concentration, students must complete the requirements for the B.S. degree, including the following:

**All of the following courses: (7)**

- ME 372  Machine Tool Laboratory 1
- ME 477  Manufacturing Processes 3
- ME 478  Product Development 3

**Select one of the following courses: (3)**

- CHE 472  Composite Materials Processing 3
- ECE 415  Computer Aided Manufacturing 3
- MSE 426  Introduction to Composite Materials 3

**Select one of the following courses: (3)**

- ACC 230  Survey of Accounting Concepts 3
- EC 201  Intro to Microeconomics 3

*Students who select CHE 472, ECE 415, and/or MSE 426 may request to apply these course credits towards fulfillment of the Mechanical Engineering Major Senior-Elective requirement (item 3c)*

**Total Credits Required for Degree: 128**

The requirements listed apply to students admitted to the major of Mechanical Engineering in the Department of Mechanical Engineering beginning Fall 2024. The Department of Mechanical Engineering (ME) constantly reviews program requirements and reserves the right to make changes as necessary. Consequently, each student is strongly encouraged to consult with their advisor to obtain assistance in planning an appropriate schedule of courses.

Some courses may have prerequisites, which are not otherwise required in the program. Students should check course descriptions to ensure they are aware of prerequisites.
# Mechanical Engineering

## Sample Program

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## Program Educational Objectives for the Undergraduate Program

in Mechanical Engineering

Department of Mechanical Engineering

Michigan State University

(Approved by the Department Faculty December 1, 2022)

Within 3 to 5 years of graduation our graduates are expected to:

1. Have evolved into competent and ethical engineers practicing in a diverse range of current and emerging activities

2. Use their mechanical engineering education as a stimulus for personal and professional growth

3. Demonstrate capability, creativity, leadership, and application of knowledge

4. Be critical thinkers, both independently and as members of a team, who identify problems and develop effective solutions

Last Revised February 2024