

# MECHANICAL ENGINEERING

**Home Department:** Mechanical Engineering (<https://my.kettering.edu/academics/departments/mechanical-engineering>)

## Department Head:

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## Program Overview

The Bachelor of Science in Mechanical Engineering (<https://www.kettering.edu/programs-and-degrees/mechanical-engineering>) (ME) prepares students for a broad range of careers associated with the design and implementation of mechanical systems involving the conversion, transmission, and utilization of energy. Mechanical engineering courses that provide breadth in the discipline include design, dynamics, engineering materials, thermodynamics, fluid mechanics, heat transfer, vibrations, systems analysis, and associated laboratories. Large and well-equipped laboratories in experimental mechanics, heat transfer, fluid mechanics, engines, vibrations, hydraulics, instrumentation, and automotive emissions support the mechanical engineering program.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a Specialty within the Mechanical Engineering program or by pursuing a Minor (<http://catalog.kettering.edu/undergrad/academic-programs/minors>) with non-Mechanical Engineering programs. For more details see Mechanical Engineering Program Specialties or Minors.

Mechanical Engineering students may elect to customize their degree by taking a set of elective courses in a specific area; either by pursuing a Specialty within the ME program or by pursuing a Minor with non-ME programs. For more details see "Mechanical Engineering Program Specialties" or "Minors".

The program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

## Program Educational Objectives

With their Kettering education as a foundation, within a few years of graduation, graduates will attain:

- A reputation for working effectively and ethically in diverse professional environments.
- Leadership in their profession while actively pursuing lifelong learning and contributing to progress within their field.
- The ability to practice responsible decision making and apply best practices to their professional endeavors.

## Program Curriculum Requirements

### First Year Experience

|                               |                        |          |
|-------------------------------|------------------------|----------|
| FYE-101                       | First Year Foundations | 1        |
| <i>Credit Hours Subtotal:</i> |                        | <i>1</i> |

### General Education

|          |                                 |   |
|----------|---------------------------------|---|
| COMM-101 | Written & Oral Communication I  | 4 |
| COMM-301 | Written & Oral Communication II | 4 |
| ECON-201 | Economic Principles             | 4 |

|                                  |                                                             |           |
|----------------------------------|-------------------------------------------------------------|-----------|
| HUMN-201                         | Introduction to Humanities                                  | 4         |
| LS-489                           | Senior Seminar: Leadership, Ethics, and Contemporary Issues | 4         |
| SSCI-201                         | Introduction to the Social Sciences                         | 4         |
| Advanced Humanities Elective     |                                                             | 4         |
| Advanced Social Science Elective |                                                             | 4         |
| <i>Credit Hours Subtotal:</i>    |                                                             | <i>32</i> |

### Basic Sciences

|                                    |                                          |           |
|------------------------------------|------------------------------------------|-----------|
| CHEM-135                           | Principles of Chemistry                  | 4         |
| & CHEM-136                         | and Principles of Chemistry Lab          |           |
| PHYS-114                           | Newtonian Mechanics                      | 4         |
| & PHYS-115                         | and Newtonian Mechanics Laboratory       |           |
| PHYS-224                           | Electricity and Magnetism                | 4         |
| & PHYS-225                         | and Electricity and Magnetism Laboratory |           |
| Math/Science Elective <sup>4</sup> |                                          | 4         |
| <i>Credit Hours Subtotal:</i>      |                                          | <i>16</i> |

### Mathematics

|                               |                                                        |           |
|-------------------------------|--------------------------------------------------------|-----------|
| MATH-101                      | Calculus I                                             | 4         |
| or MATH-101X                  | Calculus I                                             |           |
| Select one of the following:  |                                                        | 4         |
| MATH-102                      | Calculus II                                            |           |
| MATH-102X                     | Calculus II                                            |           |
| MATH-102H                     | Calculus II - Honors                                   |           |
| MATH-203                      | Multivariate Calculus                                  | 4         |
| or MATH-203H                  | Multivariate Calculus - Honors                         |           |
| MATH-204                      | Differential Equations & Laplace Transforms            | 4         |
| or MATH-204H                  | Differential Equations and Laplace Transforms - Honors |           |
| MATH-305                      | Numerical Methods and Matrices                         | 4         |
| MATH-408                      | Probability and Statistics                             | 4         |
| <i>Credit Hours Subtotal:</i> |                                                        | <i>24</i> |

### Mechanical Engineering Required Courses

|                              |                                                                     |   |
|------------------------------|---------------------------------------------------------------------|---|
| EE-212                       | Applied Electrical Circuits                                         | 3 |
| MECH-231L                    | Signals for Mechanical Systems Lab <sup>1</sup>                     | 1 |
| IME-100                      | Interdisciplinary Design and Manufacturing                          | 4 |
| Select one of the following: |                                                                     |   |
| IME-301                      | Engineering Materials <sup>(EP-342 only if dual degree ME/EP)</sup> | 4 |
| or EP-342                    | Materials Science and Nanotechnology                                |   |
| MECH-100                     | Engineering Graphical Communication                                 | 4 |
| MECH-210                     | Statics                                                             | 4 |
| MECH-212                     | Mechanics of Materials                                              | 4 |
| MECH-300                     | Computer Aided Engineering                                          | 4 |
| MECH-310                     | Dynamics                                                            | 4 |
| MECH-311                     | Introduction to Mechanical System Design                            | 4 |
| MECH-312                     | Mechanical Component Design I                                       | 4 |
| MECH-320                     | Thermodynamics                                                      | 4 |
| MECH-322                     | Fluid Mechanics                                                     | 4 |
| MECH-330                     | Dynamic Systems with Vibrations                                     | 4 |
| MECH-420                     | Heat Transfer                                                       | 4 |

|                                                   |                                                                                 |     |
|---------------------------------------------------|---------------------------------------------------------------------------------|-----|
| MECH-422                                          | Energy Systems Laboratory                                                       | 4   |
| MECH-430                                          | Dynamic Systems with Controls                                                   | 4   |
| <i>Credit Hours Subtotal:</i>                     |                                                                                 | 64  |
| <b>Electives</b>                                  |                                                                                 |     |
| Two Free Electives <sup>3</sup>                   |                                                                                 | 8   |
| Two Mechanical Engineering Electives <sup>2</sup> |                                                                                 | 8   |
| Mechanical Engineering Senior Design Project      |                                                                                 | 4   |
| <i>Credit Hours Subtotal:</i>                     |                                                                                 | 20  |
| <b>Culminating Undergraduate Experience</b>       |                                                                                 |     |
| CUE-495                                           | Culminating Undergraduate Experience Introductory Course (No credit, Pass/Fail) |     |
| Select one of the following:                      |                                                                                 | 4   |
| CUE-495C                                          | Co-op Thesis                                                                    |     |
| CUE-495E                                          | Intra/Entre/Social E-ship Thesis                                                |     |
| CUE-495P                                          | Professional Practice Thesis                                                    |     |
| CUE-495R                                          | Research Thesis                                                                 |     |
| <i>Credit Hours Subtotal:</i>                     |                                                                                 | 4   |
| Total Credit Hours                                |                                                                                 | 161 |

**(Minimum) Total Credits Required for the Program: 161**

- <sup>1</sup> Students pursuing an Electrical Engineering minor take EE-210/EE-211 in lieu of MECH-231L/EE-212.
- <sup>2</sup> ME electives are described as: Any 300-599 level BIOL, CE, CHEM, CHME, CS, ECE, EE, EP, IME, ISYS, MATH (except pre-calc and college math), MECH, or PHYS that is not used to complete core degree requirements. In addition, BUSN-372/BUSN-303, BUSN-373/BUSN-304, KETT-540, and MGMT-546/BUSN-411 also qualify as M.E. Electives.
- <sup>3</sup> Free electives are described as: Any Kettering University course except any course that consists of an elementary nature when advanced topics have been mastered, and any course that consists of topics, which are very similar to topics which have been mastered.
- <sup>4</sup> Math/Science elective is described as: Any level BIOL, CHEM, MATH or PHYS that is not used to complete core degree requirements.

## Mechanical Engineering Program Specialties

Students majoring in Mechanical Engineering may select a specialty consisting of 20 credit hours of courses focused in a particular area. Specialties may include both required and elective courses. First Six Semesters are common to all Mechanical Engineering Students. Senior I through Senior III representative programs are given for each specialty.

A Mechanical Engineering specialty provides students a depth of study in preparation for a career within an industrial sector and/or as a foundation for graduate study. However, the student's degree is Mechanical Engineering and the selected specialty does not prevent students from working within any industry. The primary advantage is to provide a "jump start" over mechanical engineering graduates from other schools with traditional degree programs. Courses are subject to cancellation due to low enrollment.

### Alternative Energy Specialty

|          |                                 |   |
|----------|---------------------------------|---|
| MECH-526 | Fuel Cell Science & Engineering | 4 |
| MECH-527 | Energy and the Environment      | 4 |

|          |                                         |   |
|----------|-----------------------------------------|---|
| MECH-528 | Bio and Renewable Energy Lab            | 4 |
| MECH-545 | Hybrid Electric Vehicle Propulsion      | 4 |
| MECH-521 | Energy and Environmental Systems Design | 4 |

### Automotive Engineering Design Specialty

|                                |                                                                          |    |
|--------------------------------|--------------------------------------------------------------------------|----|
| MECH-548                       | Vehicle Design Project                                                   | 4  |
| Select three of the following: |                                                                          | 12 |
| MECH-516                       | Introduction to Finite Element Analysis with Structural Applications     |    |
| MECH-540                       | Introduction to Internal Combustion Engines and Automotive Power Systems |    |
| MECH-541                       | Advanced Automotive Power Systems                                        |    |
| MECH-542                       | Chassis System Design                                                    |    |
| MECH-544                       | Introduction to Automotive Powertrains                                   |    |
| MECH-545                       | Hybrid Electric Vehicle Propulsion                                       |    |
| MECH-546                       | Vehicle Systems Dynamics                                                 |    |
| Select one of the following:   |                                                                          | 4  |
| Any course previously listed   |                                                                          |    |
| IME-575                        | Failure Analysis                                                         |    |
| KETT-540                       | Environmentally Conscious Design                                         |    |
| MECH-510                       | Analysis and Design of Machines and Mechanical Assemblies                |    |
| MECH-515                       | Failure and Material Considerations in Design                            |    |
| MECH-526                       | Fuel Cell Science & Engineering                                          |    |
| MECH-550                       | Automotive Bioengineering: Occupant Protection and Safety                |    |
| MECH-551                       | Vehicular Crash Dynamics and Accident Reconstruction                     |    |

Other courses with the approval of the automotive faculty

### Bioengineering Application Specialty

#### Required Courses

|          |                                             |   |
|----------|---------------------------------------------|---|
| MECH-350 | Introduction to Bioengineering Applications | 4 |
| MECH-554 | Bioengineering Applications Project         | 4 |

#### Electives

|                                |                                                           |    |
|--------------------------------|-----------------------------------------------------------|----|
| Select three of the following: |                                                           | 12 |
| BIOL-141 & BIOL-142            | General Biology and General Biology Lab                   |    |
| BIOL-241 & BIOL-242            | Human Biology and Human Biology Lab                       |    |
| BIOL-341                       | Anatomy and Physiology                                    |    |
| MECH-550                       | Automotive Bioengineering: Occupant Protection and Safety |    |
| MECH-551                       | Vehicular Crash Dynamics and Accident Reconstruction      |    |
| PHYS-354                       | Medical Physics Principles                                |    |

### Machine Design & Advanced Materials Specialty

|          |                                                                      |   |
|----------|----------------------------------------------------------------------|---|
| MECH-516 | Introduction to Finite Element Analysis with Structural Applications | 4 |
|----------|----------------------------------------------------------------------|---|

|                                      |                                                                                                                |                     |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------|
| MECH-582                             | Mechanics and Design Simulation of Fiber-Reinforced Composite Materials                                        | 4                   |
| MECH-512<br>or MECH-572              | Mechanical Systems Design Project<br>CAD/CAM and Rapid Prototyping Project                                     | 4                   |
| Two MDAM Specialty Related Electives |                                                                                                                | 8                   |
| <b>Course</b>                        | <b>Title</b>                                                                                                   | <b>Credit Hours</b> |
| <b>Freshman I</b>                    |                                                                                                                |                     |
| FYE-101                              | First Year Foundations                                                                                         | 1                   |
| CHEM-135                             | Principles of Chemistry                                                                                        | 3                   |
| CHEM-136                             | Principles of Chemistry Lab                                                                                    | 1                   |
| COMM-101                             | Written & Oral Communication I                                                                                 | 4                   |
| MATH-101                             | Calculus I                                                                                                     | 4                   |
| MECH-100                             | Engineering Graphical Communication <sup>1</sup>                                                               | 4                   |
| Credit Hours                         |                                                                                                                | 17                  |
| <b>Freshman II</b>                   |                                                                                                                |                     |
| IME-100                              | Interdisciplinary Design and Manufacturing <sup>1</sup>                                                        | 4                   |
| MATH-102                             | Calculus II                                                                                                    | 4                   |
| PHYS-114                             | Newtonian Mechanics                                                                                            | 3                   |
| PHYS-115                             | Newtonian Mechanics Laboratory                                                                                 | 1                   |
| HUMN-201<br>or SSCI-201              | Introduction to Humanities<br>or Introduction to the Social Sciences                                           | 4                   |
| Credit Hours                         |                                                                                                                | 16                  |
| <b>Sophomore I</b>                   |                                                                                                                |                     |
| ECON-201                             | Economic Principles                                                                                            | 4                   |
| MATH-203                             | Multivariate Calculus                                                                                          | 4                   |
| MECH-210                             | Statics                                                                                                        | 4                   |
| PHYS-224                             | Electricity and Magnetism                                                                                      | 3                   |
| PHYS-225                             | Electricity and Magnetism Laboratory                                                                           | 1                   |
| Credit Hours                         |                                                                                                                | 16                  |
| <b>Sophomore II</b>                  |                                                                                                                |                     |
| EE-212                               | Applied Electrical Circuits                                                                                    | 3                   |
| MECH-231L                            | Signals for Mechanical Systems Lab                                                                             | 1                   |
| MATH-204                             | Differential Equations & Laplace Transforms                                                                    | 4                   |
| MECH-212                             | Mechanics of Materials                                                                                         | 4                   |
| Math/Science Elective                |                                                                                                                | 4                   |
| Credit Hours                         |                                                                                                                | 16                  |
| <b>Junior I</b>                      |                                                                                                                |                     |
| CUE-495                              | Culminating Undergraduate Experience Introductory Course                                                       | 0                   |
| Select one of the following:         |                                                                                                                | 4                   |
| IME-301<br>or EP-342                 | Engineering Materials <sup>(EP-342 only if dual degree ME/EP)</sup><br>or Materials Science and Nanotechnology |                     |
| MATH-305                             | Numerical Methods and Matrices                                                                                 | 4                   |
| MECH-312                             | Mechanical Component Design I                                                                                  | 4                   |
| MECH-311                             | Introduction to Mechanical System Design                                                                       | 4                   |

|                                                         |                                                                      |     |
|---------------------------------------------------------|----------------------------------------------------------------------|-----|
| HUMN-201<br>or SSCI-201                                 | Introduction to Humanities<br>or Introduction to the Social Sciences | 4   |
| Credit Hours                                            |                                                                      | 20  |
| <b>Junior II</b>                                        |                                                                      |     |
| COMM-301                                                | Written & Oral Communication II                                      | 4   |
| MATH-408                                                | Probability and Statistics                                           | 4   |
| MECH-300                                                | Computer Aided Engineering <sup>2</sup>                              | 4   |
| MECH-310                                                | Dynamics                                                             | 4   |
| MECH-320                                                | Thermodynamics                                                       | 4   |
| Credit Hours                                            |                                                                      | 20  |
| <b>Senior I</b>                                         |                                                                      |     |
| MECH-322                                                | Fluid Mechanics                                                      | 4   |
| MECH-330                                                | Dynamic Systems with Vibrations                                      | 4   |
| Advanced Humanities or Advanced Social Science Elective |                                                                      | 4   |
| Free Elective                                           |                                                                      | 4   |
| ME Elective <sup>3</sup>                                |                                                                      | 4   |
| Credit Hours                                            |                                                                      | 20  |
| <b>Senior II</b>                                        |                                                                      |     |
| MECH-420                                                | Heat Transfer                                                        | 4   |
| MECH-430                                                | Dynamic Systems with Controls                                        | 4   |
| Advanced Humanities or Advanced Social Science Elective |                                                                      | 4   |
| ME Elective <sup>3</sup>                                |                                                                      | 4   |
| Credit Hours                                            |                                                                      | 16  |
| <b>Senior III</b>                                       |                                                                      |     |
| LS-489                                                  | Senior Seminar: Leadership, Ethics, and Contemporary Issues          | 4   |
| MECH-422                                                | Energy Systems Laboratory                                            | 4   |
| Free Elective                                           |                                                                      | 4   |
| ME Senior Design Project <sup>4</sup>                   |                                                                      | 4   |
| Credit Hours                                            |                                                                      | 16  |
| <b>Any Term</b>                                         |                                                                      |     |
| CUE -495C/E/P/R Culminating Undergraduate Experience    |                                                                      | 4   |
| Credit Hours                                            |                                                                      | 4   |
| Total Credit Hours                                      |                                                                      | 161 |

<sup>1</sup> Approximately one-half of the students take MECH-100 Freshman I and IME-100 Freshman II, the other one-half take IME-100 Freshman I and MECH-100 Freshman II.

<sup>2</sup> Approximately one-half of students take MECH-300 Junior II and MECH-311 Junior I, the other one-half take MECH-311 Junior II and MECH-300 Senior I.

<sup>3</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown. Math/Science electives are any level MATH, BIOL, CHEM, or PHYS course that is not used to complete core degree requirements.

<sup>4</sup> ME Senior Design Projects may vary in lecture and/or laboratory credits and terms from those shown.

## Bachelor of Science in Mechanical Engineering Curriculum by Specialty

### Alternative Energy Specialty

Freshman I through Junior II Representative Program Credit Total: 105

| Course                                                  | Title                                                       | Credit Hours |
|---------------------------------------------------------|-------------------------------------------------------------|--------------|
| <b>Senior I</b>                                         |                                                             |              |
| MECH-322                                                | Fluid Mechanics                                             | 4            |
| MECH-330                                                | Dynamic Systems with Vibrations                             | 4            |
| MECH-420                                                | Heat Transfer                                               | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                             | 4            |
| Credit Hours                                            |                                                             | 16           |
| <b>Senior II</b>                                        |                                                             |              |
| MECH-430                                                | Dynamic Systems with Controls                               | 4            |
| MECH-527                                                | Energy and the Environment                                  | 4            |
| MECH-528                                                | Bio and Renewable Energy Lab                                | 4            |
| MECH-545                                                | Hybrid Electric Vehicle Propulsion                          | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                             | 4            |
| Credit Hours                                            |                                                             | 20           |
| <b>Senior III</b>                                       |                                                             |              |
| LS-489                                                  | Senior Seminar: Leadership, Ethics, and Contemporary Issues | 4            |
| MECH-422                                                | Energy Systems Laboratory                                   | 4            |
| MECH-526                                                | Fuel Cell Science & Engineering                             | 4            |
| MECH-521                                                | Energy and Environmental Systems Design                     | 4            |
| Credit Hours                                            |                                                             | 16           |
| <b>Any Term</b>                                         |                                                             |              |
| CUE -495C/E/P/R Culminating Undergraduate Experience    |                                                             | 4            |
| Credit Hours                                            |                                                             | 4            |
| Total Credit Hours                                      |                                                             | 56           |

**(Minimum) Total Credits Required for Program: 161**

### Automotive Engineering Design Specialty

Freshman I through Junior II Rep. Program Credit Total: 105

| Course                                                  | Title                                                       | Credit Hours |
|---------------------------------------------------------|-------------------------------------------------------------|--------------|
| <b>Senior I</b>                                         |                                                             |              |
| MECH-322                                                | Fluid Mechanics                                             | 4            |
| MECH-330                                                | Dynamic Systems with Vibrations                             | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                             | 4            |
| Automotive Specialty Electives <sup>1,2</sup>           |                                                             | 8            |
| Credit Hours                                            |                                                             | 20           |
| <b>Senior II</b>                                        |                                                             |              |
| MECH-420                                                | Heat Transfer                                               | 4            |
| MECH-430                                                | Dynamic Systems with Controls                               | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                             | 4            |
| Automotive Specialty Elective                           |                                                             | 4            |
| Credit Hours                                            |                                                             | 16           |
| <b>Senior III</b>                                       |                                                             |              |
| LS-489                                                  | Senior Seminar: Leadership, Ethics, and Contemporary Issues | 4            |
| MECH-422                                                | Energy Systems Laboratory                                   | 4            |
| MECH-548                                                | Vehicle Design Project                                      | 4            |
| Automotive Specialty Elective                           |                                                             | 4            |
| Credit Hours                                            |                                                             | 16           |

| <b>Any Term</b>                                      |    |
|------------------------------------------------------|----|
| CUE -495C/E/P/R Culminating Undergraduate Experience | 4  |
| Credit Hours                                         |    |
| Total Credit Hours                                   |    |
|                                                      | 56 |

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.

### Bioengineering Application Specialty

Freshman I through Junior I Representative Program Credit Total: 85

| Course                                                   | Title                                                       | Credit Hours |
|----------------------------------------------------------|-------------------------------------------------------------|--------------|
| <b>Junior II</b>                                         |                                                             |              |
| COMM-301                                                 | Written & Oral Communication II                             | 4            |
| MECH-300                                                 | Computer Aided Engineering                                  | 4            |
| MECH-310                                                 | Dynamics                                                    | 4            |
| MECH-320                                                 | Thermodynamics                                              | 4            |
| MECH-350                                                 | Introduction to Bioengineering Applications                 | 4            |
| Credit Hours                                             |                                                             | 20           |
| <b>Senior I</b>                                          |                                                             |              |
| MATH-408                                                 | Probability and Statistics                                  | 4            |
| MECH-322                                                 | Fluid Mechanics                                             | 4            |
| MECH-330                                                 | Dynamic Systems with Vibrations                             | 4            |
| Advanced Humanities or Advanced Social Science Elective  |                                                             | 4            |
| Bioengineering Specialty Related Elective <sup>1,2</sup> |                                                             | 4            |
| Credit Hours                                             |                                                             | 20           |
| <b>Senior II</b>                                         |                                                             |              |
| MECH-420                                                 | Heat Transfer                                               | 4            |
| MECH-430                                                 | Dynamic Systems with Controls                               | 4            |
| Advanced Humanities or Advanced Social Science Elective  |                                                             | 4            |
| Bioengineering Specialty Related Elective <sup>1,2</sup> |                                                             | 4            |
| Credit Hours                                             |                                                             | 16           |
| <b>Senior III</b>                                        |                                                             |              |
| LS-489                                                   | Senior Seminar: Leadership, Ethics, and Contemporary Issues | 4            |
| MECH-422                                                 | Energy Systems Laboratory                                   | 4            |
| MECH-554                                                 | Bioengineering Applications Project                         | 4            |
| Bioengineering Specialty Related Elective <sup>1,2</sup> |                                                             | 4            |
| Credit Hours                                             |                                                             | 16           |
| <b>Any Term</b>                                          |                                                             |              |
| CUE -495C/E/P/R Culminating Undergraduate Experience     |                                                             | 4            |
| Credit Hours                                             |                                                             | 4            |
| Total Credit Hours                                       |                                                             | 76           |

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.

## Machine Design & Advanced Materials Specialty

Freshman I through Junior II Representative Program Credit Total: **105**

| Course                                                  | Title                                                                         | Credit Hours |
|---------------------------------------------------------|-------------------------------------------------------------------------------|--------------|
| <b>Senior I</b>                                         |                                                                               |              |
| MECH-322                                                | Fluid Mechanics                                                               | 4            |
| MECH-330                                                | Dynamic Systems with Vibrations                                               | 4            |
| MECH-516                                                | Introduction to Finite Element Analysis with Structural Applications          | 4            |
| MECH-582                                                | Mechanics and Design Simulation of Fiber-Reinforced Composite Materials       | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                                               | 4            |
| Credit Hours                                            |                                                                               | 20           |
| <b>Senior II</b>                                        |                                                                               |              |
| MECH-420                                                | Heat Transfer                                                                 | 4            |
| MECH-430                                                | Dynamic Systems with Controls                                                 | 4            |
| Advanced Humanities or Advanced Social Science Elective |                                                                               | 4            |
| Machine Design Specialty Elective <sup>1,2</sup>        |                                                                               | 4            |
| Credit Hours                                            |                                                                               | 16           |
| <b>Senior III</b>                                       |                                                                               |              |
| LS-489                                                  | Senior Seminar: Leadership, Ethics, and Contemporary Issues                   | 4            |
| MECH-422                                                | Energy Systems Laboratory                                                     | 4            |
| Select one of the following:                            |                                                                               |              |
| MECH-512<br>or MECH-572                                 | Mechanical Systems Design Project<br>or CAD/CAM and Rapid Prototyping Project | 4            |
| Machine Design Specialty Elective <sup>1,2</sup>        |                                                                               | 4            |
| Credit Hours                                            |                                                                               | 16           |
| <b>Any Term</b>                                         |                                                                               |              |
| CUE -495C/E/P/R Culminating Undergraduate Experience    |                                                                               | 4            |
| Credit Hours                                            |                                                                               | 4            |
| Total Credit Hours                                      |                                                                               | 56           |

**(Minimum) Total Credits Required for Program: 161**

<sup>1</sup> Elective courses may vary in lecture and/or laboratory credits and terms from those shown.

<sup>2</sup> Students select a Specialty Related Elective or Specialty Related ME Elective with approval of their ME Specialty Advisor.