MECHANICAL ENGINEERING (ME)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

### Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website [link](http://louisville.edu/bursar/tuitionfee).

#### ME 206. Mechanics II: Dynamics 3 Units

**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** ENGR 102 and CEE 205.  
**Description:** Study of motions and forces in engineering systems. Kinematics and kinetics of particles; equations of motion. Energy and momentum methods. Introduction to rigid body dynamics. Engineering applications.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 251. Thermodynamics I 3 Units

**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** ENGR 102 and PHYS 298.  
**Description:** This course covers: fundamental thermodynamic concepts involving heat and work; obtaining properties for typical working fluids, real and ideal gases; first and second laws of thermodynamics; entropy and reversible and irreversible processes; and basic cycles. For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 280. Structured Programming for Mechanical Engineering 2 Units

**Term Typically Offered:** Fall, Spring  
**Prerequisite(s):** CECS 121.  
**Description:** Software development using structured computer programming. Design and implementation of programs with application to mechanical engineering problems such as numerical solution methods and kinematics. Uses a suitable programming language such as MATLAB.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 288. Mechanical Engineering Cooperative Education Seminar 0 Units

**Grading Basis:** Pass/Fail  
**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** CEE 205.  
**Description:** Discussion of the policies and procedures for cooperative education and instruction in self-directed job search techniques, including interviewing skills, resume preparation, and guidelines for the co-op report. This is a prerequisite for each cooperative education term.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 289. Mechanical Engineering Cooperative Education I 1 Unit

**Grading Basis:** Pass/Fail  
**Term Typically Offered:** Fall, Spring, Summer  
**Prerequisite(s):** ME 288.  
**Description:** Full-time technical work experience related to the student’s academic program.

**Course Attribute(s):** CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 310. Thermodynamics II 3 Units

**Term Typically Offered:** Spring, Summer  
**Prerequisite(s):** ME 251.  
**Description:** Exergy analysis and second law efficiency. Power and refrigeration cycles. Thermodynamic relations and real gas behavior. Ideal gas mixtures and psychrometrics. Thermochemistry. Chemical equilibrium.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 311. Fluid Mechanics I 3 Units

**Term Typically Offered:** Fall, Spring  
**Prerequisite(s):** ME 206 and ME 251.  
**Description:** Characteristics of fluids. Fluid statics and kinematics. Applications of the Bernoulli equation. Conservative equations in integral and differential form. Dimensional analysis and modeling. For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

#### ME 312. Fluid Mechanics Laboratory 1 Unit

**Term Typically Offered:** Fall, Spring  
**Corequisite(s):** ME 311.  
**Description:** Experimental measurements of static and dynamic fluid properties. Concepts of laboratory testing. Introduction to technical report writing.

For class offerings for a specific term, refer to the Schedule of Classes [link](http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
ME 323. Mechanics of Materials 3 Units
Term Typically Offered: Fall, Summer
Prerequisite(s): CEE 205 and ENGR 201.

ME 324. Mechanics of Materials Laboratory 1 Unit
Term Typically Offered: Fall, Summer
Corequisite(s): ME 323.
Description: Experimental measurements of mechanical material properties and experimental verification of solid mechanics theory. Concepts of laboratory testing. Introduction to technical report writing. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 380. Computer Aided Design 2 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): ENGR 151 and ME 323.
Description: An introduction to the engineering design process emphasizing the use of modern computer-based analysis, design and presentation tools for mechanical engineering applications. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 381. Introduction to Manufacturing 2 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): CHE 253 and ME 251.
Corequisite(s): ME 380.
Description: Introduction to manufacturing processes with an emphasis on considerations for mechanical engineering design. Topics covered include casting, machining, forming, assembly, and modern methods for both polymer and metal materials. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 389. Mechanical Engineering Cooperative Education II 1 Unit
Grading Basis: Pass/Fail
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): ME 289.
Description: Full-time technical work experience related to the student’s academic program.
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content.

For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 414. Mechanical Measurements 3 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): ENGR 205, ME 312, and ME 324.
Description: General consideration of signals and utilization of instruments to measure physical properties of systems. Review and introduction of useful mathematical concepts such as statistical data analysis. Introduction to digital data acquisition and signal processing. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 415. Senior Mechanical Engineering Laboratory 1 Unit
Term Typically Offered: Fall, Spring
Corequisite(s): ME 414
Description: Experiments in heat transfer, mechanics, acoustics, pumps, electrical circuits, sound dynamics, and HVAC systems. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 422. Machine Design I 3 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): ME 323 and CHE 253.
Description: Fundamental concepts related to the design of mechanical components and machines. The engineering design process. Design for strength and reliability. Open-ended design projects are assigned. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 432. Intermediate Mechanics of Materials 3 Units
Prerequisite(s): ME 323.
Description: Principle of virtual work. Principle of minimum potential energy. Matrix formulation of static and dynamic structural mechanics problems with a strong emphasis on computer applications. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 435. System Dynamics 3 Units
Term Typically Offered: Spring, Summer
Prerequisite(s): ECE 252, ENGR 205 and ME 311.
Description: Modeling of mechanical, fluid, electrical, and mixed systems. Determination of time and frequency domain response of such systems to transient and periodic inputs. Specific applications. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 440. Heat Transfer 3 Units
Term Typically Offered: Fall, Spring
Prerequisite(s): ME 401.
Description: A study of the fundamental laws and applications of heat transfer by conduction, convection, and radiation. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccel.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
ME 442. Machine Design II  
Term Typically Offered: Fall, Spring  
Prerequisite(s): ME 422.  
Description: Design and application of machine elements such as springs, rolling element bearings, gearing, and journal bearings. Open-ended design projects are assigned. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 489. Mechanical Engineering Cooperative Education III  
Grading Basis: Pass/Fail  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 389.  
Description: Full-time technical work experience related to the student’s academic program.  
Course Attribute(s): CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 497. Mechanical Engineering Capstone Design Project - CUE  
Term Typically Offered: Fall, Spring  
Prerequisite(s): ME 442.  
Description: Team-oriented design of a mechanism, system or process satisfying a set of open-ended requirements. Written reports and oral presentations are required.  
Course Attribute(s): CUE - This course fulfills the Culminating Undergraduate Experience (CUE) requirement for certain degree programs. CUE courses are advanced-level courses intended for majors with at least 90 earned credits/senior-level status. CBL - This course includes Community-Based Learning (CBL). Students will engage in a community experience or project with an external partner in order to enhance understanding and application of academic content. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 510. Thermal Design of Internal Combustion Engines  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 310.  
Description: Thermodynamics and fluid mechanics of internal combustion engine design. Combustion stoichiometry, thermochemistry, and properties of working fluids. Ideal and real engine cycles. Fluid flow processes, combustion processes, pollutant formation and control. Engine operating characteristics. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 512. Finite Element Methods for Mechanical Design I  
Term Typically Offered: Occasionally Offered  
Prerequisite(s): ME 422.  
Description: Matrix analysis of static and dynamic structural systems and steady-state heat transfer. Computer aided design of trusses, frames, plane stress structures, as well as one- and two-dimensional thermal systems including conduction and convection. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 513. Energy Conversion  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 310.  
Description: A study of nuclear and fossil-fueled steam generators, plus internal combustion prime movers and alternate energy sources. A computerized design project will be required. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 521. Mechanical Vibrations  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 422.  
ME 523. Intermediate Dynamics  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 206.  
Description: Extension of the concepts in introductory dynamics (ME 206) to three dimensional motion. This includes the kinematics of multiple, rotating reference frames, and Newtonian vector mechanics for particles and rigid bodies (Euler’s equations). Lagrangian analytical methods. Stability of motion. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 526. Vehicle Dynamics and Handling  
Term Typically Offered: Fall, Spring, Summer  
Prerequisite(s): ME 380.  
Description: Design of passenger and commercial vehicles for optimal dynamic performance with a focus on architecture layout, characterization of critical subsystems, and CAE-based kinematic and kinetic modeling. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)  
ME 530. Mechanical Design of Consumer Appliances  
Term Typically Offered: Fall, Spring, Summer  
Description: Application of classical, computational, and experimental methods and analyses to the design of mechanical systems characteristic of consumer appliances. Topics include component analysis and design, failure mechanisms, and organization with respect to life, reliability, performance, and cost. For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
<th>Term Typically Offered</th>
<th>Description</th>
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<tbody>
<tr>
<td>ME 531</td>
<td>Consumer Appliance Energy Systems</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Analysis and design of energy systems in home appliances. Topics include thermal-fluid process fundamentals, energy transport, storage, use, and conversion, energy system components and materials, and the affect of extreme environments on components and finishes. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 532</td>
<td>Experimental Stress Analysis</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Fundamentals of experimental stress analysis. Brittle coating methods, photoelastic coating and electrical strain gage techniques, strain measurements under static and dynamic loading. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 534</td>
<td>Experimental Vibrations</td>
<td>3 Units</td>
<td>Summer Odd Years</td>
<td>Experimental techniques for identifying the modal parameters of mechanical and structural systems. Review of multiple degree-of-freedom vibration modeling and analysis: Measurement of frequency response functions. Excitation techniques, instrumentation, Fourier analysis and signal processing. Acoutical modal analysis. Experiments on real mechanical and structural systems. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 535</td>
<td>Control System Design</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Basic concepts and principles of feedback control systems. Formulation of linear control problems by classical methods. Analysis and synthesis techniques as used in the design of automatic, dynamic control systems. Study of transient and steady state response, use of time and frequency domain concepts. System performance specifications. Design applications. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 544</td>
<td>Design of Fluid Power Systems</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Design methodology of hydraulic circuits and fluid power components. Study of rotary/linear actuators, hydrostatic transmissions, temperature control, combustion control, pneumatics, valves, and control components. Applied design projects and laboratory modules are required. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 555</td>
<td>Introduction to Micro and Nanotechnology</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Design, fabrication and application of micro- and nano-electro-mechanical systems (MEMS/NEMS). Scaling laws governing micro- and nanoscale physics. Use of MEMS/NEMS devices in electronics, as sensors, and for medical applications. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 595</td>
<td>Process Physics &amp; Material Science in Advanced Manufacturing</td>
<td>3 Units</td>
<td>Spring Only</td>
<td>Materials processing lies at the core of advanced manufacturing. It is through understanding and innovations in materials processing, true progress in manufacturing development can be reached. Topics include mechanical, thermal, electrochemical, acoustic, optical, energy-based material processing physics, physical metallurgy, phase transformation, solidification, heat and mass transfer, dislocation mechanics in the context of manufacturing. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 562</td>
<td>Composite Materials</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Overview of composite materials, stress/strain analysis of a polymer matrix fiber-reinforced composite ply, classical lamination theory, failure criteria, design approaches, manufacturing methods, and applications for structural polymeric composites. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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<td>ME 565</td>
<td>Advanced Engineering Mathematics I</td>
<td>3 Units</td>
<td>Fall, Spring, Summer</td>
<td>Formulation and solution of mathematical models for mechanical engineering problems leading to ordinary and partial differential equations. Transform solution methods and linear algebra concepts, including real and complex-domain eigenvalue problem solutions. For class offerings a specific term, refer to the Schedule of Classes(<a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a>)</td>
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ME 566. Advanced Engineering Mathematics II 3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): ME 565 or equivalent.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 570. Sustainable Energy Systems 3 Units
Term Typically Offered: Fall Only
Prerequisite(s): ME 310 and ME 311.
Description: Analysis and design of sustainable energy systems, and exploration of concepts such as carbon capture storage for making fossil energy systems more environmentally acceptable.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 572. Energy Storage Systems 3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): ME 440.
Description: Study of the principles and analysis of energy systems. Introduction to energy storage systems and their applications; thermal and mechanical energy storage, storage of organic fuels, hydrogen, and electrochemical energy.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 575. Special Topics in Mechanical Engineering 1-4 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): Faculty consent.
Description: A special topics course in mechanical engineering topics not covered by regularly scheduled courses.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 580. Air Pollution Control 3 Units
Term Typically Offered: Fall, Spring, Summer
Prerequisite(s): CHEM 202, ME 310 or equivalent.
Description: Origin and fate of air pollutants, combustion and pollutant formation processes, control of emissions of gaseous and particulate pollutants and design of various pollution control devices.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)

ME 585. Design and Energy Analysis of Consumer Appliances 4.5 Units
Description: Application of classical, computational, and experimental methods and analysis to the design of mechanical and energy systems. Topics include material impacts on design, structural component design, and design and analysis of thermal fluid, and acoustic systems.
For class offerings for a specific term, refer to the Schedule of Classes (http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm)