Department of Mechanical Engineering

The Department of Mechanical Engineering offers a Bachelor of Science degree in Mechanical Engineering (ME). The program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org. Individuals enrolling in this degree program are given the opportunity to develop a strong background in Engineering Science and to learn the analysis, design, and synthesis tools necessary to contribute in traditional and emerging areas of technology.

The department has excellent laboratory facilities where students receive hands-on instruction from faculty members. Computer-aided design (CAD) facilities, including state-of-the-art workstations, are routinely used. Some classes are taught by adjunct faculty from local industries, giving students the opportunity to interact with engineering professionals engaged in relevant engineering practice.

Because of the broad engineering training in this program, graduates may find employment in many industries, including companies or government agencies associated with aerospace, automotive, energy, petroleum, manufacturing, biomedical engineering, and research.

Bachelor of Science Degree in Mechanical Engineering

The Bachelor of Science degree in Mechanical Engineering offers students the opportunity to prepare for careers in traditional, new, and emerging technologies related to the practice of Mechanical Engineering, which is a versatile and broadly-based engineering discipline. Mathematics and basic sciences, such as physics and chemistry, form the foundation of mechanical engineering, which requires an understanding of diverse subject areas, such as solid and fluid mechanics, thermal sciences, mechanical design, structures, material selection, manufacturing processes and systems, mechanical systems and control, and instrumentation.

The Mechanical Engineering curriculum provides education and basic engineering training through the required coursework. Students may develop a degree of specialization and depth through the selection of technical elective courses. The design experience is integrated throughout the program. Development of open-ended, problem-solving skills is a part of many mechanical engineering courses. Design projects with formal report writing are included in many courses. In addition, a substantial portion of all technical elective courses is devoted to the design of systems and components. A capstone design sequence at the senior level provides an opportunity to apply and integrate the knowledge gained throughout the curriculum to the development of an instructor-approved project.

The laboratory requirements are designed to provide hands-on experience in basic measurement and instrumentation equipment and the application of classroom theory. Students may receive additional hands-on experiences by selecting technical elective courses with laboratory components.

Opportunities exist for students to participate in research and design projects. All students are eligible to participate in undergraduate research, through the independent study courses. Students also have an opportunity to participate in an approved co-op program and may receive up to 3 semester credit hours for their experience.

Program Educational Objectives

The Mechanical Engineering Program prepares students to attain the following program educational objectives after graduation:

1. Have engineering or other careers in industry, government, and/or will pursue advanced graduate or professional degrees.
2. Apply their engineering knowledge and skills to their professional careers.
3. Continue to advance their knowledge, communication and leadership skills using technology, continuing education, problem solving, and by serving technical or professional societies.
4. Apply their understanding of societal, environmental, and ethical issues to their professional activities.

Student Outcomes

Graduates of the UTSA Mechanical Engineering Program will demonstrate the following:

a. an ability to apply knowledge of mathematics, science, and engineering
b. an ability to design and conduct experiments, as well as to analyze and interpret data
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multidisciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility
g. an ability to communicate effectively
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in life-long learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

The minimum number of semester credit hours required for this degree is 128, at least 39 of which must be at the upper-division level. All candidates for this degree must fulfill the Core Curriculum requirements, the General Engineering requirements, and the degree requirements, listed below. A minimum grade of “C-” or better is required for all mathematics, science, Engineering (EGR), and Mechanical Engineering (ME) courses in the curriculum.
Core Curriculum Requirements (42 semester credit hours)

Students seeking the Bachelor of Science degree in Mechanical Engineering must fulfill the University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both major requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for the degree.

MAT 1214 may be used to satisfy the core requirement in Mathematics, as well as one of the General Engineering requirements. PHY 1943 and PHY 1963 may be used to satisfy the core requirement in Life and Physical Sciences, as well as two of the General Engineering requirements. EGR 1403 may be used to satisfy the core requirement in the Component Area Option.

Core Curriculum Component Area Requirements (http://catalog.utsa.edu/undergraduate/bachelorsdegeregulations/degrequirements/corecurriculumcomponentarequirements)

First Year Experience Requirement 3
Communication 6
Mathematics 3
Life and Physical Sciences 6
Language, Philosophy and Culture 3
Creative Arts 3
American History 6
Government-Political Science 6
Social and Behavioral Sciences 3
Component Area Option 3
Total Credit Hours 42

General Engineering Requirements

Students seeking the Bachelor of Science degree in Mechanical Engineering must complete the following 22 semester credit hours:

CHE 1103 General Chemistry I 3
EGR 2323 Applied Engineering Analysis I 3
MAT 1214 Calculus I 4
or EGR 1324 Calculus II for Engineers 4
MAT 1224 Calculus II 4
PHY 1943 Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory 4
& PHY 1951
PHY 1963 Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory 4
& PHY 1971
Total Credit Hours 22

Gateway Courses

Students pursuing the Bachelor of Science degree in Mechanical Engineering must successfully complete each of the following Gateway Courses with a grade of “C” or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of “W” or taking an equivalent course at another institution, will be required to change his or her major.

EGR 2103 Statics
EGR 2323 Applied Engineering Analysis I
EGR 2513 Dynamics

Degree Requirements

Students seeking the Bachelor of Science degree in Mechanical Engineering must complete the following 22 semester credit hours, as well as the Core Curriculum requirements and General Engineering requirements:

A. Required foundation and general mechanical engineering courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE 2213</td>
<td>Electric Circuits and Electronics</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2103</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EGR 2513</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>EGR 3323</td>
<td>Applied Engineering Analysis II</td>
<td>3</td>
</tr>
<tr>
<td>ME 1403</td>
<td>Engineering Practice and Graphics</td>
<td>3</td>
</tr>
<tr>
<td>ME 2173</td>
<td>Numerical Methods</td>
<td>3</td>
</tr>
<tr>
<td>ME 3113</td>
<td>Measurements and Instrumentation</td>
<td>3</td>
</tr>
<tr>
<td>ME 3244</td>
<td>Materials Engineering and Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>ME 3263</td>
<td>Manufacturing Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ME 3293</td>
<td>Thermodynamics I</td>
<td>3</td>
</tr>
<tr>
<td>ME 3543</td>
<td>Dynamic Systems and Control</td>
<td>3</td>
</tr>
<tr>
<td>ME 3663</td>
<td>Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>ME 3813</td>
<td>Mechanics of Solids</td>
<td>3</td>
</tr>
<tr>
<td>ME 3823</td>
<td>Machine Element Design I</td>
<td>3</td>
</tr>
<tr>
<td>ME 4293</td>
<td>Thermodynamics II</td>
<td>3</td>
</tr>
<tr>
<td>ME 4313</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>ME 4543</td>
<td>Mechatronics</td>
<td>3</td>
</tr>
<tr>
<td>ME 4733</td>
<td>Mechanical Engineering Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ME 4803</td>
<td>Senior Design I</td>
<td>3</td>
</tr>
<tr>
<td>ME 4813</td>
<td>Senior Design II</td>
<td>3</td>
</tr>
</tbody>
</table>

B. Mechanical Engineering elective courses

Select 9 semester credit hours of Mechanical Engineering elective courses. Students are encouraged to choose courses from a specific group listed below. Students may also select courses to earn a Certificate in Oil/Gas.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 4183</td>
<td>Compressible Flow and Propulsion Systems</td>
</tr>
<tr>
<td>ME 4323</td>
<td>Thermal Systems Design</td>
</tr>
<tr>
<td>ME 4343</td>
<td>Heating, Air Conditioning, and Refrigeration Design</td>
</tr>
<tr>
<td>ME 4593</td>
<td>Alternative Energy Sources</td>
</tr>
<tr>
<td>ME 4613</td>
<td>Power Plant System Design</td>
</tr>
<tr>
<td>ME 4623</td>
<td>Internal Combustion Engines</td>
</tr>
</tbody>
</table>

Manufacturing Engineering and Systems

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 4563</td>
<td>Computer Integrated Manufacturing</td>
</tr>
<tr>
<td>ME 4573</td>
<td>Facilities Planning and Design</td>
</tr>
<tr>
<td>ME 4583</td>
<td>Enterprise Process Engineering</td>
</tr>
</tbody>
</table>

Design and Control of Mechanical Systems

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 3323</td>
<td>Mechanical Vibration</td>
</tr>
<tr>
<td>ME 3513</td>
<td>Mechanism Design</td>
</tr>
</tbody>
</table>
Department of Mechanical Engineering

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 4433</td>
<td>Machine Element Design II</td>
</tr>
<tr>
<td>ME 4553</td>
<td>Automotive Vehicle Dynamics</td>
</tr>
<tr>
<td>ME 4723</td>
<td>Reliability and Quality Control in Engineering Design</td>
</tr>
<tr>
<td>ME 4773</td>
<td>Robotics</td>
</tr>
<tr>
<td>ME 4243</td>
<td>Intermediate Materials Engineering</td>
</tr>
<tr>
<td>ME 4603</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>ME 4963</td>
<td>Mechanical Engineering Applications to Biomedical Systems</td>
</tr>
<tr>
<td>ME 3323</td>
<td>Mechanical Vibration</td>
</tr>
<tr>
<td>ME 4323</td>
<td>Thermal Systems Design</td>
</tr>
<tr>
<td>ME 4373</td>
<td>Separation Processes</td>
</tr>
<tr>
<td>ME 4643</td>
<td>Pressure Vessel and Piping Design</td>
</tr>
<tr>
<td>ME 4653</td>
<td>Oil and Gas Engineering and Reservoir Geomechanics</td>
</tr>
<tr>
<td>ME 4683</td>
<td>Corrosion Engineering</td>
</tr>
<tr>
<td>EGR 4993</td>
<td>Honors Research</td>
</tr>
<tr>
<td>ME 4953</td>
<td>Special Studies in Mechanical Engineering</td>
</tr>
</tbody>
</table>

**Mechanics and Materials**

**Oil and Gas**

**Additional engineering elective courses**

- EGR 2103: Statics 3
- EGR 2323: Applied Engineering Analysis I 3
- PHY 1963: Physics for Scientists and Engineers II (core and major) 3
- PHY 1971: Physics for Scientists and Engineers II Laboratory 1
- EGR 1403: Technical Communication (or other core option) 3
- Math/Science Elective 3

**Spring**

- EGR 2513: Dynamics 3
- EGR 3323: Applied Engineering Analysis II 3
- ME 2173: Numerical Methods 3
- ME 3244: Materials Engineering and Laboratory 4
- ME 3293: Thermodynamics I 3

**Third Year**

**Fall**

- EGC 2123: Electric Circuits and Electronics 3
- ME 3263: Manufacturing Engineering 3
- ME 3663: Fluid Mechanics 3
- ME 3813: Mechanics of Solids 3
- ME 4293: Thermodynamics II 3
- Language, Philosophy & Culture core 3

**Spring**

- ME 3113: Measurements and Instrumentation 3
- ME 3543: Dynamic Systems and Control 3
- ME 3823: Machine Element Design I 3
- ME 4313: Heat Transfer 3
- Creative Arts core 3

**Fourth Year**

**Fall**

- ME 4543: Mechatronics 3
- ME 4733: Mechanical Engineering Laboratory 3
- ME 4803: Senior Design I 3
- POL 1133 or 1213: Texas Politics and Society (core) 3
- ME Technical elective 3

**Spring**

- ME 4813: Senior Design II 3
- ME Technical elective 3
- ME Technical elective 3
- American History core 3
- Social and Behavioral Sciences core 3

**Total Credit Hours:** 128.0

**Certificate in Oil/Gas**

The Certificate in Oil/Gas is designed to prepare mechanical engineering degree-seeking students and non-degree-seeking students with mechanical engineering background with the fundamental engineering knowledge necessary for successful careers in Oil/Gas Industry. It certifies to employers that students awarded the certificate have completed coursework essential to Oil/Gas industry.
Eligibility requirements:

- Meet the prerequisite courses for the certificate program (refer to course descriptions in the UTSA Undergraduate Catalog)

Students pursuing an Oil/Gas certificate must complete 15 semester credit hours as follows:

A. Required courses:

- ME 3113 Measurements and Instrumentation 1 3
- ME 3823 Machine Element Design 1 3

B. ME Electives. Three courses (9 semester credit hours) selected from the following list:

- ME 3323 Mechanical Vibration
- ME 4323 Thermal Systems Design
- ME 4373 Separation Processes
- ME 4643 Pressure Vessel and Piping Design
- ME 4653 Oil and Gas Engineering and Reservoir Geomechanics
- ME 4683 Corrosion Engineering

Total Credit Hours 15

1 Those students who have transferred equivalent required and elective courses, as listed above, from other institutions may complete the certificate program by taking 15 semester credit hours of ME courses listed above.

To earn an Oil/Gas certificate, students must satisfy the following requirements:

1. Complete all the requirements of the certificate program.
2. Receive a grade of “C-” or better in each course used to satisfy the requirements of the certificate program.
3. Achieve at least a 2.5 grade point average (on a 4.0 scale) in all courses used to satisfy the requirements of the certificate program.

Undergraduates who are currently enrolled in the baccalaureate degree program in mechanical engineering or enrolled as non-degree-seeking students and who wish to earn an undergraduate Certificate in Oil/Gas are eligible to seek enrollment in the certificate program. An undergraduate wishing to enroll in the certificate program should contact the Mechanical Engineering Certificate Program Advisor and request permission to enter into the program. Approval is needed to enter into a certificate program and must be granted by the Certificate Program Advisor and the Dean of the College of Engineering.

Students not currently admitted to UTSA who wish to earn an undergraduate Certificate in Oil/Gas will be required to apply for admission to UTSA as non-degree-seeking, special students at the undergraduate level, and indicate in the application process their desire to pursue the requirements for an undergraduate Oil/Gas certificate program. Applicants will be required to meet University admission requirements for special students at the undergraduate level.

Students who are pursuing a certificate as non-degree-seeking students will not be eligible for financial aid or Veterans Administration educational benefits.

Graduate students may enroll in the undergraduate certificate programs, provided they meet the requirements for enrollment in a graduate certificate program.
ME 3513. Mechanism Design. (3-0) 3 Credit Hours.
Prerequisites: EGR 2513 and ME 1403. Introduction to mechanisms, graphical and linear analytical methods for kinematic synthesis of mechanisms; design of cam follower; gearing fundamentals, ordinary and planetary gear trains; and computer-aided design projects.

ME 3543. Dynamic Systems and Control. (3-0) 3 Credit Hours.
Prerequisites: EE 2213, EGR 2513 and EGR 3323. Introduction to modeling and control of dynamic physical systems, analysis and design of control systems for mechanical, electrical, manufacturing, fluid, and thermal systems. (Formerly ME 4522 and ME 4523. Credit cannot be earned for more than one of the following: ME 3543, ME 4522, or ME 4523.) Generally offered: Fall, Spring, Summer.

ME 3563. Fluid Mechanics. (3-0) 3 Credit Hours.
Prerequisites: EGR 2323, EGR 2513, and completion of or concurrent enrollment in ME 3293. Fluid properties, fluid statics, integral and differential analysis of fluid flow, viscous laminar and turbulent flow in conduits, dimensional analysis, boundary layer concepts, drag and lift. Generally offered: Fall, Spring, Summer.

ME 3813. Mechanics of Solids. (3-0) 3 Credit Hours.
Prerequisite: EGR 2103. Internal forces and deformations in solids, stress, strain and their relations, torsion, stresses and deflections in beams, and elastic behavior of columns. (Credit cannot be earned for both ME 3813 and BME 3223.) Generally offered: Fall, Spring, Summer.

ME 3823. Machine Element Design I. (3-0) 3 Credit Hours.
Prerequisites: ME 1403, ME 3244 (or ME 3241 and ME 3243 in previous catalogs), and ME 3813. Introduction to design of machine elements, pressurized cylinders, press and shrink fits, curved beams and contact stresses, static and fatigue theories of failure, shafts and shaft components, welded and bolted connections, mechanical springs, and computer-aided design projects. (Formerly ME 4423. Credit cannot be earned for both ME 3823 and ME 4423.) Generally offered: Fall, Spring, Summer.

ME 4173. High Performance Computing. (3-0) 3 Credit Hours.
Prerequisite: ME 2173. Introduction to UNIX (login, shell scripts, editors, file permissions), visualization (software tools, data formats), parallel programming (numerical libraries, Message Passing Interface, Trilinos, GPGPU programming).

ME 4183. Compressible Flow and Propulsion Systems. (3-0) 3 Credit Hours.
Prerequisites: ME 3293 and ME 3636. Application of mass, energy, and force balance to compressible fluids, analysis of one-dimensional steady flow, isentropic flow, adiabatic flow, flow with heat addition, supersonic flow, and shock waves. Introduction to the analysis and design of air-breathing engines for aeronautical transportation. (Formerly EGR 4183. Credit cannot be earned for both ME 4183 and EGR 4183.)

ME 4243. Intermediate Materials Engineering. (3-0) 3 Credit Hours.
Prerequisites: ME 3244 (or ME 3241 and ME 3243 in previous catalogs) and ME 3813. Selected topics in fabrication and processing of materials; macroscopic and microscopic aspects of the mechanical behavior of metals, ceramics, polymers and composites; Failure mode analysis in materials; optimization of material selection in the design process.

ME 4293. Thermodynamics II. (3-0) 3 Credit Hours.
Prerequisite: ME 3293. Energy and availability analysis, reactive and nonreactive mixtures, moist air properties, psychometric systems and analysis, vapor and gas power cycles, refrigeration and heat-pump cycles, thermodynamic relations, and chemical equilibria. Generally offered: Fall, Spring.

ME 4313. Heat Transfer. (3-0) 3 Credit Hours.
Prerequisites: EGR 3323, ME 2173 and ME 3663. Generalized potential distribution and gradients, and heat transfer, including transient and steady state conduction, forced and free convection, radiation, and heat exchanger analysis. Generally offered: Fall, Spring, Summer.

ME 4323. Thermal Systems Design. (3-0) 3 Credit Hours.
Prerequisite: ME 4313. Application of basic thermodynamics, fluid mechanics, heat transfer, and computer methods to the design of heat exchangers, coils, fans, pumps, and thermal energy systems.

ME 4343. Heating, Air Conditioning, and Refrigeration Design. (3-0) 3 Credit Hours.
Prerequisites: ME 4293 and ME 4313. Moist air properties, human comfort, solar radiation, heating loads, design selection, construction, and operation of air conditioning equipment, and duct design.

ME 4373. Separation Processes. (3-0) 3 Credit Hours.
Prerequisites: ME 4293 and ME 4313. Rate- and equilibrium-controlled separation, mass transfer, phase equilibrium, absorption, distillation, extraction, adsorption and membranes.

ME 4433. Machine Element Design II. (3-0) 3 Credit Hours.
Prerequisite: ME 3823. Design of spur, helical, bevel and worm gears; journal and rolling bearings; design of couplings, clutches, brakes, and flywheels; and computer-aided design project.

ME 4503. Lean Manufacturing and Enterprise Engineering. (3-0) 3 Credit Hours.
Prerequisite: ME 3263. Concepts and applications of Lean Systems applied to manufacturing and non-manufacturing environments. Topics include lean fundamentals and various tools and methodologies for transformation of companies and organizations into globally competitive enterprises. Team project on Value Streaming Mapping analysis of processes in real settings is required.

ME 4543. Mechatronics. (2-3) 3 Credit Hours.
Prerequisite: ME 3113. Modeling and analysis of electrical (resistors, capacitors, inductors, diodes, transistors, operational amplifiers, combinational logic and sequential logic) and mechanical systems (spring mass damper), data acquisition and measurements, sensors, actuators, and micro-controller programming. A lab component with emphasis on building electrical circuits, data acquisition using LabVIEW, and integration of sensors, actuators, and micro-controller programming (Arduino) to create a mechatronics system. Generally offered: Fall, Spring.

ME 4553. Automotive Vehicle Dynamics. (3-0) 3 Credit Hours.
Prerequisites: EGR 2323 and EGR 2513. Dynamics and control of automotive systems, handling, tires, suspension, steering, and aerodynamic forces.

ME 4563. Computer Integrated Manufacturing. (3-0) 3 Credit Hours.
Prerequisite: ME 3263. Fundamental concepts and models related to computer-aided design, computer-aided process planning, computer-aided manufacturing, production planning and scheduling, and manufacturing execution systems. Laboratory work includes computer-aided applications and programming of automated production equipment.

ME 4573. Facilities Planning and Design. (3-0) 3 Credit Hours.
Prerequisite: ME 3263. Product, process, and schedule design, flow, space, and activity relationships, material handling, layout planning models and design algorithms, and warehouse operations.
ME 4583. Enterprise Process Engineering. (3-0) 3 Credit Hours.
Prerequisite: ME 3263. Fundamental concepts, methodologies, and tools for the design, engineering and continuous improvement of enterprises. Topics include Six Sigma for process design and improvement, lean manufacturing fundamentals, value-stream mapping, performance evaluation, and other contemporary enterprise process engineering approaches. Generally offered: Fall.

ME 4593. Alternative Energy Sources. (3-0) 3 Credit Hours.
Prerequisites: ME 4293 and ME 4313. Solar, nuclear, wind, hydrogen, and geothermal energy sources. Resources, production, utilization, economics, sustainability, and environmental considerations. (Formerly ME 3593. Credit cannot be earned for both ME 3593 and ME 4593.).

ME 4603. Finite Element Analysis. (3-0) 3 Credit Hours.
Prerequisites: EGR 3323, ME 2173 and ME 3823. Finite element method fundamentals, advanced geometric modeling of mechanical components and systems, and finite element modeling of components.

ME 4613. Power Plant System Design. (3-0) 3 Credit Hours.
Prerequisites: ME 4293 and ME 4313. Application of thermodynamics and fluid mechanics to the design of vapor and gas-turbine power plant systems including boilers, condensers, turbines, pumps, compressors, and cooling towers.

ME 4623. Internal Combustion Engines. (3-0) 3 Credit Hours.
Prerequisites: ME 4293 and ME 4313. Application of thermodynamic cycles in design, analysis, and modeling of internal combustion engines including spark-ignition and compression-ignition cycles, thermochemistry, fuels, combustion, emissions, and pollution.

ME 4643. Pressure Vessel and Piping Design. (3-0) 3 Credit Hours.
Prerequisites: ME 3663 and ME 3813. ASME Section XIII Boiler and Pressure Vessel code, inspection, maintenance, repair, and modification of pressure vessels. Piping design and construction.

ME 4653. Oil and Gas Engineering and Reservoir Geomechanics. (3-0) 3 Credit Hours.
Prerequisites: ME 3663 and ME 3813. Introduction to the oil and gas industry, Measurement; deformation mechanisms in rock; rock fracture description and analysis; wellbore stresses and failure; wellbore stability analysis; fault stability analysis; depletion-induced reservoir deformation; and hydraulic fracturing.

ME 4683. Corrosion Engineering. (3-0) 3 Credit Hours.
Prerequisite: ME 3244. Principles of electrochemistry, fundamentals of the environmental degradation of materials, corrosion thermodynamics and kinetics, corrosion phenomenology, and corrosion control and prevention.

ME 4723. Reliability and Quality Control in Engineering Design. (3-0) 3 Credit Hours.
Prerequisite: ME 3113. Introduction to statistical methods in reliability and probablistic engineering design methodology, statistical quality control and inspection, life prediction and testing, and design optimization. Generally offered: Fall.

ME 4733. Mechanical Engineering Laboratory. (2-3) 3 Credit Hours.
Prerequisites: ME 3113, ME 3543, and ME 4293. Completion of or concurrent enrollment in ME 4313 is required. Transducers and signal conditioning, strain, force, acceleration, controls, vibration, rotating machinery, fluid flow, heat transfer, thermodynamics, internal combustion engines, and design of experiments. (Formerly ME 4702. Credit cannot be earned for ME 4702 and ME 4733. Prior completion of ME 4702 and ME 4802 can be substituted for this course.) Generally offered: Fall, Spring.

ME 4773. Robotics. (3-0) 3 Credit Hours.
Prerequisite: ME 2173. Kinematics, dynamics, planning and control of mobile robots and manipulators. Special topics may include legged robots, soft robots, climbing robots, advanced control methods, image processing, computer vision, estimation. A LEGO-based laboratory with emphasis on prototyping robotic systems for practical applications.

ME 4803. Senior Design I. (3-0) 3 Credit Hours.
Prerequisites: ME 3113, ME 3263, ME 3543, ME 3663, ME 3823, and ME 4293. Completion of or concurrent enrollment in ME 4313, ME 4543 (or ME 3513 in previous catalogs) and ME 4733 required. Design project proposals, computer-aided synthesis, analysis, and modeling of an open-ended problem development and presentation of conceptual designs. Industrial cooperation is encouraged. This course, as well as ME 4313, ME 4543, and ME 4733, must be completed with a grade of "C-" or better to serve as prerequisites for ME 4813. (Formerly ME 4811 and ME 4812. Credit cannot be earned for more than one of the following: ME 4803, ME 4811, or ME 4812.).

ME 4813. Senior Design II. (2-3) 3 Credit Hours.
Prerequisites: ME 4313, ME 4543, ME 4733, and ME 4803. Development of a working design of an instructor-approved design project using computer-aided synthesis, analysis, modeling, and optimization methods. Industrial cooperation encouraged. Considerations of safety, reliability, environmental, and economic constraints, and ethical and social impacts. Generally offered: Fall, Spring.

ME 4911. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor’s degree.

ME 4912. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor’s degree.

ME 4913. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Permission in writing (form available) from the instructor, the student’s advisor, the Department Chair, and Dean of the College. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours of independent study, regardless of discipline, will apply to a bachelor’s degree.

ME 4953. Special Studies in Mechanical Engineering. (3-0) 3 Credit Hours.
Prerequisite: Will depend on the topic. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when topics vary, but not more than 9 semester credit hours, regardless of discipline, will apply to a bachelor’s degree. Generally offered: Fall, Spring.

ME 4963. Mechanical Engineering Applications to Biomedical Systems. (3-0) 3 Credit Hours.
Prerequisites: EGR 2513, ME 3663 and ME 3813. Applications of dynamics, solid mechanics and fluid mechanics to biomedical systems. (Formerly titled "Bioengineering").