

# REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

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## COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

### GENERAL REQUIREMENTS

Total Credit Hours . . . . . **122\***

**Minimum Retention/Graduation Grade Point Averages:**

Overall - Combined and OU . . . . . **2.00**

Major - Combined and OU . . . . . **2.00**

Curriculum - Combined and OU . . . . . **2.00**

**A minimum grade of C is required for each course in the curriculum.**

Mechanical Engineering  
(Standard)

**B675**

Bachelor of Science  
in Mechanical Engineering

For Students Entering the  
Oklahoma State System  
for Higher Education  
**Summer 2009 through  
Spring 2010**

**OU encourages students to complete at least 31 hours of applicable coursework each year to have the opportunity to graduate in four years.**

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
<b>FRESHMAN</b>	<b>ENGL 1113</b> , Prin. of English Composition (Core I)	3	<b>ENGL 1213</b> , Prin. of English Composition (Core I), <b>or</b>	3
	<b>CHEM 1315</b> , General Chemistry (Core II)	5	<b>EXPO 1213</b> , Expository Writing (Core I)	3
	<b>MATH 1823</b> , Calculus & Analytic Geometry I (Core I)	3	<b>MATH 2423</b> , Calculus & Analytic Geometry II (Core I)	3
	<b>ENGR 1411</b> , Freshman Engineering Experience	1	<b>PHYS 2514</b> , General Physics for Engineering & Science Majors (Core II)	4
	<b>HIST 1483</b> , U.S., 1492-1865, <b>or</b>		<b>P SC 1113</b> , American Federal Government (Core III)	3
	<b>1493</b> , U.S., 1865-Present (Core IV)	3	†Approved Elective: Social Science (Core III)	3
	<b>TOTAL CREDIT HOURS</b>	<b>15</b>	<b>TOTAL CREDIT HOURS</b>	<b>16</b>
<b>SOPHOMORE</b>	<b>MATH 2433</b> , Calculus & Analytic Geometry III	3	<b>MATH 2443</b> , Calculus & Analytic Geometry IV	3
	<b>PHYS 2524</b> , General Physics for Engineering & Science Majors (Core II)	4	<b>MATH 3113</b> , Introduction to Ordinary Differential Equations	3
	♣ <b>AME 2113</b> , Statics	3	<b>AME 2303</b> , Materials, Design & Manufacturing Processes	3
	<b>AME 2213</b> , Thermodynamics	3	<b>AME 2533</b> , Dynamics	3
	* <b>AME 2401</b> , Engineering Computing	1	<b>ENGR 2431</b> , Electrical Circuits	1
			<b>ENGR 2531</b> , Electrical Circuits II	1
	<b>TOTAL CREDIT HOURS</b>	<b>14</b>	<b>TOTAL CREDIT HOURS</b>	<b>15</b>
			<b>ENGR 3431</b> , Electromechanical Systems	1
<b>In order to be admitted to upper-division AME classes, students must submit an application to the AME office. At the time of the application, students shall have completed a set of requisite courses and should have a 2.80 OU retention and 2.80 combined retention grade point average.</b>				
<b>JUNIOR</b>	<b>AME 3112</b> , Solid Mechanics Lab	2	<b>AME 3103</b> , Interactive Engineering Design Graphics	3
	<b>AME 3143</b> , Solid Mechanics	3	<b>AME 3122</b> , Heat Transfer & Fluid Mechanics Lab	2
	<b>AME 3153</b> , Fluid Mechanics	3	<b>AME 3173</b> , Heat Transfer	3
	<b>AME 3723</b> , Numerical Methods for Engineering Computation	3	<b>AME 3353</b> , Design of Mechanical Components	3
	<b>ENGR 2002</b> , Professional Development	2	<b>ENGL 3153</b> , Technical Writing	3
	#Approved Technical Elective	3	#Approved Technical Elective	3
	<b>TOTAL CREDIT HOURS</b>	<b>16</b>	<b>TOTAL CREDIT HOURS</b>	<b>17</b>
<b>SENIOR</b>	<b>PHYS 3223</b> , Modern Physics for Engineers	3	<b>AME 4553</b> , Design Practicum (Capstone)	3
	<b>AME 3363</b> , Design of Thermal-Fluid Systems	3	† <b>COMM 3513</b> , Intercultural Communication (or an advisor-approved substitution) Western Civ. & Culture (Core IV)	3
	<b>AME 4163</b> , Principles of Engr. Design	3	† <b>ANTH 4623</b> , Approaches to Cross-Cultural Human Problems (or an advisor-approved substitution) Non-Western Culture (Core IV)	3
	#Approved Engineering Science Elective	3	#Approved Engineering Science Elective	3
	#Approved Experimental Elective	2	†Approved Elective: Artistic Forms (Core IV)	3
		<b>TOTAL CREDIT HOURS</b>	<b>14</b>	<b>TOTAL CREDIT HOURS</b>

**NOTE:** Engineering transfer students may take ENGR 3511 in place of ENGR 1411.

Courses designated as Core I, II, III, IV, or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list.

†To be chosen from the **University-Wide General Education Approved Course List**. Three of these 12 hours must be upper-division (3000-4000). See list in the Class Schedule.

In the College of Engineering, in order to progress in your curriculum, and as a specific graduation requirement, a grade of C or better is required in each course in the curriculum. Please refer to the General Catalog and Advising Center Bulletin Board for additional enrollment limitations.

Students must successfully complete prerequisite courses (with a minimum C grade) before proceeding to the next course.

• Two college-level courses in a single foreign language are required; this may be satisfied by successful completion of 2 years in a single foreign language in high school. Students who must take foreign language at the University will have an additional 6-10 hours of coursework.

#A list of Technical, Experimental, and Engineering Science electives is available in the AME Office, FH 212.

♣AME courses are sequential and usually offered only in the semester shown. Note prerequisites on the back of this page.

\*This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.

## COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

**2113 Statics.** Prerequisite: Physics 2514 and Mathematics 2433 or concurrent enrollment in Mathematics 2433. Vector representation of forces and moments; general three-dimensional theorems of statics; centroids and moments of area and inertia. Free-body diagrams, equilibrium of a particle and of rigid bodies, distributed loads, friction and internal shear and moment loads. Analysis of trusses, frames, and machines. (F)

**2213 Thermodynamics.** Prerequisite: Mathematics 2433 and Physics 2524, or concurrent enrollment (in both). First and second law of thermodynamics are developed and applied to the solutions of problems from a variety of engineering fields. Extensive use is made of differential calculus to interrelate thermodynamics functions. (F)

**2303 Materials, Design and Manufacturing Processes (Crosslisted with Industrial Engineering 2303).** Prerequisite: 2113 or Civil Engineering 2113 or Engineering 2113. Mechanical and physical properties of engineering materials. Introduction to design concepts, manufacturing processes and equipment used in engineering. (Sp)

**2401 Engineering Computing.** Prerequisite: Mathematics 1823 or concurrent enrollment. Introduction to computer programming and university computing facilities. Program design and development: computer application exercises in engineering. (F)

**2533 Dynamics.** Prerequisite: 2113, Mathematics 2433. Dynamics (kinematics and kinetics) of particles and rigid bodies for rectilinear, curvilinear and angular motion; work and energy methods; conservations of impulse and momentum; introduction to mechanical vibrations. (Sp)

**3103 Interactive Engineering Design Graphics.** Prerequisite: Mathematics 1823. Visualization and modeling techniques for product design and development. Design methodology, graphic standards, projection theory, freehand sketching, spatial geometry, CAD systems, geometric modeling, and tolerancing. Solving open-ended design and visualization problems. **Laboratory** (Sp)

**3112 Solid Mechanics Lab.** Prerequisite: 2113 or Engineering 2113; 3143 or concurrent enrollment. Measurement of displacement; velocity, acceleration, force, torque, strain, stress, data acquisition and processing; data analysis. **Laboratory** (F)

**3122 Heat Transfer and Fluid Mechanics Lab.** Prerequisite: 2113 or Engineering 2113, 3173 or concurrent enrollment. Basic measurement concepts in fluid mechanics and thermal science. Concepts and methods of measuring pressure, temperature, flow, thermal and transport properties. Data acquisition and analysis. **Laboratory** (Sp)

**3143 Solid Mechanics.** Prerequisite: 2113 or Engineering 2113, Mathematics 3113, or 3413 and 3401. Concepts of stress and strain; mechanical behavior of engineering materials; analysis of uniform stress states; analysis of members in torsion; stresses and deflections in beams; modes and theories of failure; design criteria. (F)

**3153 Fluid Mechanics.** Prerequisite: 2113, 2213, or Engineering 2113, 2213, Mathematics 3113. Principles of fluid mechanics: fluid statics, flow descriptions, conservation equations, dimensional analysis, potential flow, viscous flow and internal flow. (F)

**3173 Heat Transfer.** Prerequisite: 2213 or Engineering 2213, 3153. Heat transfer by conduction, convection, and radiation; mass transfer and combined modes of heat transfer. (Sp)

**3353 Design of Mechanical Components.** Prerequisite: 2303 and 3143. Analysis and design of mechanical subsystems and selection of elements such as gears, shafts, clutches, brakes and modern mechanical components. (Sp)

**3363 Design of Thermal-Fluid Systems.** Prerequisite: 2401 or Engineering 1001, 3153 or 3253, and 3173. Design of fluid flow, heat transfer and energy systems including analysis, synthesis and optimization. Topics include but are not limited to: ducts and piping systems, fluid machinery, heat exchangers, thermal storage devices, furnaces, combustors, refrigeration and air conditioning systems. (F)

**†G3723 AME Numerical Methods for Engineering Computation.** Prerequisites: 2401 or Chemical Engineering 2002, or Engineering 2002 or 2003, or Computer Science 1313 or 1323, and Mathematics 3113 or 3413. Course uses specific software applications tailored toward aerospace and mechanical engineering. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solutions of algebraic and transcendental equations, simultaneous linear equations, ordinary and partial differential equations, and curve fitting techniques. The methods are compared with respect to computational efficiency and accuracy. Any student who earns credit for P E 3723 cannot receive duplicate credit for AME 3723, C S 3723, or CH E 3723. This course may not be taken for graduate credit within the College of Engineering. (F)

**4163 Principles of Engineering Design.** Prerequisite: 2103 or 3103, 2533, 3353. Design process and methodology from concept through analysis, layout and report: Types of design problems, human element in design, computer aid in design, specification development, concept generation, concept evaluation, product generation, function and performance evaluation, design for manufacturing, design for assembly, design for life-cycle, sustainability, final product documentation, ethics, safety and economics. (F)

**4553 Design Practicum.** Prerequisite: senior standing, 3363 and 4163. Design study of actual problems in industry. **Lecture and Laboratory** (Sp) [V]

## COURSES IN ANTHROPOLOGY (ANTH)

**4623 Approaches to Cross-Cultural Human Problems.** Prerequisite: 1113 or junior standing. Introduces students to the complex problems of contemporary global-scale cultures and helps them better understand their place on this global arena. This course will look at specific international issues or problems, and relate them to processes occurring in many parts of the world. (Irreg.) [IV-NW]

## COURSES IN COMMUNICATION (COMM)

**3513 Intercultural Communication.** Prerequisite: 1113 and junior standing. Introduction to intercultural communication theory, research and selected applications. Topics include conceptualizing intercultural communication theoretically, trends in research, diffusion of innovation, nationality barriers and training for foreign assignments. (F, Sp) [IV-WC]

## COURSES IN ENGINEERING (ENGR)

**1411 Freshman Engineering Experience.** Prerequisite: declared major in Engineering or permission of instructor. Required of all entering freshmen with a declared Engineering major. Lecture hours cover a variety of topics including: majors and minors; career planning; advising; and extra-curricular activities. Students also work on multi-disciplinary engineering projects in smaller groups during the lab hour. (F)

**2002 Professional Development.** Prerequisite: sophomore standing. Develop an understanding of engineering ethics, teamwork, leadership, and professional responsibility through the concepts of contemporary, social, and global issues. (F, Sp)

**2431 Electrical Circuits.** Prerequisite: Mathematics 2423 and Physics 2524 or concurrent enrollment. Introduction to basic principles of electrical circuits. Topics include circuits (DC circuits, AC circuits, resonance, AC transients, DC transients) static electrical fields, static magnetic fields, and electronics (diodes, operational amplifiers). (F, Sp)

**2531 Electrical Circuits II.** Prerequisite: 2431. Introduction to intermediate principles of electrical circuits. Topics include amplifiers, filters, signal conditioning, A/D and D/A conversion, and common digital and analog circuits. (Sp)

**3431 Electromechanical Systems.** Prerequisite: 2431 and 2531. Introduction to basic principles of electromechanical systems. Topics include physical principles of sensing and actuation, types of sensors and actuators, and interfacing and communication protocols. (Sp)

## COURSES IN ENGLISH (ENGL)

**3153 Technical Writing.** Prerequisite: 1213 and Engineering or hard science majors only. For students of the pure and applied sciences. Focuses on the forms of report writing most frequently encountered in research and industry. (F, Sp, Su)

## COURSES IN MATHEMATICS (MATH)

**1823 Calculus and Analytic Geometry I.** Prerequisite: 1523 at OU, or satisfactory score on the placement test, or, for incoming freshmen direct from high school, satisfactory score on the ACT/SAT. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

**2423 Calculus and Analytic Geometry II.** Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

**2433 Calculus and Analytic Geometry III.** Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

**2443 Calculus and Analytic Geometry IV.** Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

**†G3113 Introduction to Ordinary Differential Equations.** Prerequisite: 2423. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transformations, phase planes and stability. (F, Sp, Su)

## COURSES IN PHYSICS (PHYS)

**2514 General Physics for Engineering and Science Majors.** Prerequisite: Mathematics 1823. Not open to students with credit in 1205. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

**2524 General Physics for Engineering and Science Majors.** Prerequisite: 2514 and Mathematics 2423. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

**†G3223 Modern Physics for Engineers.** Prerequisite: Mathematics 3113 or equivalent. Relativity, atomic structure, nuclear theory, wave mechanics, statistical physics, solid state physics. (F)