REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING/MASTER OF SCIENCE

(Accredited by the Accreditation Board for Engineering and Technology)

COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2008 through Spring 2009

GENERAL REQUIREMENTS

Total Credit Hours . . . . . **144-148•§**
Minimum Retention/Graduation Grade Point Averages:
Overall - Combined and OU **3.25**
Major - Combined and OU **3.25**
Curriculum - Combined and OU **3.25**
A minimum grade of C is required for each course in the curriculum.

Mechanical Engineering (Standard) **0910N**
Bachelor of Science in Mechanical Engineering/ Master of Science

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
FRESHMAN	**ENGL 1113**, Prin. of English Composition (Core I)	3	**ENGL 1213**, Prin. of English Composition (Core I), **or**	3
	CHEM 1315, General Chemistry (Core II)	5	**EXPO 1213**, Expository Writing (Core I)	
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	**MATH 2423**, Calculus & Analytic Geometry II (Core I)	3
	ENGR 1410, Freshman Engineering Orientation I	0	**PHYS 2514**, General Physics for Engineering & Science Majors (Core II)	4
	HIST 1483, U.S., 1492-1865, **or** **1493**, U.S., 1865-Present (Core IV)	3	**P SC 1113**, American Federal Government (Core III)	3
			ENGR 1420, Freshman Engineering Orientation II	0
			†Approved Elective: Social Science (Core III)	3
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**	**16**
SOPHOMORE	**MATH 2433**, Calculus & Analytic Geometry III	3	**MATH 2443**, Calculus & Analytic Geometry IV	3
	PHYS 2524, General Physics for Engineering & Science Majors (Core II)	4	**MATH 3113**, Introduction to Ordinary Differential Equations	3
			AME 2303, Materials, Design & Manufacturing Processes	3
	✤**AME 2113**, Statics	3	**AME 2533**, Dynamics	3
	AME 2213, Thermodynamics	3	**ENGR 2431**, Electrical Circuits	1
	***AME 2401**, Engineering Computing	1	**ENGR 2531**, Electrical Circuits II	1
			ENGR 3431, Electromechanical Systems	1
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**	**15**
‡ 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.				
JUNIOR	**AME 3112**, Solid Mechanics Lab	2	**AME 3103,** Interactive Engineering Design Graphics	3
	AME 3143, Solid Mechanics	3	**AME 3122**, Heat Transfer & Fluid Mechanics Lab	2
	AME 3153, Fluid Mechanics	3	**AME 3173**, Heat Transfer	3
	AME 3723, Numerical Methods for Engineering Computation	3	**AME 3353**, Design of Mechanical Components	3
	ENGR 2003, Engineering Practice I	3	**ENGL 3153,** Technical Writing	3
	#Approved Technical Elective	3	#Approved Technical Elective	3
	TOTAL CREDIT HOURS	**17**	**TOTAL CREDIT HOURS**	**17**
✯ Approval for admission to the accelerated BS/MS program must be initiated at the beginning of the second semester of the junior year.				
SENIOR	**PHYS 3223**, Modern Physics for Engineers	3	**AME 4553**, Design Practicum (Capstone)	3
	AME 3363, Design of Thermal-Fluid Systems	3	**AME** Graduate-level Elective	3
	AME 4163, Principles of Engineering Design	3	†**COMM 3513**, Intercultural Communication (or an advisor-approved substitution) Western Civ. & Culture (Core IV)	3
	AME Graduate-level Elective	3	†**ANTH 4623**, Approaches to Cross-Cultural Human Problems (or an advisor-approved substitution) Non-Western Culture (Core IV)	3
	#Approved Experimental Elective	2		
			†Approved Elective: Artistic Forms (Core IV)	3
	TOTAL CREDIT HOURS	**14**	**TOTAL CREDIT HOURS**	**15**
Students are eligible for graduate status upon graduation with the Bachelor of Science in Mechanical Engineering.				
FIFTH YEAR	**AME 5573**, Advanced Engineering Analysis I, **or**	3	**AME** Graduate-level Elective	3
	MATH Graduate-level Elective		**AME** Graduate-level Elective	3
	AME Graduate-level Elective	3	**AME** Graduate-level Elective	3
	AME Graduate-level Elective	3	§**AME 5980,** Thesis Research (thesis option only), **or**	3-4
	§**AME 5980,** Thesis Research**, or**	2-3	**AME** Graduate-level Elective	
	AME Graduate-level Elective			
	TOTAL CREDIT HOURS	**11-12**	**TOTAL CREDIT HOURS**	**12-13**

§ Dependent upon whether a student chooses the thesis or non-thesis option. Non-thesis option additionally requires: **AME Graduate-level Elective** (3 hrs.) and **AME 5990 Special Project** (3 hrs.) to be taken in the Summer between the Senior and the Fifth Year, and **Comprehensive Exam** to be taken in the last semester of study.

✯ **Students may enter the accelerated program based on the undergraduate degree pattern offered in the year they first enrolled in the Oklahoma State System of Higher Education or later. NOTE:** Engineering transfer students may take ENGR 3410 in place of ENGR 1410 and ENGR 1420.
Fourth and fifth year graduate electives must satisfy MS in mechanical engineering requirements.

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 Numerical Methods for Engineering Computation (Crosslisted with Chemical Engineering, Computer Science and Petroleum Engineering 3723). Prerequisites: 2401 or Chemical Engineering 2002 or Computer Science 1313 or Computer Science 1323 or Engineering 1001 or Engineering 2003, and Mathematics 3113. 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. 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, 3143. 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)

G4243 Aerospace Propulsion Systems. Prerequisite: 2213 or Engineering 2213, and 3153 or 3253 or permission. Propulsion systems, thermodynamic cycles, combustion and thermochemical analysis, reciprocating engines, gas turbine and jet engines, current developments in propulsion systems. (F)

4263 Computer Integrated Manufacturing (Slashlisted with 5263). Prerequisite: 2303, 4283. A general understanding on computer-based methods for manufacturing and assembly of mechanical products. The concept and methods for product manufacturing and assembly will be introduced from design viewpoint. No student may earn credit for both 4263 and 5263. (Irreg.)

G4383 Control Systems. Prerequisite: 2533, Mathematics 3413 and 3401. Introduction to the concepts and theory of feedback control systems. Representation of electromechanical systems and aerospace vehicles by transfer and state variable methods. Stability and performance analysis, design techniques and synthesis methods for linear control systems. (F)

G4442 Internal Combustion Engines Laboratory. Prerequisite: 3122 or graduate standing. Test equipment and instrumentation, propulsion systems, reciprocating engines, supercharger fuel systems, tests and evaluation. **Lecture and Laboratory** (Sp)

4553 Design Practicum. Prerequisite: senior standing, 3353 3363, and 4163, or permission of instructor. Design study of actual problems in industry. **Lecture and Laboratory** (Sp) [V]

4593 Space Systems and Mission Design (Slashlisted with 5593). Prerequisite: 4493 or permission from instructor. Topics include basic orbital mechanics, orbit determination, perturbations, numerical techniques, interplanetary transfer, influence of space environment, atmospheric re-entry. Space vehicles subsystems design; propulsion, attitude determination and control, structural design, thermal control, power and telecommunications. Investigation into mission design concepts and consideration. No student may earn credit for both 4593 and 5593. (Sp)

4613 Multimedia in Engineering (Slashlisted with 5613). Prerequisite: junior, senior, or graduate standing or permission of instructor. Introduces engineering students to electronic media. Topics will center on engineering and how electronic media can be used by engineers to illustrate technical topics such as three-dimensional motion, data visualization, time-based physical actions, and real-time simulations. Emphasizes developing effective interactive media programs for all engineering disciplines. No student may earn credit for both 4613 and 5613. (F)

G4812 Dynamics and Controls Laboratory. Prerequisite: 3112 or equivalent or graduate standing. May be repeated with change of project; maximum credit four hours. Objectives are to teach the implementation of instrumentation and controls for mechanical systems and explore design factors of the control of mechanical systems. **Lecture and Laboratory** (Sp)

G4822 Fluid and Thermal Laboratory. Prerequisite: 3173; 3122 or equivalent or graduate standing. May be repeated with change of content; maximum credit six hours. Experimental studies in heat transfer or fluid mechanics. **Lecture and Laboratory** (F)

G5573 Advanced Engineering Analysis I. Prerequisite: Mathematics 3113. Vector and tensor analysis. Calculus of variations followed by variational methods and/or the method of weighted residuals. (Irreg.)

G5980 Research for Master's Thesis. Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

COURSES IN ENGINEERING (ENGR)

1410 Freshman Engineering Orientation I. Prerequisite: declared major in engineering. All entering freshmen with a declared engineering major are required to enroll. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the College of Engineering, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean's Leadership Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area. (F)

1420 Freshman Engineering Orientation II. Prerequisite: declared major in engineering. All entering freshmen with a declared engineering major are required to enroll in this spring continuation course. One hour of this seminar a week is in a large group setting where all students meet and cover details on all engineering disciplines. Additional topics would be continuums of majors, success in the College of Engineering, success at the University of Oklahoma, study abroad programs, advising issues, graduate school opportunities, career planning, and information related to technical/honor societies and participation. A second hour a week is a required small group session with an upper-class mentor from the College of Engineering Dean's Leadership Council. This second hour will focus on basic enrollment and retention strategies such as adding and dropping classes and choosing electives in addition to a weekly topic area. (Sp)

2003 Engineering Practice I. Prerequisite: 1410, 1420, and English 1213. Introduction to basic principles of successful engineering enterprise. (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 MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the placement test, or 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)