REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

(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 2000 through Spring 2001**	**GENERAL REQUIREMENTS** Total Credit Hours . . . . 131• **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 required for each course in the curriculum.	Mechanical Engineering # (Premedical Option) **0910B** Bachelor of Science in Mechanical Engineering

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FRESHMAN	ENGL **1113**, Prin. of English Composition (Core I) CHEM **1315**, General Chemistry (Core II) MATH **1823**, Calculus & Analytic Geometry I (Core I) P SC **1113**, American Federal Government (Core III) ENGR **1112**, Intro. to Engineering	3 5 3 3 2	ENGL **1213**, Prin. of English Composition (Core I) CHEM **1415**, General Chemistry MATH **2423**, Calculus & Analytic Geometry II (Core I) ••PHYS **2514**, General Physics for Engineering & Science Majors (Core II) ◆AME **2103**, Interactive Engineering Design Graphics ENGR **1001**, Engineering Computing	3 5 3 4 3 1
	TOTAL CREDIT HOURS	**16**	**TOTAL CREDIT HOURS**	**19**
SOPHOMORE	MATH **2433**, Calculus & Analytic Geometry III ••PHYS **2524**, General Physics for Engineering & Science Majors ZOO **1114**, Intro. Zoology ENGR **2113**, Rigid Body Mechanics ENGR **2313**, Structure & Properties of Materials	3 4 4 3 3	MATH **2443**, Calculus & Analytic Geometry IV MATH **3113**, Introduction to Ordinary Differential Equations ENGR **2213**, Thermodynamics ENGR **2613**, Electrical Science AME **2303**, Design & Manufacturing Processes AME **2533**, Dynamics	3 3 3 3 3 3
	TOTAL CREDIT HOURS	**17**	**TOTAL CREDIT HOURS**	**18**
JUNIOR	^CHEM **3053**, Organic Chemistry ZOO **1121**, Intro. Zoology Lab ENGR **3723**, Numerical Methods for Engineering Computation AME **3112**, Solid Mechanics Lab AME **3143**, Solid Mechanics I AME **3153**, Fluid Mechanics	3 1 3 2 3 3	^CHEM **3153**, Organic Chemistry ^CHEM **3152**, Organic Chemistry Lab AME **3122**, Heat Transfer & Fluid Mechanics Lab AME **3173**, Heat Transfer ~Approved Communications Elective †Approved Elective: Social Science (Core III)	3 2 2 3 3 3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**16**
SENIOR	HIST **1483**, U.S., 1492-1865, **or** **1493**, U.S., 1865-Present (Core IV) PHYS **3223**, Modern Physics for Engineers ‡^ZOO Elective ¤AME Required Design Elective †Approved Elective: Artistic Forms (Core IV)	3 3 3 3 3	AME **4163**, Principles of Engr. Design AME **4553**, Design Practicum (Capstone) §Approved Engineering Science Elective †Approved Elective: Non-Western Culture (Core IV) †Approved Elective: Western Civ. & Culture (Core IV)	3 3 3 3 3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**15**

Courses designated as Core I, II, III or IV 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. One of these courses should be an English course 2000-level or above. Six 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 for additional enrollment limitations.

Students should read the College of Engineering Scholastic Regulations which are posted on the Advising Bulletin Board across from CEC 104.

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.

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

§A list of Engineering Science electives is available in AME Office, FH 212.

‡To be chosen from ZOO 2204, 2343, 3113, 3203, 3333, or 4243.

••Some medical schools also require PHYS 1302; OU does not.

^Students who wish to take the MCAT in their junior year are encouraged to take the required zoology elective and the organic chemistry during their junior year. Some may also wish to take an additional zoology elective (not required in the curriculum).

¤To be chosen from AME 3353, Design of Mechanical Components and Thermal-Fluid Systems, or AME 3363, Design of Thermal-Fluid and Mechanical Systems.

~To be chosen from: ENGL 3153; COMM 1113; COMM 2113; or COMM 2613.

#Pre-med students should consult their pre-med adviser as well as their Mechanical Engineering adviser for necessary medical school information.

COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

2103 Interactive Engineering Design Graphics. Prerequisite: Engineering 1112, 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)

2303 Design and Manufacturing Processes (Crosslisted with Industrial Engineering 2303). Prerequisite: Engineering 1112 and 2313. Introduction to the fundamentals of product design and manufacturing process selection. (Sp)

2533 Dynamics. Prerequisite: Engineering 2113, Mathematics 2433. Dynamics of particles and rigid bodies for rectilinear and curvilinear motion; energy and momentum methods; introduction to mechanical vibrations. (Sp)

3112 Solid Mechanics Lab. Prerequisite: Engineering 2113, Mathematics 3113; corequisite: 3143. 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: Engineering 2113, Mathematics 3113; corequisite: 3173. 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** (F)

3143 Solid Mechanics I. Prerequisite: Engineering 2113; corequisite: 3112. 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: 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: 3153, Engineering 2213; corequisite: 3122. Heat transfer by conduction, convection, and radiation; mass transfer and combined modes of heat transfer. (Sp)

3353 Design of Mechanical Components and Thermal-Fluid Systems. Prerequisite: 2303, 3173, Engineering 1001, Engineering 2213; 3143 or Engineering 2153; and 3153 or 3253 or Engineering 3223. Analysis and design of mechanical subsystems and selection of elements such as gears, shafts, clutches, brakes and modern mechanical components. Design of fluid flow, heat transfer and energy systems is also covered. **Lecture and laboratory.** (F)

3363 Design of Thermal-Fluid and Mechanical Systems. Prerequisite: 2303, 3173, Engineering 1001, Engineering 2213; 3143 or Engineering 2153; and 3153 or 3253 or Engineering 3223. Analysis, synthesis, and design of fluid flow, heat transfer and energy systems such as ducts and piping systems, fluid machinery, heat exchangers, thermal storage devices, furnaces, combustors, refrigeration and air conditioning systems. Design of mechanical systems and subsystems is also covered. **Lecture and laboratory** (F)

4163 Principles of Engineering Design. Prerequisite: 2103, 2533, 3143; Engineering 2213. 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-to-cast, design-for-assembly, final product documentation, ethics, safety and economics. (Sp)

4213 Biomechanics I (Slashlisted with 5213). Prerequisite: 3143 and 3153 or permission of instructor. Introduction to physiological systems with emphasis on structure and function of tissues and organs; application of continuum mechanics to understanding of tissue and organ behavior at microscopic and macroscopic levels; viscoelastic and solid biomaterials. No student may earn credit for both 4213 and 5213. (F)

4223 Biomechanics II (Slashlisted with 5223). Prerequisite: 3143 and 3153 or permission of instructor. Biofluid mechanics; non-Newtonian behavior of blood and body fluids; basic mechanical properties of muscle, bone, cartilage, and other living tissues; application of continuum mechanics to circulation; growth and change of living organs in response to stress and strain. No student may earn credit for both 4223 and 5223. (Sp)

4233 Biomaterials (Slashlisted with 5233). Prerequisite: junior or senior standing in the College of Engineering and permission of instructor. Introduction to materials used in biomedical environment, the design and use of implantable materials, such as metals, polyethylene, ceramics, and composites, biocompatibility, test methods, and tissue growth on biomaterials. No student may earn credit for both 4233 and 5233. (Sp)

4553 Design Practicum. Prerequisite: senior standing, 3173, 3353 or 3363, corequisite: 4163; or permission. Design study of actual problems in industry. **Lecture and Laboratory** (Sp)

COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, gas laws and changes in state, stoichiometry, atomic theory, electron configuration, periodicity, bonding, molecular structure and thermochemistry. **Laboratory** (F, Sp, Su)

1415 General Chemistry (Continued). Prerequisite: 1315 with a minimum grade of C or a satisfactory score on the chemistry placement examination. Topics covered include: nature of solutions, equilibrium, thermodynamics, acid and base properties, kinetics and electrochemistry. **Laboratory** (F, Sp, Su)

3053 Organic Chemistry. Prerequisite: 1415 or 1425. Two-semester sequence (3053 and 3153) covering the fundamental concepts of organic structure and reactions of the principal functional groups. Reaction mechanisms. (F, Sp, Su)

3152 Organic Chemistry Laboratory. Prerequisite: concurrent enrollment in 3153 or permission of the department. Selected experiments designed to illustrate the fundamental techniques used in organic research, to develop familiarity with the properties of organic compounds and to demonstrate the application of the scientific approach to laboratory work. (F, Sp, Su)

3153 Organic Chemistry. Prerequisite: 3053 or 3013 and permission. Two-semester sequence (3053 and 3153) covering the fundamental concepts of organic structure and reactions of the principal functional groups. Reaction mechanisms. (F, Sp, Su)

COURSES IN ENGINEERING (ENGR)

1001 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, Sp, Su)

1112 Introduction to Engineering. Prerequisite: Mathematics 1523. Engineering fundamentals/problem solving, (principles of mechanics, energy balances, simple circuits), graphics, specifications, ethics, contracts, introduction to the engineering library. (F, Sp, Su)

2113 Rigid Body Mechanics. Prerequisite: 1112, Physics 2514 and Mathematics 2433 or concurrent enrollment in 2433. Vector representation of forces and moments; general three-dimensional theorems of statics; free bodies; two- and three-dimensional statically determinate frames; centroids and moments of inertia of areas. Absolute motion of a particle; motion of rigid bodies; rotating axes and the Coriolis component of acceleration; Newton's laws applied to translating and rotating rigid bodies; principles of work and energy and impulse and momentum in translation and rotation; moments of inertia of masses. (F, Sp, Su)

2213 Thermodynamics. Prerequisite: 1112, Mathematics 2433 and Physics 2524 or concurrent enrollment. First and second laws of thermodynamics are developed and applied to the solution of problems from a variety of engineering fields. Extensive use is made of partial differential calculus to interrelate the thermodynamic functions. (F, Sp, Su)

2313 Structure and Properties of Materials. Prerequisite: 1112, Chemistry 1315 and concurrent enrollment in Physics 2524. The behavior of materials under various conditions and environments is correlated to atomic and molecular structure and bonding. (F, Sp, Su)

2613 Electrical Science. Prerequisite: 1112, Mathematics 2423; Physics 2524 or concurrent enrollment. Formulation and solution of circuit equations, network theorems, sinusoidal steady-state analysis, simple transients. (F, Sp, Su)

†G3723 Numerical Methods for Engineering Computation. Prerequisite: 1112, 1001 or Computer Science 1313 or 1323, and Mathematics 3113. Basic methods for obtaining numerical solutions with a digital computer. Included are methods for the solution 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. (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 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)

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)

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: 2443 or concurrent enrollment. Duplicates two hours of 3413. First order ordinary differential equations, linear differential equations with constant coefficients, Laplace transformations, power-series solutions of differential equations, Bessel functions. (F, Sp, Su)

COURSES IN PHYSICS (PHYS)

1302 General Physics Laboratory. Prerequisite: high school physics or enrollment in a college course in physics. Experiments in basic laws of physics. **Laboratory** (F, Sp, Su)

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)

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)

COURSES IN ZOOLOGY (ZOO)

1114 Introductory Zoology. Major biological principles and concepts as illustrated in the structure, function and evolution of animals. Emphasis is on self-regulatory mechanisms, especially in the vertebrates, and their adaptive significance. (F, Sp, Su)

1121 Introductory Zoology Laboratory. Prerequisite: previous completion or concurrent enrollment in 1114. Laboratory study of structure and development of organ systems. Experiments on physiological process of selected vertebrates and invertebrates. (F, Sp, Su)

2204 Comparative Vertebrate Anatomy. Prerequisite: 1114 and 1121, or equivalent. A study of the anatomy and evolutionary development of vertebrate organ systems. Representative vertebrates are studied in laboratory. **Laboratory** (F)

3113 Cell Biology (Crosslisted with Botany, Microbiology 3113). Prerequisite: 1114 or Botany 1114 and Chemistry 3013 or 3053. Introduction to the cell as a unit of life. A chemical and physical comparison of procaryotic and eucaryotic cells to include a discussion of cell metabolism, types of metabolic regulation, and an analysis of ultrastructure. Emphasis will be placed on the dynamic changes in structure and ultrastructure which occur during the life of a cell. (F, Sp)

†G3201 Animal Development Lab. Prerequisite: 3203 or concurrent enrollment. Laboratory study of the development and embryology of a variety of animals. Developmental concepts and mechanisms will be illustrated through the use of prepared materials and hands-on experiments. **Laboratory** (F, Sp)

†G3203 Animal Development. Prerequisite: eight hours of zoology including 1114 and 1121. Study of animal development from gamete formation through organogenesis and postembryonic phases in different animal models. Concepts and mechanisms at the tissue, cellular and molecular levels will supplement descriptive analyses of development. (Sp)

†G3333 Genetics (Crosslisted with Botany 3333). Prerequisite: eight hours of zoology or eight hours of botany, or five hours of zoology or botany and permission. Principles of inheritance at gene, chromosome, and population levels; nature of the genetic material and its involvement in the determination of structure and function. No laboratory. (F, Sp)

G4243 Animal Histology. Prerequisite: 3103, 3113 or 3203 or permission. Structure and function of animal tissues with emphasis on the cellular basis of tissue and organ function. Laboratory emphasizes the identification of cells and tissues with the use of the light microscope. **Laboratory** (Sp)