REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Accredited by ABET, Inc., (formerly the Accrediting Board for Engineering and Technology)

COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

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

GENERAL REQUIREMENTS

Total Credit Hours . . . . . **126•**

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.

Engineering Physics

B372

Bachelor of Science in Engineering Physics

OU encourages students to complete at least 32 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
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	**EXPO 1213**, Expository Writing (Core I)	
	P SC 1113, American Federal Government (Core III)	3	**CHEM 1315**, General Chemistry (Core II)	5
	§PHYS 1205, Intro. Physics I for Physics Majors (Core II)	5	**MATH 2423**, Calculus & Analytic Geometry II (Core I)	3
	ENGR 1411, Freshman Engineering Experience	1	**§PHYS 1215**, Intro. Physics II for Physics Majors	5
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**16**
SOPHOMORE	**MATH 2433**, Calculus & Analytic Geometry III	3	**MATH 2443**, Calculus & Analytic Geometry IV	3
	HIST 1483, U.S., 1492-1865, **or**	3	**MATH 3413**, Physical Mathematics I	3
	1493, U.S. 1865-Present (Core IV)		**CH E 2313**, Structure & Properties of Materials	3
	PHYS 2203, Introductory Physics III: Modern Physics	3	**ENGR 2002**, Professional Development	2
	PHYS 2303, Electronics	3	**PHYS 3043**, Physical Mechanics I	3
	***C S 1313**, Programming for Nonmajors, **or**	3		
	1323, Introduction to Computer Programming			
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**14**
JUNIOR	**MATH 3423**, Physical Mathematics II	3	**PHYS 3302**, Advanced Laboratory I **or**,	2
	PHYS 3053, Physical Mechanics II	3	**3312**, Advanced Laboratory II	
	PHYS 3183, Electricity & Magnetism	3	**PHYS 3803**, Introduction to Quantum Mechanics I	3
			AME 3153, Fluid Mechanics, **or**	3
	Engineering Elective (2000-4000-level)	3	**CEES 2223**, Fluid Mechanics	
	†Approved Elective: Artistic Forms (Core IV)	3	Engineering Elective (2000-4000-level)	3
			❊Engineering Elective (Design Sequence 1)	3
			†Approved Elective: Social Science (Core III)	3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**17**
SENIOR	**PHYS 4153**, Statistical Physics & Thermodynamics	3	**PHYS 4300**, Senior Lab Project (Capstone)	2
	PHYS 4300, Senior Lab Project (Capstone)	2		
			Approved Physics Elective	3
	❊Engineering Elective (Design Sequence 2)	3	❊Engineering Elective (Design Sequence 4)	3
	❊Engineering Elective (Design Sequence 3)	3	❊Engineering Elective (Design Sequence 5)	3
	‡Technical Elective	3	+Engineering Physics Elective	3
	†Approved Elective: Non-Western Culture (Core IV)	3		
			†Approved Elective: Western Civ. & Culture (Core IV)	3
	TOTAL CREDIT HOURS	**17**	**TOTAL CREDIT HOURS**	**17**

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 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.

§With approval of adviser, PHYS 2514, 2524, and PHYS 1311 and 1321 may substitute for PHYS 1205, 1215.

‡A course numbered 3000 or above from engineering, physics or mathematics. Co-op students may substitute 3 hours of ENGR 2281, on approval of adviser. A 2000-level engineering course may be used if prerequisite for engineering design sequence. Must be approved by adviser.

❊The 15 hours of engineering electives in an engineering discipline must emphasize engineering design. Electives must be approved by adviser.

+A course numbered 3000 or above from engineering or physics. A 2000-level engineering course may be used if it is a prerequisite of a design sequence and the technical elective is not a 2000-level course. ELECTIVES MUST BE APPROVED BY ADVISER.

*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)

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)

COURSES IN CHEMICAL ENGINEERING (CH E)

2313 Structure and Properties of Materials. Prerequisite: Chemistry 1415, Physics 2524. The behavior of materials under various conditions and environments is correlated to atomic and molecular structure and bonding. (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) [II-LAB]

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

2223 Fluid Mechanics. Prerequisites: 2113, Mathematics 3113 and concurrent enrollment. Coverage of the fundamentals of fluid statics and dynamics. Formulation of the equation of fluid flow, i.e., Navier-Stokes equations, Eulers equations, Bernoulli equations, etc. and their application. Examples of ideal fluid flow and viscous fluid flow, such as flow in open and closed conduits. (Sp)

COURSES IN COMPUTER SCIENCE (C S)

1313 Programming for Nonmajors. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

1323 Introduction to Computer Programming. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer software with an emphasis on abstraction and program organization. (F, Sp)

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)

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)

†G3413 Physical Mathematics I. Prerequisite: 2443 or concurrent enrollment. Complex numbers and functions. Fourier series, solution methods for ordinary differential equations and partial differential equations, Laplace transforms, series solutions, Legendre's equation. Duplicates two hours of 3113. (F)

†G3423 Physical Mathematics II. Prerequisite: 2443, 3413. The Fourier transform and applications, a survey of complex variable theory, linear and nonlinear coordinate transformations, tensors, elements of the calculus of variations. (F, Sp)

COURSES IN PHYSICS (PHYS)

1205 Introductory Physics I for Physics Majors. Prerequisite: enrollment in Mathematics 1823 or permission of instructor. To be taken by physics, astronomy and engineering physics majors during the first semester of their freshman year. Kinematics, dynamics, work and energy, many-particle systems, rigid body rotation, simple harmonic motion. Laboratory is an integral part of the course. **Laboratory** (F) [II-LAB]

1215 Introductory Physics II for Physics Majors. Prerequisite: 1205 or permission of instructor. Electricity and magnetism: static fields and forces, circuits, electromagnetic induction. Thermodynamics: the First and Second Laws, temperature, heat, work and entropy. Laboratory is an integral part of the course. **Laboratory** (Sp)

2203 Introductory Physics III: Modern Physics. Prerequisite: 1215 or 2524 (or concurrent enrollment), or permission of instructor. An introduction to and overview of key concepts in contemporary physics, with emphasis on the contrast between classical and modern ways of thinking about the physical universe. Includes an introduction to selected major subject areas, which might include light and optics, relativity, atoms and molecules, the solid state, nuclei, elementary particles, fundamental interactions, cosmology and/or chaos. Students will also explore selected topics in current physics research. (F)

2303 Electronics. Prerequisite: 1215 or 2524 (or concurrent enrollment), or permission of instructor. An introduction to the characteristics of semiconductor electronic components and their use in the design and operation of practical analog and digital electronic circuits. The emphasis will be on gaining a working knowledge of basic circuits and preparation for understanding and building electronic circuits encountered by experimental research physicists. (F)

3043 Physical Mechanics I. Prerequisite: 1205 or 2514, and Mathematics 3113 or 3413 (or concurrent enrollment); or permission of instructor. Differential equations based continuum mechanics: Newtonian particle mechanics, driven and damped oscillations, vibrations and waves, and their application to other linear systems, non-linear oscillations, introduction to Lagrange's equations. (Sp)

†G3053 Physical Mechanics II. Prerequisite: 3043 or permission of instructor. Lagrangian and Hamiltonian dynamics. Non-inertial reference frames. Rigid body motion. Central forces and collisions. Special relativity. (F)

†G3183 Electricity and Magnetism I. Prerequisite: 2203, Mathematics 3413 or concurrent enrollment; or permission of instructor. Electrostatics, dielectrics, continuity conditions, magnetic forces and fields, magnetic induction, magnetization, Maxwell's equations. (F)

3302 Advanced Lab I. Prerequisite: 2303 or permission of instructor. Junior-level experiments in physics. (F, Sp)

3312 Advanced Lab II. Prerequisite: 3302 or permission of instructor. Junior-level experiments in physics. (F, Sp)

†G3803 Introduction to Quantum Mechanics I. Prerequisite: 2203 or permission of instructor. Fundamental ideas of quantum physics. Postulates of quantum theory, wave functions, operators, the Schrödinger equation, one-dimensional systems. Mathematical tools of quantum mechanics. Theory of measurement. Stationary and nonstationary states. (Sp)

G4153 Statistical Physics and Thermodynamics. Prerequisite: 3803. Statistical properties of physical systems. Entropy and temperature, the Boltzmann distribution, Fermi-Dirac and Bose-Einstein gases. Thermodynamic functions. Statistical interpretation of thermodynamics. (F)

4300 Senior Research Project. 1 to 3 hours. Prerequisite: senior standing in major and permission of instructor. May be repeated once. Research project, experimental or theoretical, to be arranged with individual faculty, leading to a senior thesis. Group seminars to discuss projects and other topics of current interest in physics and astronomy. Total of four hours required for general education capstone. (F, Sp) [V]