

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

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GALLOGLY COLLEGE OF ENGINEERING

THE UNIVERSITY OF OKLAHOMA

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

For Students Entering the
Oklahoma State System for
Higher Education
**Summer 2018 through
Spring 2019**

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 1914, Differential and Integral Calculus I (Core I)	4	EXPO 1213, Expository Writing (Core I)	3
	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 2924, Differential and Integral Calculus II (Core I)	4
	ENGR 1411, Freshman Engineering Experience	1	§PHYS 1215, Intro. Physics II for Physics Majors	5
	TOTAL CREDIT HOURS	16	TOTAL CREDIT HOURS	17
SOPHOMORE	❖MATH 2934, Differential and Integral Calculus III	4	MATH 3413, Physical Mathematics I	3
	HIST 1483, U.S., 1492-1865, or	3	Engineering Elective (2000-4000 level)	3
	1493, U.S. 1865-Present (Core IV)	3	ENGR 2002, Professional Development	2
	PHYS 2203, Introductory Physics III: Modern Physics	3	PHYS 3043, Physical Mechanics I	3
	PHYS 2303, Electronics	3	†Approved Elective: Social Science (Core III)	3
	C S 1313, Programming for Non-Majors with C or	3		
	1323, Intro. to Comp. Programming for Programmers	3		
	TOTAL CREDIT HOURS	16	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	3
	PHYS 3183, Electricity & Magnetism	3	PHYS 3803, Introduction to Quantum Mechanics I	3
	Engineering Elective (2000-4000-level)	3	AME 3153, Fluid Mechanics, or	3
	†Approved Elective: Artistic Forms (Core IV)	3	CEES 2223, Fluid Mechanics	3
			Engineering Elective (2000-4000-level)	3
		‡Engineering Elective (Design Sequence 1)	3	
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	14
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.**

❖MATH 1823, 2423, 2433, and 2443 sequence can be substituted for MATH 1914, 2924, and 2934.

* CHEM 1315 can be substituted with CHEM 1335 (Fall only).

COURSES IN AEROSPACE AND MECHANICAL ENGINEERING (AME)

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

COURSES IN CHEMISTRY AND BIOCHEMISTRY (CHEM)

1315 General Chemistry. Prerequisite: Mathematics 1503 or 1643, or math ACT equal to or greater than 23. General Chemistry is an overview of the chemical basis of natural phenomena. First of a two-semester sequence in general chemistry. Topics covered: basic measurement, atomic theory, electron configuration, periodicity, chemical reactivity and energetics, stoichiometry, gas laws and changes in state, bonding and molecular structure. A student may not receive credit for this course and CHEM 1335. **Laboratory.** (F, Sp, Su) [II-LAB]

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

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

COURSES IN COMPUTER SCIENCE (C S)

1313 Programming for Non-Majors with C. Prerequisite: MATH 1523 or concurrent enrollment. Introduction to the design and implementation of computer programs. Emphasis on problem solving. Topics include: variables and constants, arithmetic and Boolean expressions, conditional statements, loops, procedures and functions, arrays, standard libraries, input and output, structures, and program documentation. (F, Sp)

1323 Intro. to Comp. Programming for Programmers. Prerequisite: MATH 1523 or concurrent enrollment or placement into MATH 1743 or MATH 1823 or higher and department permission. Introduction to the design and implementation of computer software with an emphasis on abstraction and program organization for students with some prior programming experience. Topics include: variables and constants, arithmetic and Boolean expressions, conditional statements, repetition, methods, arrays, linear and binary search, basic sorting algorithms, object-oriented programming, documentation, and testing. (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: ENGR 1410 or ENGR 1411, or ENGR 3511 or ENGR 3410 or concurrent enrollment; ENGL 1213 or EXPO 1213, and 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)

1914 Differential and Integral Calculus I. Prerequisite: satisfactory score on the math assessment. Duplicates three hours of MATH 1823 and one hour of MATH 2423. Limits and continuity, differentiation, applications of differentiation to optimization and curve sketching, integration, the fundamental theorem of calculus, the substitution rule, applications of integration to computation of areas and volumes. (F, Sp, Su) [I-M]

2924 Differential and Integral Calculus II. Prerequisite: 1914 with a grade of C or better. Duplicates two hours of 2423 and two hours of 2433. The natural logarithmic and exponential functions, indeterminate forms, techniques of integration, improper integrals, parametric curves and polar coordinates, infinite sequences and series, vectors in two and three dimensions. (F, Sp, Su)

2934 Differential and Integral Calculus III. Prerequisite: 2924 with grade of C or better. Duplicates one hour of 2433 and three hours of 2443. Vectors and vector functions, functions of several variables, partial differentiation and gradients, multiple integration, line and surface integrals, Green-Stokes-Gauss theorems. (F,Sp,Su)

†**G3413 Physical Mathematics I.** Prerequisite: MATH 2443 or MATH 2934 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 1914 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]