

Physics

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Requirements for a Physics Major, B.A. (55)

PS 151	General Physics I	4
PS 153	General Physics II	4
PS 251W	General Physics III	4
PS 355W	Quantum Mechanics	4
PS 363W	Thermodynamics	4
PS 373	Electronics	4
One of the following:		4
PS 451	Electricity and Magnetism I	
PS 461	Theoretical Mechanics I	
MA 110	Calculus I	4
MA 111	Calculus II	4
MA 210	Calculus III	4
MA 212	Differential Equations	3
CH 161	Principles of Chemistry I	3
CH 161L	Laboratory for Principles of Chemistry I	1
CH 281	Principles of Chemistry II	3
CH 281L	Laboratory for Principles of Chemistry II	1
One additional physics course (excluding PS 121)		4
For 4-12 teaching endorsement, the following additional courses are required:		
EDU 455	Methods of Teaching Science: Secondary	2
CO 350	Western Civilization III: The Scientific Tradition	4

Requirements for a Physics Major, B.S. (69)

PS 151	General Physics I	4
PS 153	General Physics II	4
PS 251W	General Physics III	4
PS 355W	Quantum Mechanics	4
PS 361	Nuclear Physics	4
PS 363W	Thermodynamics	4
PS 373	Electronics	4
PS 451	Electricity and Magnetism I	4
PS 453	Electricity and Magnetism II	4
PS 461	Theoretical Mechanics I	4
PS 463	Theoretical Mechanics II	4
Two semesters of PS 382, 383, 482, 483 Science Seminar		2
MA 110	Calculus I	4
MA 111	Calculus II	4
MA 210	Calculus III	4
MA 212	Differential Equations	3
CH 161	Principles of Chemistry I	3
CH 161L	Laboratory for Principles of Chemistry I	1
CH 281	Principles of Chemistry II	3
CH 281L	Laboratory for Principles of Chemistry II	1
For 4-12 teaching endorsement, the following additional courses are required:		
EDU 455	Methods of Teaching Science: Secondary	2
CO 350	Western Civilization III: The Scientific Tradition	4

Requirements for an Applied Physics Major, B.A. (55-57)

PS 151	General Physics I	4
PS 153	General Physics II	4
PS 251W	General Physics III	4
PS 373	Electronics	4
One of the following:		4
PS 451	Electricity and Magnetism I	
PS 461	Theoretical Mechanics I	
MA 110	Calculus I	4
MA 111	Calculus II	4
MA 210	Calculus III	4
MA 212	Differential Equations	3
CH 161	Principles of Chemistry I	3
CH 161L	Laboratory for Principles of Chemistry I	1
CH 281	Principles of Chemistry II	3
CH 281L	Laboratory for Principles of Chemistry II	1
CS 171	Computer Science I	3
One of the following:		3
CS 172	Computer Science II	
EN 211	Statics	

Two additional approved upper-division courses from physics, computer science, math, chemistry or engineering 6-8
Note: Students may not receive both an applied physics major and a physics major.

Requirements for a Physics Minor (24)

PS 151	General Physics I	4
PS 153	General Physics II	4
PS 251W	General Physics III	4
Three additional courses in physics (excluding PS 121)		12

Requirements for Physics as a Supporting Endorsement

Complete a physics minor	24
EDU 455 Methods of Teaching Science: Secondary	2
CO 350 Western Civilization III: The Scientific Tradition	4

Requirements for a Science Primary Endorsement for Majors in Biology, Chemistry, or Physics

BI 150 Cell Biology	2
BI 152 Animal Biology	2
BI 153 Plant Biology	2
BI 154 Microbial Biology	2
CH 161/162 Principles of Chemistry I	3
CH 161L Lab: Principles of Chemistry I	1
One of the following:	4
CH 271 Organic Chemistry plus Lab	
CH 281 Principles of Chemistry II plus Lab	
PS 151* General Physics I	4
PS 153* General Physics II	4
<i>*Note: PS 151 has a prerequisite of Math 110 (Calculus I) and PS 153 has a prerequisite of MA 111 (Calculus II).</i>	
One of the following:	4
GL 131 Understanding Earth	
GL 139 Environmental Geology	
PS 141 Introduction to Astronomy	
EDU 455 Methods of Teaching Science: Secondary	2
CO 350 Western Civilization III: The Scientific Tradition	4

Pre-Engineering

Whitworth's pre-engineering program is designed to give students the broad foundation of a liberal arts education as well as technical training to be successful in a variety of engineering disciplines. Arrangements have been made with several top engineering schools allowing pre-engineering students to complete their first two or three years of coursework at Whitworth and the remainder of the five-year program at a partner engineering school. Partnership arrangements exist with Washington University (St. Louis), the University of Southern California, Columbia University and Seattle Pacific University. Upon completing a customized Whitworth pre-engineering curriculum with at least a 3.0 GPA, students are guaranteed enrollment in one of the partner engineering schools. Students completing the program report that the broad knowledge base and the critical thinking, teamwork and communication skills acquired at Whitworth enabled them to thrive in both engineering school and the professional environment. Recent graduates are working at successful engineering firms around the country. The following courses are recommended to meet the requirements of most engineering schools, with additional courses available to prepare for specific engineering fields.

Pre-engineering advisor: Richard Stevens (Ph.D., Rice Univ.), Assistant Professor of Physics

Pre-Engineering Recommended Courses

PS 151 General Physics I	4
PS 153 General Physics II	4
PS 251W General Physics III	4
MA 110 Calculus I	4
MA 111 Calculus II	4
MA 210 Calculus III	4
MA 212 Differential Equations	3
CH 161 Principles of Chemistry I	3
CH 161L Laboratory for Principles of Chemistry I	1

CH 281	Principles of Chemistry II	3
CH 281L	Laboratory for Principles of Chemistry II	1
CS 171	Computer Science I	3
EN 110	Engineering Orientation	1
EL 110	Writing I	3

Engineering Courses

EN 110	Engineering Orientation	1
Concerns of the engineering profession: its scope, challenges, opportunities, rewards and educational requirements. Includes guest lectures by professional engineers and tours of area engineering facilities. Fall semester.		
EN 211	Statics	3
Mathematical review, equilibrium of a particle, free-body diagrams, equilibrium of a rigid body, structural analysis, friction, center of gravity, moments of inertia. Prerequisites: PS 151 and MA 110; also MA 111 or concurrent enrollment. Fall semester, even years.		

Geology Courses

GL 131	Understanding Earth	4
Structure of the earth and the forces of plate tectonics that build and move continents. Examination of the dynamic interactions between the lithosphere (crust), atmosphere, and hydrosphere. Laboratory included. Fall semester, even years.		
GL 139	Environmental Geology	4
Interactions of the human species with land, sea and air. Geologic hazards, earth resources, oceanography, meteorology. Laboratory included. Fall semester, odd years.		

Natural Science Courses

NS 201	Inquiry Science: Physical Science	2
This course provides science content and models hands-on science instruction in an inquiry-based format. Focus is on scientific inquiry and how to ask and answer science questions. For elementary education students.		

Physics Courses

PS 121	Concepts of Physics	3
Study of fundamental unifying ideas of physics and of how scientists learn about the physical world. Emphasis on the comprehension of concepts. For non-science majors. Jan Term.		
PS 141	Introduction to Astronomy	4
Nature and origin of the solar system, starlight and star life, components and structure of a galaxy, the expanding universe and cosmology. Astronomical instruments are also discussed. Includes laboratory. Spring semester.		
PS 151	General Physics I	4
Basic principles of mechanics. Includes laboratory. Prerequisite: MA 110 or concurrent enrollment. Fall semester.		
PS 153	General Physics II	4
Continuation of PS 151. Basic principles of thermodynamics, electricity and magnetism. Includes laboratory. Prerequisites: PS 151, also MA 111 or concurrent enrollment. Spring semester.		
PS 196	Topics in Physics	1-3
Selected lower-division topics in physics. Periodic offering.		
PS 251W	General Physics III	4
Continuation of PS 153. Basic principles of optics, special relativity, and modern physics. Includes laboratory. Prerequisite: PS 153. Fall semester. Completion of this three-semester sequence is the normal pattern for entry into all upper-level physics courses.		

- PS 355W Quantum Mechanics** 4
Principles of quantum mechanics, including Schroedinger's equation applied to the rigid rotor, the hydrogen atom and the harmonic oscillator. Includes laboratory. Prerequisites: PS 251 and MA 212. Fall semester, odd years.
- PS 357 Mathematical Methods for Engineers and Scientists** 4
Introduction to a variety of mathematical methods commonly used in engineering and science, and computer applications using Mathematica. Applications to solutions of engineering and science problems. Topics include Fourier series, Fourier and Laplace transforms, complex variables and calculus of residues, introduction to partial differential equations and applications of linear algebra. Prerequisite: MA 212. Fall semester, odd years.
- PS 361 Nuclear Physics** 4
Nuclear structure, radioactivity, nuclear reaction, interactions of nuclear radiations with matter. Includes laboratory. Prerequisites: PS 251 and PS 355. Spring semester, even years.
- PS 363W Thermodynamics** 4
Thermodynamical laws, kinetic theory, states of matter, phase transitions, and statistical mechanics. Includes laboratory. Prerequisites: PS 153, MA 212 and CH 281. Fall semester, even years.
- PS 371 Optics** 4
Nature of light, geometrical and physical optics, interference, quantum optics, optical instruments. Includes laboratory. Prerequisites: PS 251 and MA 212. Spring semester, odd years.
- PS 373 Electronics** 4
A "learn-by-doing" practical introduction to the fundamentals of electronic devices and circuits. Emphasis on modern instrumentation. Includes laboratory. Prerequisite: PS 153. Spring semester.
- PS 382, 383, 482, 483 Science Seminar** 1
Current developments in physics, biology and chemistry. Guest speakers, faculty and student presentations. Prerequisites: Natural Sciences major, junior or senior standing, and permission. Fall and spring semesters.
- PS 396 Topics in Physics** 1-3
Selected upper-division topics in physics. Periodic offering.
- PS 451 Electricity and Magnetism I** 4
Electric and magnetic fields, boundary value problems, steady and alternating currents, electrical instruments, and measurement techniques. Includes laboratory. Prerequisites: PS 153 and MA 212. Fall semester, even years.
- PS 453 Electricity and Magnetism II** 4
Continuation of PS 451. Maxwell's equations, electromagnetic waves, advanced topics in electrical and magnetic phenomena. Includes laboratory. Prerequisite: PS 451. Spring semester, odd years.
- PS 461 Theoretical Mechanics I** 4
Newtonian mechanics, central forces, dynamics of systems, oscillating systems, numerical techniques. Includes laboratory. Prerequisites: PS 153 and MA 212. Fall semester, odd years.
- PS 463 Theoretical Mechanics II** 4
Continuation of PS 461. Lagrange's equations, rigid bodies, continuous media. Includes laboratory. Prerequisite: PS 461. Spring semester, even years.
- PS 271, 471, 473 Experimental Physics** Varies
Supervised research projects in areas such as electronics, optics, nuclear physics, computer applications, atmospheric physics. Prerequisite: permission of professor.

Directed Studies

Independent Studies (191, 291, 391, 491); Readings (386, 486); Internships (290, 490); Field Studies (280, 480); and Teaching Assistantships (395, 495). See Page 169 for details.