Physics

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The field of physics is concerned with the study of matter, energy, motion, and the interaction of material particles. It is a cornerstone science that attempts to explain at a fundamental level the concepts underlying phenomena important to the other physical sciences, to the biological sciences, and to engineering. The Physics Department provides elementary courses to introduce students to the field, general and topical courses that support the other science departments and engineering, and a four-year program leading to a B.A. degree in physics. The physics major covers the traditional areas of modern and classical physics, and is intended to prepare graduates for careers in physics and related technical areas or for graduate school.

Programs and Requirements

Bachelor of Arts in Physics

The minimum number of credits in physics and related areas (exclusive of the University's Core curriculum) required for the physics major: 61. A student majoring in physics must take 37 credit hours of physics courses including some requirements and some electives as outlined below. In addition, the major requires 16 credits of mathematics courses, 8 credits of chemistry courses, and a demonstration of competency in computer programming.

1. Required courses

PHY	114K, 116	Introductory Physics Laboratory I and II
PHY	121K, 123	General Physics I and II (PHY 111K may replace PHY 121K with Departmental permission.)
PHY	211, 213	Nonclassical Physics I and II
PHY	221, 223, 225	Classical Physics I, II, and III
PHY	240	Intermediate Laboratory I
CHY	373	Physical Chemistry II

2. Electives. In addition to the required courses, the student must take a minimum of 6 credits of physics courses numbered 200 or higher: three credits from each of groups A and B below.

Group A

PHY	251	Principles of Electronics
PHY	261	Computational Physics
PHY	281	Astrophysics
PHY	375	Optics

Group B

PHY	242	Intermediate Laboratory II
PHY	311	Quantum Mechanics

The physics major must also complete the following courses:

MAT	152D	Calculus A
MAT	153	Calculus B
MAT	252	Calculus C
MAT	350	Differential Equations
CHY	113K & 114K	Principles of Chemistry I with Lab
CHY	115 & 116	Principles of Chemistry II with Lab

Suggestions for demonstrating competency in computer programming include:

COS	160 & 170	Structured Problem Solving: Java
COS	141	Visual Basic
PHY	261	Computational Physics

To graduate as a physics major, a student must maintain a minimum GPA of 2.0 in all courses which satisfy the major requirement, and a minimum overall GPA of 2.0.

Minor in Physics

The minimum number of credits (exclusive of the University's Core curriculum) required for the minor: 19. The required courses are PHY 121K, 123 or PHY 111K, 112; PHY 114K, 116; PHY 211, PHY 240; at least 3 credits of physics courses numbered 200 or higher.

PHY 101K Introduction to Physics
An elementary approach to the study of mechanics, heat, sound, electricity, magnetism, light, and modern physics, intended for the student who desires a one-semester introduction to the subject with emphasis on concepts as opposed to problem solving. Students desiring laboratory work should also register for PHY 102K. Students planning to major in any of the natural sciences are not directed to this course but rather to a more advanced introductory course. Prerequisite: high school algebra. Cr 3.

PHY 102K Introduction to Physics Laboratory
Laboratory experiments and additional material designed to supplement the topics considered in PHY 101K. Prerequisite: concurrent registration in PHY 101K or permission of the instructor. Cr 1.

PHY 111K Elements of Physics I
The first of a two-semester non-calculus sequence in introductory physics, intended particularly for life-science majors. Topics to be covered include mechanics, waves, sound, and thermal physics. Lectures, demonstrations, and problem solving will help the student develop an understanding of physical phenomena. Mathematical treatment is at the level of algebra and trigonometry. This course is not recommended for students planning to major in the physical sciences or engineering. It should be taken concurrently with PHY 114K, Introductory Physics Laboratory I. Prerequisite: successful completion of the University's minimum proficiency requirement in mathematics. Three hours of lecture and one hour of recitation per week. Cr 4.

PHY 112 Elements of Physics II
A continuation of PHY 111K, intended particularly for life-science majors. Topics to be covered include electricity, magnetism, optics, and modern physics. Lectures, demonstrations, and problem solving will help the student develop an understanding of physical phenomena. Mathematical treatment is at the level of algebra and trigonometry. This course is not recommended for students planning to major in the physical sciences or engineering. It should be taken concurrently with PHY 116, Introductory Physics Laboratory II. Prerequisite: PHY 111K or equivalent. Three hours of lecture and one hour of recitation per week. Cr 4.

PHY 114K Introductory Physics Laboratory I
Experiments designed to illustrate the concepts studied in PHY 111K and PHY 121K. Prerequisite: concurrent registration in PHY 111K or 121K. Two hours per week. Cr 1.

PHY 116 Introductory Physics Laboratory II
Experiments designed to illustrate the concepts studied in PHY 112 and PHY 123. Prerequisite: concurrent registration in PHY 112 or PHY 123. Two hours per week. Cr 1.

PHY 121K General Physics I
The first of a two-semester sequence introducing the fundamental concepts of physics, using calculus. Topics to be covered include mechanics, waves, sound, and thermal physics. This course is recommended for students who plan further study in physical sciences, mathematics, or engineering. It should be taken with PHY 114K, Introductory Physics Laboratory I. Prerequisite: prior or concurrent registration in MAT 152D or equivalent experience. Three hours of lecture and one and one-half hours of recitation per week. Cr 4.

PHY 123 General Physics II
A continuation of PHY 121K, introducing the fundamental concepts of physics, using calculus. Topics to be covered include electricity, magnetism, and light. This course is recommended for students who plan further study in physical sciences, mathematics, or engineering. It should be taken concurrently with PHY 116, Introductory Physics Laboratory II. Prerequisites: PHY 121K or equivalent and one semester of calculus. Three hours of lecture and one and one-half hours of recitation per week. Cr 4.

PHY 211 Nonclassical Physics I
The first of a two-semester sequence covering the principal topics which show the departure of physics from its classical roots. Topics will include relativity and atomic structure. Prerequisite: PHY 123 or PHY 112, and MAT 152D. Cr 3.

PHY 213 Nonclassical Physics II
A continuation of PHY 211, covering the principal topics which show the departure of physics from its classical roots. Topics will include quantum physics, nuclear physics, and particle physics. Prerequisite: PHY 211. Cr 3.

PHY 221 Classical Physics I
The first of a three-semester sequence offering an intermediate-level treatment of the principal topics of classical physics. The focus for this course is mechanics, including particle motion, oscillations, and noninertial reference systems. Prerequisite: PHY 121K and prior or concurrent registration in MAT 252. Cr 3.

PHY 223 Classical Physics II
A continuation of PHY 221, offering an intermediate-level treatment of the principal topics of classical physics. This course will continue a study in mechanics and start a study in electrostatics. Prerequisite: PHY 123, PHY 221, and MAT 252. Cr 3.

PHY 225 Classical Physics III
A continuation of PHY 223, offering an intermediate-level treatment of the principal topics of classical physics. Topics will continue through magnetism and electrodynamics, leading to Maxwell's equations. Prerequisite: PHY 223. Cr 3.

PHY 240 Intermediate Laboratory I
A selection of experiments designed to illustrate the

more important principles of classical and modern physics. Prerequisites: prior or concurrent registration in a 200-level physics course and two semesters of calculus. Six hours per week. Cr 3.

PHY 242 Intermediate Laboratory II
A selection of experiments illustrating the important principles of classical and modern physics. Prerequisite: prior or concurrent registration in a 200-level physics course and two semesters of calculus. Cr 3.

PHY 251 Principles of Electronics
An introduction to electronics including DC and AC circuits, transistors, operational amplifiers, and combinatorial and sequential logic devices. The laboratory will cover the use of electronic instrumentation as well as illustrate principles. Prerequisite: MAT 152D or equivalent, or permission of instructor. Cr 3.

PHY 261 Computational Physics
This course is a project-oriented course which introduces methods of computer simulation and their diverse applications in the physical world. Examples of projects include projectile motion, planetary systems, chaotic systems, and thermal systems. Methods include numerical solutions to differential equations and Monte Carlo techniques. The course emphasizes structured programming, although no background in computer programming is required. Prerequisite: PHY 121K and prior or concurrent registration in MAT 153, or permission of instructor. Two laboratory sessions and one discussion session per week. Cr 3.

PHY 281 Astrophysics
An intermediate-level course in the physics of the astronomical universe. Topics covered include classical astronomy, celestial mechanics, the structure and evolution of stars and galaxies, and cosmology. No previous background in astronomy is required. Prerequisite: PHY 221. Cr 3.

PHY 311 Quantum Mechanics
A study of the quantum physics of atoms, nuclei, and particles. Topics covered include wave particle duality; the Schrordinger Wave Equation and its application to a variety of quantum systems, three-dimensional and time-dependent systems, and photons. Prerequisite: PHY 213 and PHY 221. Cr 3.

PHY 375 Optics
An intermediate-level study of the more important principles of geometric and physical optics, with illustrations of both classical and modern applications. Prerequisites: PHY 223 and two semesters of calculus. Cr 3.

PHY 390 Independent Laboratory Study in Physics
An independent study involving primarily laboratory work. Prerequisite: permission of instructor. Cr 1-3.

PHY 410 Independent Study in Physics
Reading and discussion of advanced subjects or instruction in special topics or research. Prerequisite: permission of instructor. Cr 1-3.

PHY 440 Advanced Physics Laboratory I
This course may involve a series of experiments in physics or, by permission of the instructor, an advanced project in experimental physics. Prerequisites: PHY 240, and at least one 300-level physics course. Cr 3.

AST 100K Astronomy
A descriptive survey of modern astronomy. Topics include theories about the origin and development of the universe, stellar evolution, the solar system, galaxies, observational methods and recent discoveries. No prerequisite. Cr 3.

AST 103K Activities and Experiments
A one-credit course meeting weekly for two hours. May be taken concurrently with AST 100K to fulfill requirements for a science laboratory experience. Includes exercises on the Moon's orbit, Earth's orbital motion, rotation of Saturn's rings, the Sun, the Crab Nebula, variable stars, pulsars, Hubble's law, and galaxies. Two planetarium sessions. Prerequisite: Prior or concurrent registration in AST 100K. Cr 1.