

DEPARTMENT OF PHYSICS

Department Chair: James Pientka, Ph.D.

Founded in 1939 by the Rev. Francis Sullivan, O.F.M.

Faculty

T. Cooke, M.S.
A. Bhardwaj, Ph.D.
J. M. Pientka, Ph.D.

The program in physics is designed to provide opportunities for the undergraduate student to develop the skills essential for graduate school, industry, government service and the teaching of physics. The physics curriculum offers two degree tracks designed to prepare a student for employment or further study in physics or in the various engineering fields, such as, but not limited to, electrical and mechanical engineering. Students with an interest in biophysics may take a minor in biology, or take a set of recommended biology electives. Physics majors have gone on to careers in physics, civil, electrical, & mechanical engineering, biomechanical engineering and medicine. The department also provides a fundamental physics foundation for other science disciplines. Physical science courses are available to those not majoring in the sciences.

A chapter of Sigma Pi Sigma, National Physics Honor Society, has been established to give recognition to outstanding students.

The Physics Department operates the SBU Observatory, which is equipped with an 11 inch Schmidt-Cassegrainian telescope. Interested students may participate in the Orion Astronomy Club.

- Engineering Physics, BS (<https://catalog.sbu.edu/undergraduate/arts-sciences/physics/engineering-physics-bs/>)
- Physics Adolescence Education, BS (<https://catalog.sbu.edu/undergraduate/arts-sciences/physics/physics-aded-bs/>)
- Physics, BS (<https://catalog.sbu.edu/undergraduate/arts-sciences/physics/physics-bs/>)
- Physics, Minor (<https://catalog.sbu.edu/undergraduate/arts-sciences/physics/physics-minor/>)

Engineering Physics (ENGR)

ENGR-220 INTRODUCTION TO MATLAB (3 Credits)

This course introduces students to MatLab, one of the most widely used software packages for technical and scientific calculation, and to the numerical solution of problems in physics and engineering.

ENGR-252 ENGINEERING MECHANICS (3 Credits)

The study of statics and dynamics with engineering applications. Deformation, strain and stresses in solids of one, two, and three dimensions. Introduction to the mechanics of continuous media, the kinematics and dynamics of fluids; viscous flow, turbulence. Bernoulli's theorem and the Navier-Stokes equation.

Prerequisite(s): Take PHYS-103 PHYS-104

ENGR-262 ELECTRONICS (3 Credits)

This course is designed for the advanced undergraduate student or the incoming graduate student who desires a basic training in electronics. The course seeks to acquaint the student with the physical principles which govern the use of electronic devices and to allow the student to use these components in the design of circuits.

Physical Science (PHSC)

PHSC-ELEC ELECTIVE (3 Credits)

PHSC-101 EARTH SCIENCE (3 Credits)

A survey of physical properties and processes of the Earth. The content is drawn from geology, atmospheric science and oceanography. Topics may include the motion of the Earth, atmospheric circulation, plate tectonics and igneous activity and physical properties of the oceans.

Corequisite(s): PHSL-101

PHSC-105 GEOLOGY (3 Credits)

A survey, with emphasis on physical geology, considering processes at work on the Earth's crust, such as glaciation, weathering, mass movement, water, diastrophism and consideration of rocks and minerals composing the crust.

PHSC-106 STARS AND STELLAR SYSTEMS (3 Credits)

A survey of the universe beyond our solar system: stars and multiple star systems, nebulae, galaxies, quasars, pulsars and black holes. Models of the universe's origin and modern observing techniques will also be discussed.

Corequisite(s): PHSC-113L

PHSC-107 THE SOLAR SYSTEM (3 Credits)

How do the planets move through space and indeed what are the planets like? How did our solar system come into existence? What is our sun like? These and other questions will be treated in depth in the introduction to the astronomical aspects of our star system.

PHSC-113L ASTRONOMY LABORATORY (1 Credit)

Basic experiments in astronomy illustrating how information is derived about stars and planets, etc.

Corequisite(s): PHSC-106

PHSC-115 ALTERNATIVE ENERGY SOURCES (3 Credits)

This course is intended for the student who has had an exposure to the rudiments of science and who is interested in exploring the topic of energy sources. This course will deal with energy sources which are state of the art or near state of the art. Each energy will be examined from the point of view of the physical principles involved and the practical limitations of the utilization. Discussions where pertinent will also include hazard analyzes.

PHSC-191 INTRODUCTION TO NATURAL SCIENCE (3 Credits)

An introduction to what we know about the physical universe and how we have discovered it. The process of scientific discovery is explored using major discoveries in the history of science as examples. Topics include the fundamental properties of matter and energy, the nature of chemical reactions, the use of energy by living things, the nature and property of DNA and biological evolution among others. The course includes a combination of lecture and classroom discussion.

Corequisite(s): PHSL-191

PHSL-101 EARTH SCIENCE LABORATORY (1 Credit)

A set of field and laboratory exercises designed to accompany PHSC 101 (Earth Science). An investigation of the ways in which earth scientists (including astronomers, geologists, chemists, meteorologists, oceanographers, and ecologists) study the Earth. Investigations will cover the four major spheres of Earth (lithosphere, hydrosphere, biosphere, and atmosphere). There will be an emphasis on quantitative methods and problem solving throughout.

Corequisite(s): PHSC-101

PHSL-191 INTRODUCTION TO NATURAL SCIENCE LAB (1 Credit)

An introduction to the study of selected phenomena within the natural sciences by means of problem-based laboratory experiences. To make the course both multidisciplinary and interdisciplinary, the various scientific disciplines (physics, chemistry, and biology) are connected through common themes such as energy and the significance of patterns and regularity in nature.

Corequisite(s): PHSC-191

Physics (PHYS)**PHYS-103 GENERAL PHYSICS I (3 Credits)**

An introductory course in physics for students of science and engineering. Topics include: vectors, statics, dynamics, rotation, conservation laws, vibrations and thermodynamics. Students without calculus admitted with permission of instructor.

Corequisite(s): TAKE MATH-151 Take PHYL-103

PHYS-104 GENERAL PHYSICS II (3 Credits)

Topics include: electricity and magnetism, circuit analysis, electromagnetic waves, optics and modern physics. Students without calculus admitted with permission of instructor.

Prerequisite(s): Take PHYS-103 MATH-151

Corequisite(s): PHYL-104

PHYS-201 THEORETICAL MECHANICS (3 Credits)

Vector algebra and calculus. Kinematics of a point. Dynamics of a system of points. Kinematics of rigid bodies. Impulse, momentum, work and energy.

Prerequisite(s): Take PHYS-103 PHYS-104

PHYS-203 MODERN PHYSICS (3 Credits)

A study of transition from classical to modern physics. Topics treated are relativity, electromagnetic radiation, discoveries of electron and nucleus, Bohr Theory of atomic structure and introductory quantum mechanics. (formerly Atomic Physics).

Prerequisite(s): Take PHYS-103 PHYS-104

PHYS-301 ELECTRICITY & MAGNETISM I (3 Credits)

Topics covered include vector analysis, selected topics in vector calculus, the electrostatic field of force, Gauss' law and the application of these principles to the solution of problems involving various geometries is considered. The electrostatic field in dielectric media, boundary value problems in dielectric media and electrostatic energy and the application of energy concepts are studied. Electric current and circuit analysis are included. Other topics include the magnetic field of steady currents, electromagnetic induction, magnetic properties of matter, magnetic energy, slowly varying currents, Maxwell's Equations and the applications of Maxwell's Equations.

Prerequisite(s): Take MATH-251 MATH-252 PHYS-103 PHYS-104

PHYS-302 ELECTRICITY & MAGNETISM II (3 Credits)

Prerequisite(s): Take PHYS-301

PHYS-304 THERMODYNAMICS (3 Credits)

Temperature, thermodynamic systems, work, the First Law, heat, ideal gases, the Second Law, reversibility and irreversibility, the Carnot cycle, entropy, Boltzmann statistics, equipartition of energy. Introductory statistical mechanics.

Prerequisite(s): PHYS-103 AND PHYS-104

PHYS-309 EXPERIMENTAL PHYSICS I (3 Credits)

This course introduces the student to the experimental techniques associated with the intermediate level physics courses. Choice of experiments will depend upon the student's background and interest.

Prerequisite(s): PHYS-103, PHYS-104, PHYL-103, PHYL-104

PHYS-312 INTERN. IN APPLIED PHYSICS (3 Credits)

This course is a practicum designed to give qualified juniors an opportunity to spend a summer in a structured industrial or research setting so that they can immerse themselves in a project involving applied physics. Open to second-semester junior physics majors and with special permission students with a physics minor.

PHYS-403 ELECTRONICS (3 Credits)

This course is designed for the student who desires a basic training in electronics. The course seeks to acquaint the student with the physical principles which govern the use of electronic devices and to allow the student to use these components in the design of circuits.

PHYS-404 SOLID STATE (3 Credits)

Crystal Structures and solids. Lattice vibrations. Thermal properties of solids,

Prerequisite(s): Take PHYS-203

PHYS-406 INTRODUCTORY QUANTUM MECHANICS (3 Credits)

De Broglie waves and wave packets, the Schroedinger equation, applications to one-dimensional problems, the hydrogen atom, perturbation theory, angular momentum and electron spin.

Prerequisite(s): Take PHYS-203

PHYS-407 TOPICS IN BIOPHYSICS (3 Credits)

A study of the principles and experimental techniques of physics as they apply to biological systems. Special emphasis will be given to the interactions as they occur on the molecular level.

PHYS-451 APPLIED PROB.COMPUTATIONAL PHY (3 Credits)

Problem solving in a wide range of engineering and physics applications, including electricity and magnetism, solid and fluid mechanics, optics, thermal physics, atomic and nuclear physics. Emphasis is placed on numerical methods, approximation techniques and advanced computer skills for solutions of problems arising in realistic engineering situations.

Prerequisite(s): Take CS-127 or ENGR-220

PHYS-490 SENIOR COMPREHENSIVES (0 Credits)

This is an oral comprehensive required of all physics seniors.

Physics Lab (PHYL)**PHYL-103 GENERAL PHYSICS I LAB (1 Credit)**

Basic experiments in classical physics designed to complement the topics covered in Physics 103.

Corequisite(s): Take PHYS-103

PHYL-104 GENERAL PHYSICS LAB II (1 Credit)

Basic experiments in classical and modern physics designed to complement topics covered in Physics 104.

Corequisite(s): Take PHYS-103 Take PHYS-104