PHYSICS

Courses

PHY 100. Seminar. 0 Hours
Opportunity to become acquainted with the broad spectrum of modern science through periodic meetings with the entire department. Invited speakers, films, student presentations, book reviews, and informal discussions. For all physics, physical science, and physics-computer science majors.

PHY 105. Physical Science - Energy & the Environment. 3 Hours
General introduction to principles of physics including motion, energy, thermodynamics, electricity and magnetism, and nuclear physics. Applications of these principles to non-renewable and renewable energy systems and the climate. Intended for business students.

PHY 108. Physical Science of Light & Color. 3 Hours
Conceptual study of physical science with emphasis on light, color, and the interaction of light with materials.

PHY 108L. Light & Color Laboratory. 1 Hour
Laboratory experiences to accompany PHY 108. Corequisite(s): PHY 108.

PHY 201. College Physics I. 3 Hours
Topics from classical mechanics, thermal and mechanical properties of matter, wave motion, and sound without the formalism of calculus.

PHY 201L. College Physics Laboratory I. 1 Hour
Algebra-based introductory laboratory. Experimental scientific techniques and the use of standard laboratory equipment. One two-hour period each week. Corequisite(s): PHY 201 or PHY 206.

PHY 202. College Physics II. 3 Hours
Continuation of PHY 201 with a treatment of electricity and magnetism, wave motion and properties of light, atomic and nuclear physics. Second term, each year. Prerequisite(s): PHY 201.

PHY 202L. General Physics Laboratory. 1 Hour
Experimental scientific techniques and the use of standard laboratory equipment. One two-hour period per week. Second term, each year. Prerequisite(s): PHY 201L.

PHY 203. Modern Technical Physics. 3 Hours
Introduction to selected topics in modern physics without the formalism of calculus. For engineering technology students. Prerequisite(s): College algebra, trigonometry, and introductory statics and dynamics.

PHY 203L. Technical Physics Laboratory. 1 Hour
Laboratory experiences to accompany PHY 203.

PHY 206. General Physics I - Mechanics. 3 Hours
Calculus-based introductory course in mechanics. Three lectures, one recitation each week. Corequisites: MTH 148 or MTH 168.

PHY 207. General Physics II - Electricity & Magnetism. 3 Hours
The basic principles of electricity and magnetism. Three lectures, one recitation each week. Prerequisite(s): PHY 201 or PHY 206. Corequisite(s): MTH 149 or MTH 169.

PHY 208. General Physics III- Thermodynamics, Waves, and Fluids. 3 Hours
Introduction to wave phenomena (including mechanical waves, sound waves, physical optics and geometrical optics), thermal physics, and fluids. Prerequisite(s): (MTH 149; PHY 202) or (MTH 169; PHY 207).

PHY 210L. General Physics Laboratory I. 1 Hour
Introduction to laboratory methods, handling of data, and analysis of results. Experiments appropriate to the background of students with an interest in mathematics and physical sciences. Two hours laboratory, one hour recitation each week. Corequisites: PHY 206.

PHY 211L. General Physics Laboratory II. 1 Hour
Laboratory methods, data handling, and analysis of results. Experiments appropriate to the background of students with an interest in mathematical and physical sciences. Two hours laboratory, one hour recitation each week. Prerequisite(s): PHY 210L. Corequisite(s): PHY 207.

PHY 220. Energy & Environmental Physics. 3 Hours
Introduction to the physical basis of energy systems and the climate. Topics covered will include thermodynamics, planetary radiation balance, heat transfer, basic atmospheric and ocean physics, nuclear energy, renewable energy, modeling of carbon emissions from fossil fuels, simple climate models, monitoring climate change, and mitigation strategies. Prerequisite(s): PHY 206.

PHY 232. The Physics of Waves. 3 Hours
Examination of analytical approaches and conceptual frameworks of physics applied to wave phenomena in a variety of physical systems. Topics include oscillation in mechanical and electrical systems, mechanical and electromagnetic waves, and geometrical and physical optics. This course is designed for electrical and computer engineering students, but is open to all meeting the prerequisites. Prerequisite(s): PHY 206, MTH 169 (may be taken as co-requisite).

PHY 250. Descriptive Astronomy. 3-4 Hours
Descriptive survey for students who have had little or no previous exposure to astronomy; material from ancient times to present, including pulsars and quasi-stellar objects.

PHY 295. Research Participation I. 1 Hour
No description available.

PHY 301. Thermal Physics. 3 Hours
Thermodynamical descriptions of many particle systems obtained from microscopic statistical considerations; laws of thermodynamics, kinetic theory of dilute gases, and Fermi-Dirac and Bose-Einstein statistics. Prerequisite(s): PHY 208 or PHY 232. Corequisite(s): MTH 219.

PHY 303. Intermediate Mechanics I. 3 Hours
The fundamental concepts of mechanics: virtual work, kinematics, special theory of relativity, Lagrange's equation-and central forces, particle dynamics. Prerequisite(s): PHY 208 or PHY 232. Corequisite(s): MTH 219.

PHY 321. General Physics IV - Modern Physics. 3 Hours
Introduction to modern physics. Topics include special relativity, elementary quantum mechanics, the structure of matter, atoms, and nuclei, radioactivity, interactions of radiation with matter, and fundamental particles. Prerequisite(s): (PHY 208 or PHY 232) or permission of the chair of the physics department.

PHY 323. Computational Physics. 3 Hours
The course will explore how computers are used in physics. Topics will include simulations of physical systems, numerical analysis, and the use of mathematical analysis packages (MATHCAD, for example.) Programming will be done in True BASIC and MATHCAD. Prerequisite(s): MTH 218; (PHY 208 or PHY 232).

PHY 333. Digital & Analog Electronics for Scientists. 3 Hours
Basic concepts of digital and analog integrated circuit electronics are developed as a way to understand modern microcomputer based instrumentation. A microcomputer based data collection and analysis system is used to study binary data input and output, analog to digital conversion (ADC) devices, digital to analog conversion (DAC) devices, and other digital integrated circuits and concepts. The analog electronics part of the course begins with a study of discrete analog devices and ends with operational amplifiers and their application. Two hours lecture and two hour laboratories each week. Prerequisite(s): (PHY 202L or PHY 211L) or equivalent.

PHY 390. Introduction to Quantum Mechanics. 3 Hours
Basic postulates of quantum mechanics with applications made to atomic physics. Prerequisite(s): MTH 219; (PHY 208 or PHY 232). Corequisite(s): MTH 310.

PHY 395. Research Participation I. 1-6 Hours
Individual projects conducted as part of the physics Undergraduate Research Participation program to encourage involvement of students with faculty researchers. Projects must be arranged in advance with faculty research directors.

PHY 399. Special Problems in Physics. 1-4 Hours
Special topical courses, laboratory, tutorial, or library work in areas of current interest. Students should consult the composite.

PHY 403. Intermediate Mechanics II. 3 Hours
Emphasis on solving physical problems; noninertial coordinate systems, rigid body motion, rotating systems, coupled systems, introductory fluid statics and dynamics, normal coordinates, and the descriptions of mechanics appropriate for the transition to wave mechanics. Prerequisite(s): PHY 303.

PHY 404. Physical Optics. 3 Hours
The electromagnetic wave theory of light, propagation of waves, reflection, refraction, dispersion, polarization, dichroism, birefringence, superposition of waves, interference, diffraction, Fourier optics. Prerequisite(s): MTH 219; (PHY 208 or PHY 232).

PHY 408. Intermediate Electricity & Magnetism I. 3 Hours
Electrostatics, Coulumb's law, Gauss's law, potential, dielectric materials, electrostatic energy, solutions to Laplace's and Poisson's equations, Biot-Savart law, Faraday induction law, magnetization, and Maxwell's equations. Prerequisite(s): MTH 219; (PHY 208 or PHY 232).

PHY 409. Intermediate Electricity & Magnetism II. 3 Hours
Further study of electric and magnetic fields with emphasis on solving problems; Maxwell's equations, propagation of electromagnetic waves, electromagnetic radiation. Prerequisite(s): PHY 408.

PHY 411. Topics in Modern Physics. 3 Hours
Elements of modern optics, solid state and other selected subjects. Consult chairperson for details. Prerequisite(s): PHY 390 or equivalent.

PHY 420. Introduction to Solid State. 3 Hours
Classification of solids, crystals and crystal structures, survey of lattice properties, free electron theory, band theory of solids, semi-conductors, and crystal imperfections. Prerequisite(s): MTH 219; (PHY 208 or 232); PHY 390.

PHY 430. Advanced Lab I. 2 Hours
First course in a two-semester laboratory sequence designed for upper-level undergraduate physics majors. Programming and use of data acquisition and analysis systems, analysis of experimental error and uncertainty, design and construction of experiments that combine mechanical, electrical, and optical components, documentation of laboratory procedures, and writing and presenting technical reports are emphasized. Prerequisite(s): PHY333, and (CPS132 or CPS150 or ECE203).

PHY 431. Advanced Lab II. 2 Hours
Second course in a two-semester laboratory sequence designed for upper-level undergraduate physics majors. Programming and use of data acquisition and analysis systems, design and construction of experiments that combine mechanical, electrical, and optical components, documentation of laboratory procedures, and writing and presenting technical reports are emphasized. Prerequisite(s): PHY 430.

PHY 440. Quantum Mechanics II. 3 Hours
Study of selected principles in quantum mechanics. Prerequisite(s): PHY 390.

PHY 450. Senior Project. 3 Hours
The senior project is a capstone experience for senior physics majors. It will consist of a research project of the student's choosing and will require both an oral and written report. The nature and scope of the project will be chosen in consultation with the student's advisor. Permission of the department chairperson is required. Senior physics majors only.

PHY 460. Seminar. 1 Hour
Presentation of papers by undergraduate students, faculty, and a guest lecturers on topics of concern to the modern physicist. Reviews of books and films appropriate to the group.

PHY 470. Introduction to Computational Physics. 3 Hours
Study of important problems in physics, other sciences, and engineering that require a numerical solution. This course refines computation skills by providing direct experience writing, executing and analyzing computer programs used to solve such problems. The approach in this course is intended to mimic approaches used in research. Prerequisite(s): MTH 219, PHY 208 or PHY 232.

PHY 477. Honors Thesis Project. 3 Hours
First of two courses leading to the selection, design, investigation, and completion of an independent, original Honors Thesis project under the guidance of a faculty research advisor. Restricted to students in the University Honors Program with permission of the program director and department chairperson. Students pursuing an interdisciplinary thesis topic may register for three semester hours each in two separate disciplines in consultation with the department chairpersons. Prerequisite(s): Approval of University Honors Program.

PHY 478. Honors Thesis Project. 3 Hours
Second of two courses leading to the selection, design, investigation, and completion of an independent, original Honors Thesis project under the guidance of a faculty research advisor. Restricted to students in the University Honors Program with permission of the program director and department chairperson. Students pursuing an interdisciplinary thesis topic may register for three semester hours each in two separate disciplines in consultation with the department chairpersons. Prerequisite(s): Approved 477; approval of University Honors Program.

PHY 480. Physics Capstone. 1 Hour
This seminar course is the capstone for all physics majors. Students will complete an independent research project and present their results in written form and in a presentation. Students will learn about the variety of career paths available after completing an undergraduate physics degree, and how to engage in these career paths in an ethical manner.

PHY 495. Research Participation II. 1-6 Hours
Individual projects conducted as part of the physics Undergraduate Research Participation program to encourage involvement of students with faculty researchers. Projects must be arranged in advance with faculty research directors.

PHY 499. Special Problems in Physics. 1-6 Hours
Laboratory, tutorial, or library work in one of such selected topics as solid state physics, polymers, atomic and nuclear physics, modern optics, theoretical physics, surface physics, or general physics. Prerequisite(s): Permission of department chairperson.

PHY 520. Solid State Physics. 3 Hours
Solid State Physics.

PHY 525. Quantum Mechanics I. 3 Hours
The physical basis of quantum mechanics, wave packets, free particle motion: Schrodinger's equation applied to potential problems; harmonic oscillator and the hydrogen atom; three-dimensional extrapolation and scattering.

PHY 570. Computational Physics. 3 Hours
Computational physics is the use of physics, mathematics and computer science to study the behavior of complex systems by computer simulation. The course refines computational skills by providing direct experience in using a computer to solve physics problems in science and engineering. Prerequisites: MTH 219 or equivalent or permission of department chairperson.

PHY 599. Introduction to Lasers. 1-3 Hours
Laser theory; coherence; Gaussian beams; optical resonators; properties of atomic and molecular radiation; laser oscillation and amplification; methods of excitation of lasers; characteristics of common lasers; laser applications.