PHYSICS & ASTRONOMY

Phone: (845) 257-3740
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The Department of Physics & Astronomy offers majors and minors in both physics and astronomy, serves a variety of other majors in the sciences and education, and offers general education courses to a wide range of students.

The Physics major leads to a Bachelor of Arts (BA) or Bachelor of Science (BS) degree and provides a broad base of fundamentals while also giving students the opportunity to get specialized training. Two-semester introductory courses that survey physics, chemistry, and calculus are followed by courses covering classical and modern physics, computational physics, and applied mathematics, among other subjects. The capstone experience is a senior project. Interested students may pursue topics of special interest through independent study, working closely with an advisor to plan what's best for each student's situation.

The 49-credit astronomy major leads to a Bachelor of Arts (BA) degree. Astronomy is a field that captures the popular imagination. Many of us are eager to explore the science of stars, galaxies, and the solar system and to extend our understanding of the physical nature of the universe. The study of astronomy engages this natural curiosity about the cosmos while strengthening the student's scientific and technological literacy. Students have ample opportunity to study one or more other academic areas and may choose to declare a second major or a minor in a field that supports their career goals.

- Major in Astronomy
- Major in Physics
- Minor in Astronomy
- Minor in Physics

PHY093. Physics Special Topics. 0 Credits.

May be repeated for credit

PHY100. Physics for the Inquiring Mind. 3 Credits.

A course in basic physics for non-science majors that stresses conceptual understanding of familiar (and not so familiar) phenomena. Mathematical formalism is held to a minimum, although some elementary algebra is helpful.

Attributes:

- Liberal Arts
- GE4: Natural Science Course
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following field(s) of study (major, minor or concentration): Physics (511)

May not be repeated for credit

PHY108. Seeing the Light: Physics, Vision and Art. 3 Credits.

A study of light, vision and art from an optical physics perspective, learning about photons, wavelength, and energy how our eyes see light, and the creation of visual art. Learn the function of the eye's lens, retina and visual cortex, and explore parallel developments in art, vision and physics.

Attributes:

- Liberal Arts
- GE4: Natural Science Course
- GE3: NSCI
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following field(s) of study (major, minor or concentration): Comm Disorders Cert Program (089)

Prerequisites:

- Math Placement Level Minimum Score of 3

May not be repeated for credit

PHY109. Physics of Sound and Music. 3 Credits.

Nature, transmission, and absorption of sound; speech; hearing; music; noise; musical instruments and amplifying systems; rooms and auditoriums; sources of noise and noise pollution; noise codes; control of noise; and practical means of noise reduction.

Attributes:

- Liberal Arts
- GE4: Natural Science Course
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following field(s) of study (major, minor or concentration): Physics (511)

Prerequisites:

- Math Placement Level Minimum Score of 3

May not be repeated for credit

PHY193. Physics Selected Topic. 1-12 Credits.

Selected topics courses are regularly scheduled courses that focus on a particular topic of interest. Descriptions are printed in the Schedule of Classes each semester. Selected topics courses may be used as elective credit and may be repeated for credit, provided that the topic of the course changes.
May be repeated for credit

PHY199. Modular Course. 0 Credits.

May not be repeated for credit

PHY201. General Physics 1. 3 Credits.

Basic principles of mechanics, wave motion, and thermodynamics using vector analysis and calculus. Primarily for students majoring in physics, engineering, mathematics, and chemistry; students majoring in biology and geology should consult their advisor if they wish to take this course in preference to PHY221.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following field(s) of study (major, minor or concentration): Comm Disorders Cert Program (089)

Prerequisites:

- Math Placement Level Minimum Score of 6 or MAT251 Minimum Grade of C-
- PHY211 Minimum Grade of D-*

* May be taken at the same time
May not be repeated for credit

PHY202. General Physics 2. 3 Credits.

Basic principles of electricity, magnetism, and optics using vector analysis and calculus. Primarily for students majoring in physics, engineering, mathematics, and chemistry; students majoring in biology and geology should consult their advisor if they wish to take this course in preference to PHY222.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

Prerequisites:

- PHY201 Minimum Grade of D-
- MAT252 Minimum Grade of D-
- PHY212 Minimum Grade of D-*

* May be taken at the same time
May not be repeated for credit

PHY203. General Physics I Workshop. 0 Credits.

Problem-solving course to be taken concurrently with PHY201 gives students an opportunity to solve additional problems, preview sample exams or review exams, and ask questions about lecture material.

Restrictions:

- Must have the following level: Undergraduate

Corequisites:

- PHY201

May not be repeated for credit

PHY204. General Physics II Workshop. 0 Credits.

Problem-solving course to be taken concurrently with PHY202 gives students an opportunity to solve additional problems, preview sample exams or review exams, and ask questions about lecture materials.

Restrictions:

- Must have the following level: Undergraduate

Corequisites:

- PHY202

May not be repeated for credit

PHY205. Exploring the Solar System. 3 Credits.

Introduction to solar system including history of astronomy, laws of mechanics and gravitation, motions of heavenly bodies, telescopes, space exploration and descriptions of sun, planets, moons, asteroids, comets and meteors. Planetarium demonstrations, sky viewing with telescopes and computer simulations. No science preparation required. Limited use of algebra. No prerequisite.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE4: Natural Science Course
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

May not be repeated for credit

PHY206. Exploring the Universe. 3 Credits.

Introduction to the universe beyond the solar system. Distance to stars, classes of stars, structure of stars, stellar evolution, white dwarfs, neutron stars, black holes, pulsars, quasars, radio astronomy, the Milky Way, galaxies, relativity and cosmology. Planetarium demonstrations, sky viewing with telescopes and computer simulation. No science preparation required. Limited use of Algebra.

Attributes:

- Liberal Arts
- GE4: Natural Science Course
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

May not be repeated for credit

PHY207. Exploring Astronomy Laboratory. 1 Credit.

Application of astronomy principles through observing the night sky and modeling astronomical phenomena in a lab setting. Students will use and construct simple telescopes and other tools to take astronomical measurements and interpret results. Computer simulations and other models will be used to demonstrate sky and planetary motion.

Attributes:

- Liberal Arts
- GE4: Natural Science Lab

Restrictions:

- Must have the following level: Undergraduate

Prerequisites:

- PHY205 Minimum Grade of D-*
- Math Placement Level Minimum Score of 4 or MAT152 Minimum Grade of D-

* May be taken at the same time
May not be repeated for credit

PHY208. The World of Sound. 4 Credits.

Fundamentals of acoustics, acoustical measurement and analysis, acoustics technology, and digital processing of acoustical signals. This course includes a laboratory component.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE4: Natural Science Lab
- GE3: NSCI
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

Prerequisites:

- Math Placement Level Minimum Score of 3 or MAT 151 Minimum Grade of C- or MAT053 Minimum Grade of C- or MAT120 Minimum Grade of C- or MAT121 Minimum Grade of C-

May not be repeated for credit

PHY211. Physics 1 Laboratory. 1 Credit.

Experiments involve measurement and analysis using equipment such as air tracks, motion sensors, force meters, and photogate timers, coupled with computer software, to gain insight into linear and rotational motion phenomena.

Attributes:

- Practicum - Non-Clinical
- Critical Thinking Introductory
- Information Mgmt Intro
- Liberal Arts
- GE4: Natural Science Lab

Prerequisites:

- (PHY201 Minimum Grade of D-*) or (PHY221 Minimum Grade of D-*)

* May be taken at the same time
May not be repeated for credit

PHY212. General Physics 2 Lab. 1 Credit.

Attributes:

- Practicum - Non-Clinical
- Liberal Arts
- GE4: Natural Science Lab

Corequisites:

- PHY202

May not be repeated for credit

PHY221. Fundamental Physics 1. 3 Credits.

An algebra-based introduction to particle mechanics, rigid-body and continuous matter motion, fluid mechanics, wave motion, structure of matter and thermo-dynamic principles.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

Prerequisites:

- Math Placement Level Minimum Score of 4 or MAT193 Minimum Grade of D- or MAT152 Minimum Grade of D- or MAT153 Minimum Grade of D-
- PHY211 Minimum Grade of D-*

* May be taken at the same time
May not be repeated for credit

PHY222. Fundamental Physics II. 3 Credits.

An algebra-based introduction to electricity, magnetism, electromagnetic waves, optics, relativity, quanta, Bohr atom, complex atom, ions and molecules, solid state, nucleus, nuclear transformation, and elementary particles.

Attributes:

- Liberal Arts
- GE4: Natural Science Lecture
- GE3: NSCI
- GE2: PHBS w/out lab
- GE2A: PHBS w/out lab
- Systematic Inquiry

Restrictions:

- Must have the following level: Undergraduate

Prerequisites:

- PHY221 Minimum Grade of D-

Corequisites:

- PHY232

May not be repeated for credit

PHY223. Fundamental Physics I Workshop. 0 Credits.

Problem-solving course to be taken concurrently with PHY221 gives students an opportunity to solve additional problems, preview sample exams or review exams, and ask questions about lecture material.

Restrictions:

- Must have the following level: Undergraduate

Corequisites:

- PHY221

May not be repeated for credit

PHY224. Fundamental Physics II Workshop. 0 Credits.

Problem-solving course to be taken concurrently with PHY222 gives students an opportunity to solve additional problems, preview sample exams or review exams, and ask questions about lecture material.

Restrictions:

- Must have the following level: Undergraduate

Corequisites:

- PHY222

May not be repeated for credit

PHY231. Fundamental Physics 1 Lab. 1 Credit.

Attributes:

- Practicum - Non-Clinical
- Liberal Arts
- GE4: Natural Science Lab

Corequisites:

- PHY221

May not be repeated for credit

PHY232. Fundamental Physics 2 Lab. 1 Credit.

Attributes:

- Practicum - Non-Clinical
- Liberal Arts
- GE4: Natural Science Lab

Corequisites:

- PHY222

May not be repeated for credit

PHY293. Physics Selected Topic. 1-12 Credits.

Selected topics courses are regularly scheduled courses that focus on a particular topic of interest. Descriptions are printed in the Schedule of Classes each semester. Selected topics courses may be used as elective credit and may be repeated for credit, provided that the topic of the course changes.

Restrictions:

- Must have the following level: Undergraduate

May be repeated for credit

PHY295. Indep Study Physics. 1-12 Credits.

Restrictions:

- Must have the following level: Undergraduate

May be repeated for credit

PHY299. Modular Course. 0 Credits.

Restrictions:

- Must have the following level: Undergraduate

May not be repeated for credit

PHY300. Mathematical Physics I. 3 Credits.

A study of the differential equations, linear algebra, and vector calculus in the context of the physical problems in which they arise. Computational techniques are used where appropriate.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT252 Minimum Grade of D-

May not be repeated for credit

PHY301. Mathematical Physics II. 3 Credits.

A continuation of Mathematical Physics I. Fourier series, partial differential equations, and complex analysis, all discussed in the context of the physical problems in which they arise. Computer techniques are used where appropriate.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY300 Minimum Grade of D-

May not be repeated for credit

PHY305. Computational Physics. 3 Credits.

Introduction to numerical techniques -- root finding, integration, matrix manipulations, differential equations. Numerical simulations -- oscillations, space flight, electric fields, linear and non-linear waves, crystal growth.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT341 Minimum Grade of D-
- PHY202 Minimum Grade of D-

May not be repeated for credit

PHY306. Mechanics 1. 3 Credits.

This is the first of a two-semester sequence comprising a traditional classical mechanics course. Topics include one-dimensional motion, energy and momentum conservation, central forces, Lagrangian and Hamiltonian formulations, systems of particles, and accelerated coordinated systems.

Attributes:

- Critical Thinking Intermediate
- Information Mgmt Intrmd
- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-
- MAT341 Minimum Grade of D-*

* May be taken at the same time
May not be repeated for credit

PHY307. Mechanics 2. 3 Credits.

This is the second of a two-semester sequence comprising a traditional classical mechanics course. Topics include Langrange and Hamiltonian formulations; gravitation, central force problems, and planetary motion; systems of particles; accelerated coordinate systems.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY306 Minimum Grade of D-

May not be repeated for credit

PHY308. Modern Physics I. 3 Credits.

An introduction to the physics of atoms, starting with the origin of the quantum theory. Extensive discussion of the hydrogen atom. Other topics chosen from solid state physics, statistical physics, and nuclear physics if time permits. Computational techniques are used where appropriate.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-

May not be repeated for credit

PHY309. Modern Physics II. 3 Credits.

A continuation of Modern Physics I, covering special relativity and other topics chosen from atomic physics, nuclear physics, statistical physics, and solid state physics. Computational techniques are used where appropriate.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY308 Minimum Grade of D-

May not be repeated for credit

PHY310. Modern Physics Laboratory. 1 Credit.

A laboratory course demonstrating the principles of Modern Physics PHY309. Required for Physics majors.

Attributes:

- Practicum - Non-Clinical
- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-

May not be repeated for credit

PHY311. Classical Mechanics. 3 Credits.

An intermediate level course in Newtonian mechanics. Linear and angular motion, conservation laws, Lagrangian and Hamiltonian formulations. Computational methods are used where appropriate.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY300 Minimum Grade of D-

May not be repeated for credit

PHY313. Electricity and Magnetism. 3 Credits.

Laws of electricity and magnetism and their applications using vector analysis and computational techniques. Differential forms of Maxwell's equations.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-
- MAT341 Minimum Grade of D-

May not be repeated for credit

PHY314. Relativity. 1 Credit.

This is a short course in Special Relativity covering the following aspects: experiments leading up to the theory, relative nature of time and distance measurements, constancy of the speed of light, Lorentz transformations, length contraction, time dilation, simultaneity, momentum and energy relations, mass-energy equivalence, and relativistic Doppler effect.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-

May not be repeated for credit

PHY315. Engineering Mechanics. 4 Credits.

A study of static and dynamic force systems. Vector and conventional techniques are used in problem solving. Properties of force systems, free body analysis, properties of area and mass, friction, kinematics and kinetics of particles and rigid bodies, energy and momentum method. Both English and SI units are used.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT252 Minimum Grade of D-
- PHY201 Minimum Grade of D-

May not be repeated for credit

PHY322. Optics. 3 Credits.

Geometrical and physical optics including thick lenses, polarization, coherence, interference and diffraction; propagation in crystals; non-linear optics; photon statistics; radiation pressure; electro-optics; gas crystals; semi-conductor laser.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY306 Minimum Grade of D-
- MAT342 Minimum Grade of D-

May not be repeated for credit

PHY323. Optics Laboratory. 2 Credits.

Introduces students to advanced experiments in optical physics and to experimental techniques in physics research. Topics include lasers, reflection, lenses and imaging, and polarization. Emphasis is on students investigating each experiment and communicating their observations through reports and presentations to build essential research skills.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY306 Minimum Grade of D-

May not be repeated for credit

PHY324. Optics Lab for Astronomers. 1 Credit.

Introduces students to experiments in optical physics relevant to astronomy and to experimental techniques in physics and astronomy as a subset of Optics Lab for physics majors. Topics include reflection, lenses and imaging, and polarization. Emphasis is on students investigating and communicating their observations through notebooks and presentations to build essential skills.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman
- Must not be enrolled in the following field(s) of study (major, minor or concentration): Physics (511)

Prerequisites:

- PHY308 Minimum Grade of D-

May not be repeated for credit

PHY331. Quantum Physics. 3 Credits.

Origin of Planck's quantum hypothesis and its later development through the deBroglie wave-particle duality to the modern quantum mechanics of Schroedinger and Heisenberg. Principles of correspondence, complementarity, and uncertainty. Application of quantum mechanics to basic problems such as the time-independent Schroedinger Equ., hydrogen atom and spin phenomena.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT341 Minimum Grade of D-
- PHY308 Minimum Grade of D-

May not be repeated for credit

PHY340. Introduction to Astrophysics. 3 Credits.

Introduction for science majors. Formation of stars, H-R diagram, binaries, brightness scale, distance ladder, doppler effect, stellar masses, parallax, proper motion, radial motion, mass-luminosity, black-body radiation, spectroscopy, telescopy, telescopes, dense stars, black holes, glaxies, relativity and cosmology.

Attributes:

- Liberal Arts

Restrictions:

- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY201 Minimum Grade of D-

May not be repeated for credit

PHY341. Observational Astronomy. 3 Credits.

An introduction to the tools and techniques of observational astronomy, including astronomical image analysis, telescopes and CCD detectors, reduction and analysis of astronomical spectra. Course requires nightime telescopic work.

Attributes:

- Practicum - Non-Clinical
- Critical Thinking Intermediate
- Information Mgmt Intrmd
- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY340 Minimum Grade of D- or PHY206 Minimum Grade of D-

May not be repeated for credit

PHY342. Planetarium Operation. 3 Credits.

Principles and operation of planetarium projection devices, and their use in developing public planetarium shows.

Attributes:

- Information Mgmt Advanced
- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY205 Minimum Grade of D-

May not be repeated for credit

PHY343. Solar Physics. 3 Credits.

A study of the structure of the Sun, and the physical phenomena (such as sunquakes, eclipses, sunspots, flares, prominences) that take place in its interior and near the surface.

Attributes:

- Liberal Arts

Restrictions:

- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY340 Minimum Grade of D-

May not be repeated for credit

PHY344. Extraterrestrial Life. 3 Credits.

Origin of life in the solar system, existence of other planetary systems, possibilities and techniques for detection of and communication with other intelligences.

Attributes:

- Critical Thinking Advanced
- Liberal Arts

Restrictions:

- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY206 Minimum Grade of D- or PHY340 Minimum Grade of D-

May not be repeated for credit

PHY345. Galaxies and Cosmology. 3 Credits.

The Milky Way; the properties, contents, origins, and evolution of galaxies; the properties of their central black holes, active galaxies and starbursts; dark matter in galaxies and clusters; galaxy clustering and large-scale structure; models of the universe, its history and its future; the early Universe; and dark energy.

Attributes:

- Liberal Arts

Restrictions:

- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY340 Minimum Grade of C-

May not be repeated for credit

PHY366. Nonlinear Dynamics. 3 Credits.

A study of systems where a change of the output is not proportional to the change of the input. In the real world, systems are typically nonlinear.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT341 Minimum Grade of C- or MAT359 Minimum Grade of C-

May not be repeated for credit

PHY393. Physics Selected Topic. 1-12 Credits.

Selected topics courses are regularly scheduled courses that focus on a particular topic of interest. Descriptions are printed in the Schedule of Classes each semester. Selected topics courses may be used as elective credit and may be repeated for credit, provided that the topic of the course changes.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May be repeated for credit

PHY399. Modular Course. 0 Credits.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May not be repeated for credit

PHY402. Fluid Mechanics. 3 Credits.

Fundamental physical characteristics, fluid statics; kinematics; flow of incompressible, compressible, and real fluids. Theory of models as applied to physical systems and development of several models of fluids.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY202 Minimum Grade of D-
- MAT341 Minimum Grade of D-

May not be repeated for credit

PHY422. Thermal Physics. 3 Credits.

Basic laws of thermodynamics. Conditions of equilibrium equations of state, Euler equation. Gibbs-Duhem relations, thermodynamic potentials, and the Nernst Theorem.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- MAT342 Minimum Grade of D-

May not be repeated for credit

PHY424. Advanced Physics Laboratory. 3 Credits.

This course introduces students to advanced experiments in physics, experimental techniques in science research, and writing in a scientific research format. Topics include electricity and magnetism, quantum mechanics, optics, and nuclear physics. Emphasis is on implementing and investigating each experiment and communication observations though online forums, written notebooks, and research articles. Students will learn skills and knowledge that they can apply to future experimental research situations.

Attributes:

- Practicum - Non-Clinical
- Liberal Arts
- Writing Intensive

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY331 Minimum Grade of D-

May not be repeated for credit

PHY429. Solid State Physics. 3 Credits.

Crystals: Binding, symmetries, diffraction, reciprocal lattice, defects. Lattice dynamics: Phonons, modes, specific heat, thermal conduction. Metals: Free electron theory, band theory,superconductivity. Semiconductors: Fermi-Dirac Statistics, transport, band shapes, p-n junction, electronic devices.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY308 Minimum Grade of D-

May not be repeated for credit

PHY432. Atomic and Nuclear Physics. 3 Credits.

Elementary quantum mechanics applied to multielectron atoms, identical particles, magnetic effects and nuclear systems. Quantum nature of elementary particles. Selections from quantum statistics, solid state physics, superconductivity and magnetic properties of solids according to class interest.

Attributes:

- Liberal Arts

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

Prerequisites:

- PHY308 Minimum Grade of D-

May not be repeated for credit

PHY491. Physics Senior Project (3-6). 3 Credits.

Project may be either experimental or theoretical physics by arrangement with a physics faculty advisor. Plan must be approved in the prior semester by chairperson.

Attributes:

- Creative Works
- Research
- Critical Thinking Advanced
- Information Mgmt Advanced

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May be repeated for credit

PHY492. Physics Senior Project Continuation (1-3). 3 Credits.

Continuation of senior project. Student must have completed PHY491 and have approval of chairperson.

Attributes:

- Creative Works
- Research

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May not be repeated for credit

PHY493. Physics Selected Topic. 3-12 Credits.

Selected topics courses are regularly scheduled courses that focus on a particular topic of interest. Descriptions are printed in the Schedule of Classes each semester. Selected topics courses may be used as elective credit and may be repeated for credit, provided that the topic of the course changes.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May be repeated for credit

PHY494. Fieldwork in Physics. 0 Credits.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May not be repeated for credit

PHY495. Indep Study Physics. 1-12 Credits.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May be repeated for credit

PHY499. Modular Course. 1 Credit.

Restrictions:

- Must have the following level: Undergraduate
- Must not be enrolled in the following class: Freshman

May be repeated for credit

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