

The Physics Minor for Earth Science Majors

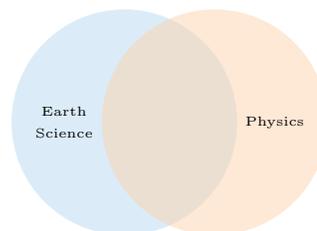
http://physics.neiu.edu/degree_programs/minor.html



1 Earth Science and Physics

Whether you want to broaden your knowledge, strengthen your background for geophysics and climate science, or explore ways to make yourself more marketable, a physics minor may be right for you.

The physics minor is rich in subjects directly related to Earth Science including radioisotopes and radio-graphic dating, the physics of mass spectroscopy, phase transitions, the thermodynamics underlying Bowen's reaction series, x-ray diffraction,...



Venn and the art of physics minoring.

2 Minor Requirements

Five courses are required for a Physics Minor. Most Earth Science majors already take two of those. The remaining three courses complement and reinforce what you are learning in Earth Science. In addition, they satisfy ELE-DS requirements needed for graduation.

- **PHYS-206L University Physics I with Lab**, 5 cr. This course also satisfies the distributed learning requirement NSL.
- **PHYS-207L University Physics II with Lab**, 5 cr. This course also satisfies the distributed learning requirement NSL.
- **PHYS-305 Modern Physics I**, 3 cr. This course also satisfies the Engaged Learning Experience requirement ELS-DS.
- **PHYS-306A Modern Physics II**, 3 cr. This course also satisfies the Engaged Learning Experience requirement ELS-DS.
- **Any 300-level physics elective** worth at least 3 cr. We suggest one of:
 - PHYS-340 The Science of Sustainable Energy, 3 cr.
 - PHYS-309 Computing for Scientists, 3cr.
 - PHYS-335 Thermal Physics, 3 cr.
 - PHYS-336 Optics, 3 cr.

3 Selected Course Descriptions

PHYS-206L University Physics I with Lab, 5 cr. This is the first term of a two-term calculus-based lecture and laboratory sequence intended for students majoring in physics, biology, chemistry, earth science or mathematics: PHYS-206L and PHYS-207L. Kinematics and dynamics of a particle and systems of particles, momentum, energy, angular momentum, conservation laws, applications to problems involving collisions, oscillatory motion and motion in a gravitational field, rigid body motion, temperature, heat, the laws of thermodynamics, application to thermodynamic engines, and ideal gases are discussed. Lecture: 3 hrs. Lab: 2 hrs. General Education (NSL). Prerequisites: MATH-187 Minimum Grade of C, or concurrent registration in MATH-187.

PHYS-207L University Physics II with Lab, 5 cr. This is the second course of a two-term calculus based lecture and laboratory sequence intended for students majoring in physics, biology, chemistry, earth science or mathematics. Charges, Coulomb's and Gauss's laws, conductors and dielectrics, Ohm's law, magnetic fields, Ampere's law, motion of charges in a magnetic field, Faraday's law, inductance, simple L.R.C. circuits, magnetic properties of matter, electromagnetic waves, kinematics of wave motion, reflection, refraction, interference, and diffraction are discussed. Lecture: 3 hrs. Lab: 2 hrs. General Education (NSL). Prerequisites: (PHYS-201 Minimum grade of C and MATH 187). Minimum grade of C or (PHYS-206 Minimum Grade of C or PHYS-206L Minimum Grade of C).

PHYS-305 Modern Physics I, 3 cr. This course covers the advances made in the discipline of physics during the first half of the twentieth century that continue to drive the technologies we use today. Topics that will be covered include an introduction to the theory of relativity, elementary quantum theory, and its applications to atomic, molecular and nuclear physics. ELS-DS Prerequisites: PHYS-207L or PHYS-207 or PHYS-202L or PHYS-202 minimum grade of C. MATH-202 minimum grade of C.

PHYS-306A Modern Physics II, 3 cr. Modern Physics II is the second part of a two course sequence covering advances made in physics during the twentieth century. This content includes aspects of the general theory of relativity, cosmology, thermal physics, and applications of elementary quantum theory to atomic physics, molecular physics, nuclear physics, particle physics and condensed matter physics. ELS-DS Prerequisites: PHYS-305, minimum grade of C.

PHYS-309 Computing for Scientists, 3cr. Introduction to the use of computers in modeling scientific problems; modern programming languages are introduced and used to model several phenomena in the natural sciences and engineering. Prerequisites: MATH-187 minimum grade of C or consent of instructor.

PHYS-331 Optics, 4 cr. The fundamental principles of geometrical and physical optics and their application to the design of modern instruments as well as atomic spectra, properties of photons, and lasers. Principles discussed in the lecture will be explored in various lab exercises. Lecture 2 hours, Lab 4 hours. Prereq.: [PHYS-207 or PHYS-202], PHYS-204, and MATH-202.

PHYS-332 Electronics, 4 cr. Laboratory and lecture covering both the basic structure of various electronic components, and their use and behavior in circuits. The course begins with linear elements, such as resistors, inductors, and capacitors, and proceeds through various semiconductor devices, diodes, transistors, and operational amplifiers, and culminates with the structure and use of logic circuits. Major emphasis is placed on laboratory work where the properties and interactions of various circuits are investigated. Lecture 2 hours, Lab 4 hours. Prerequisites: PHYS-204., [PHYS-207 or PHYS-202]

PHYS-335 Thermal Physics, 3 cr. Thermal Physics provides an introduction to thermodynamics and statistical mechanics. Course content includes the relationship between volume, pressure, heat, work, energy, temperature, entropy, free energy, enthalpy, chemical potential, heat capacities, and other quantities. Topics presented in this course include the first, second, and third laws of thermodynamics; heat engines, refrigerators, and heat pumps; mechanical, thermal, and chemical equilibrium, phase diagrams, phase transitions. Boltzmann and Gibbs distributions. partition functions. the equipartition theorem,

PHYS-340 The Science of Sustainable Energy, 3 cr. Sustainable energy provides a quantitative understanding of energy use and energy resources on both global scales and local settings. This courses will identify and quantify current energy resources, provide an understanding of energy conservation, efficiency, and the conversion of energy from less useful to more useful forms. PHYS-340 investigates the environmental consequences of our energy use, and emphasizes an interdisciplinary approach required to solving real-world problems. This course focuses on the science which informs development, policy, and management decisions. ELS-DS. Prerequisites: (PHYS-207L or PHYS-202L) and MATH-187