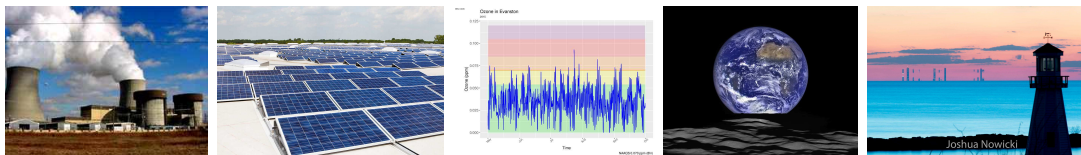


# The Physics Minor for Environmental Science Majors

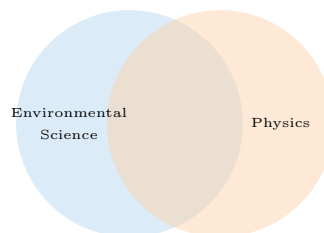
[http://physics.neiu.edu/degree\\_programs/minor.html](http://physics.neiu.edu/degree_programs/minor.html)



## 1 Environmental Science and Physics

Whether you want to broaden your knowledge, strengthen your background in renewable energy 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 topics with a direct application to environmental science including the science of sustainable energy and climate modeling. This includes nuclear physics and nuclear energy, heat engines, solar energy and photovoltaics, and blackbody radiation.



Venn and the art of physics minoring.

## 2 Minor Requirements

Five courses are required for a Physics Minor. As an Environmental Science major, you already take two of those. The remaining three courses will complement and reinforce what you are learning in Environmental 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.

**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-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, blackbody radiation, and degenerate fermi gasses. Prerequisites: PHYS-305 minimum grade of C.

**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