

Physics

PROGRAM OBJECTIVES

The Physics degree is a true liberal arts degree, preparing the student for many options after graduation, from immediate employment to graduate school in a wide range of disciplines. The problem-solving approaches developed in the physics curriculum can be applied in multiple career paths. Students are strongly encouraged to engage in research, either with faculty members or through summer internships. Our emphasis is on quality instruction, full student participation and individual attention to the student.

LEARNING OUTCOMES

At the end of their studies, Eastern Oregon University physics graduates will:

- be proficient in the problem-solving approaches, both theoretical and experimental, used by physicists.

- have an understanding of the main areas of physics, including mechanics, electricity and magnetism, wave phenomena (including optics), thermodynamics and quantum theory.

- have a good understanding of laboratory instrumentation, and be able to design specialized instrumentation as needed.

- be able to communicate the knowledge and applications of physics to peers and to the general public, orally and in writing.

- have a knowledge of the history of physics and the importance of physics to modern society.

MEANS OF ASSESSMENT

Several tools are used in assessing student learning. Examinations are designed to let us assess students' ability to apply fundamental concepts and problem-solving skills to the solutions of specific problems. The laboratory notebook is evaluated in courses containing a lab component to test experimental skills. Evaluation of oral presentations and term papers is used in the upper-division courses. In the first-year courses we use the Force Concept Inventory exam, a tool widely used by physics programs, to evaluate the improvement in conceptual understanding by students.

REQUIREMENTS FOR THE BACHELOR OF ARTS OR

THE BACHELOR OF SCIENCE IN PHYSICS

1. To be admitted to the Physics program, candidates must complete PHYS 221, 222, 223 with a 2.00 GPA or better and attempt the WPE. Entry may also be gained by petition to the School of Arts and Sciences. A 2.00 GPA in Physics courses must be maintained to remain in good standing in the program.

2. Complete EOU graduation requirements.

3. Complete the following with a grade of "C-" or higher in each course:

PHYS 221, 222, 223 Gen Physics w/Calculus (15)
PHYS 321, 322 Waves & Quantum Theory (10)
PHYS 343, 344, 345 Exper Techniques (15)
PHYS 441, 442, 443 Theoretical Physics (15)
PHYS 490 Physics: History & Philosophy (2)
PHYS 491 Physics Capstone Seminar (1)
MATH 251, 252, 253, 254 Calculus (16)
MATH 321 Differential Equations (5)
CS 161 Structured Programming (4)
CHEM 204,205 General Chemistry (10)
CHEM 206 Qualitative Analysis (5)
CHEM 440 Thermodynamics (5)

4. Students transferring from Blue Mountain Community College with an A.A. degree in Electronics Technology ordinarily can earn a Physics degree in two years at EOU by completion of Eastern graduation requirements and PHYS 321, 322, 441, 442, 443; CHEM 204, 205, 206, 440; and MATH 254, 321. Such students should consult with an electronics technology adviser at Blue Mountain Community College or a physics adviser at Eastern Oregon University for further details.

REQUIREMENTS FOR THE B.A. OR THE B.S. IN PHYSICS IN A 3-2 ENGINEERING PROGRAM

Students may obtain a physics degree by attending Eastern Oregon University for three years and transferring to Oregon State University for two years. In this program students receive both a physics degree from EOU and an engineering degree from OSU.

For more information, consult option 4 in the Engineering section.

CONCENTRATION IN CHEMICAL PHYSICS FOR THE PHYSICS B.S./B.A. DEGREE

Requirements:

1. Complete, with a grade of "C-" or better, each of the following courses:

CHEM 440 Thermodynamics (4)

CHEM 442 Chemical Dynamics (4)

CHEM 443 Thermodynamics Lab (1)

CHEM 445 Chemical Dynamics Lab (1)

PHYS 321 Waves & Quantum Theory (5)

PHYS 322 Waves & Quantum Theory (5)

2. Complete, with a grade of "C-" or better, 3 credits from the following list of courses:

CHEM 410 Selected Topics in Physical Chemistry (1-5)

PHYS 410 Selected Topics in Chemical Physics (1-5)

CHEM 421 Instrumental Analysis (3) and

CHEM 422 Instrumental Analysis Lab (2)*

*Both classes must be successfully completed in order to count towards the concentration.

3. Students earning a minor in chemistry may not earn a concentration in chemical physics.

4. Students earning a double major or a double degree in chemistry and physics may not earn a concentration in chemical physics.

TYPICAL FIRST YEAR CURRICULUM

Fall

MATH 251 Calculus I (4) [1]

PHYS 221 General Physics with Calculus (5) [2]

General Education or Elective Courses (7)

Winter

MATH 252 Calculus II (4) [1]

PHYS 222 General Physics with Calculus (5) [2]

CS 161 Structured Programming (4)

General Education or Elective Courses (1-4)

Spring

MATH 253 Calculus III (4) [1]

PHYS 223 General Physics with Calculus (5) [2]

General Education or Elective Courses (6-8)

TYPICAL SECOND YEAR CURRICULUM

Fall

CHEM 204 General Chemistry (5)

MATH 254 Vector Calculus (4)

General Education or Elective Courses (6)

Winter

PHYS 321 Waves and Quantum Theory (5)

CHEM 205 General Chemistry (5)

MATH 321 Differential Equations (5)

General Education or Elective Courses (2-4)

Spring

PHYS 322 Waves and Quantum Theory (5)

CHEM 206 Qualitative Analysis (5)

General Education or Elective Courses (5)

TYPICAL THIRD YEAR CURRICULUM

Fall

PHYS 343 Experimental Techniques (5) [3]

General Education or Elective Courses (8- 10)

Winter

PHYS 344 Experimental Techniques (5)

General Education or Elective Courses (11)

Spring

PHYS 345 Experimental Techniques (5)

MATH 322 Fourier Series (3)

General Education or Elective Courses (6-8)

TYPICAL FOURTH YEAR CURRICULUM

Fall

PHYS 441 Theoretical Physics (5)

CHEM 440 Thermodynamics (5)

General Education or Elective Courses (6)

Winter

PHYS 442 Theoretical Physics (5)

PHYS 490 Physics: History & Philosophy (2)

General Education or Elective Courses (11)

Spring

PHYS 443 Theoretical Physics (5)

PHYS 491 Physics Capstone Seminar (1)

MATH 417 Complex Variables (2)

General Education or Elective Courses (6)

Note:

[1.] Students may need to enroll in a lower level math sequence as determined by Eastern evaluation.

[2.] Students must have completed or be concurrently enrolled in MATH 251, or obtain permission of the instructor.

[3.] The PHYS 343, 344, 345 sequence is offered only every other year. The student may, therefore, need to take this sequence during the second year.

[4.] Recommended but not required. In addition, the weaker student should also take ENGR 212, Dynamics.

REQUIREMENTS FOR THE MINOR IN PHYSICS

1. A minimum of 30 graded credits in Physics courses with a minimum GPA of 2.00 to be selected from the following:

Required:

PHYS 221, 222, 223

Gen Physics w/Calculus (15)

PHYS 321* Waves and Quantum Theory (5)

At least 10 hours to be selected from the following:

PHYS 322 Waves and Quantum Theory (5)

PHYS 343, 344, 345 Experimental Tech (15)

PHYS 441, 442, 443 Theoretical Physics (15)

* May be under the prefix CHEM 441.

2. A grade of "C-" or better in each course counting toward the minor.

3. A minimum of 10 hours counting toward the minor must be completed at Eastern Oregon University.

PHYSICS COURSE DESCRIPTIONS

PHYS 110 - Selected Topics Credits: 1.00 to 6.00

PHYS 201 - General Physics*N/NW Credits: 4.00 Gen Ed-Natural Science

New Gen Ed-Natural World

An introductory college physics sequence for those whose majors are not in the physical sciences or engineering, which includes the principles of mechanics, waves, sound, thermodynamics, electricity, magnetism, optics, relativity, and quantum theory. Prerequisite: MATH 111, 112, or equivalent.

PHYS 201L - Physics Lab Credits: .00

PHYS 202 - General Physics*N Credits: 4.00 Gen Ed-Natural Science

An introductory college physics sequence for those whose majors are not in the physical sciences or engineering, which includes the principles of mechanics, waves, sound, thermodynamics, electricity, magnetism, optics, relativity, and quantum theory. Prerequisite: MATH 111, 112, or equivalent.

PHYS 202L - Physics Lab Credits: .00

PHYS 203 - General Physics*N Credits: 4.00 Gen Ed-Natural Science

An introductory college physics sequence for those whose majors are not in the physical sciences or engineering, which includes the principles of mechanics, waves, sound, thermodynamics, electricity, magnetism, optics, relativity, and quantum theory. Prerequisite: MATH 111, 112, or equivalent.

PHYS 203L - Physics Lab Credits: .00

PHYS 210 - Selected Topics Credits: 1.00 to 6.00

PHYS 221 - Gen Physics/Calc*N/NW Credits: 5.00 Gen Ed-Natural Science
New Gen Ed-Natural World

First part of a six-term sequence in physics, which includes CHEM 440 and PHYS 321, 322, for students in the physical sciences and engineering. Emphasis in classical mechanics, special relativity, electricity and magnetism, and waves. Prerequisite: Calculus previously or concurrently.

PHYS 221L - Gen Physics Lab Credits: .00

PHYS 222 - Gen Physics/Calc*N/NW Credits: 5.00 Gen Ed-Natural Science
New Gen Ed-Natural World

First part of a six-term sequence in physics, which includes CHEM 440 and PHYS 321, 322, for students in the physical sciences and engineering. Emphasis in classical mechanics, special relativity, electricity and magnetism, and waves. Prerequisite: Calculus previously or concurrently.

PHYS 222L - Gen Physics Lab Credits: .00

PHYS 223 - Gen Physics/Calc*N/NW Credits: 5.00 Gen Ed-Natural Science
New Gen Ed-Natural World

First part of a six-term sequence in physics, which includes CHEM 440 and PHYS 321, 322, for students in the physical sciences and engineering. Emphasis in classical mechanics, special relativity, electricity and magnetism, and waves. Prerequisite: Calculus previously or concurrently.

PHYS 223L - Gen Physics Lab Credits: .00

PHYS 310 - Selected Topics Credits: 1.00 to 6.00

PHYS 321 - Waves & Quan Theory Credits: 5.00 (Writing Intensive) An introduction to quantum physics, from basic concepts through rigorous treatment of the hydrogen atom. Prerequisite: PHYS 223 and MATH 254.

Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 321L - Waves & Quan Thry Lab Credits: .00 Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 322 - Waves & Quan Theory Credits: 5.00 (Writing Intensive) Classical waves. The second term of a sequence, emphasizing spectroscopy, quantum statistics, the solid state, and a brief introduction to nuclear physics. Prerequisite: PHYS 223 and MATH 254.

Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 322L - Waves & Quan Thry Lab Credits: .00 Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 343 - Experimental Tech Credits: 5.00 (Writing Intensive) For students in science and engineering. Topics include an introduction to electronic circuits and techniques, vacuum technology, optical techniques, and machine shop practices of special relevance to present-day experimental instrumentation. The final term deals almost exclusively with microcomputer interfacing and application. Prerequisite: PHYS 223. Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 343L - Experimental Tech Lab Credits: .00 Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 344 - Experimental Tech Credits: 5.00 (Writing Intensive) For students in science and engineering. Topics include an introduction to electronic circuits and techniques, vacuum technology, optical techniques, and machine shop practices of special relevance to present-day experimental instrumentation. The final term deals almost exclusively with microcomputer interfacing and application. Prerequisite: PHYS 223. Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 344L - Experimental Tech Lab Credits: .00 Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 345 - Experimental Tech Credits: 5.00 (Writing Intensive) For students in science and engineering. Topics include an introduction to electronic circuits and techniques, vacuum technology, optical techniques, and machine shop practices of special relevance to present-day experimental instrumentation. The final term deals almost exclusively with microcomputer interfacing and application. Prerequisite: PHYS 223. Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 345L - Experimental Tech Lab Credits: .00 Restrictions: May not be enrolled in one of the following Class(es): Freshman

PHYS 401 - Research Credits: 1.00 to 15.00 Individual research project selected with and supervised by a member of the Physics faculty. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 405 - Reading & Conference Credits: 1.00 to 15.00 Individual or small group study of a physics topic not included in the regular curriculum, under the supervision of a member of the Physics faculty. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 407 - Seminar Credits: 1.00 to 15.00 A formal course on a physics topic not included in the regular curriculum offered by a member of the Physics faculty. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 410 - Selected Topics Credits: 1.00 to 6.00 Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 441 - Theoretical Physics Credits: 5.00 An advanced integrated course in mechanics and electromagnetic fields: relativistic and nonrelativistic kinematics, dynamics and electrodynamics of particles and rigid bodies; Lagrange's equations; Maxwell's equations and electromagnetic waves. Prerequisite: CS 161 and MATH 321. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 442 - Theoretical Physics Credits: 5.00 An advanced integrated course in mechanics and electromagnetic fields: relativistic and nonrelativistic kinematics, dynamics and electrodynamics of particles and rigid bodies; Lagrange's equations; Maxwell's equations and electromagnetic waves. Prerequisite: PHYS 441 or consent of instructor. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 443 - Theoretical Physics Credits: 5.00 An advanced integrated course in mechanics and electromagnetic fields: relativistic and nonrelativistic kinematics, dynamics and electrodynamics of particles and rigid bodies; Lagrange's equations; Maxwell's equations and electromagnetic waves. Prerequisite: PHYS 442 or consent of instructor. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 490 - Hist & Phil Phys Credits: 2.00 (Capstone) A seminar on the history and philosophy of physics, emphasizing the essential unity of the discipline and exploring questions of how physics relates to the other natural sciences. Intended to serve as a capstone experience for physics majors. Prerequisite: PHYS 223; PHYS 321 recommended but not required. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore

PHYS 491 - Physics Capstone Seminar Credits: 1.00 A seminar on the history and philosophy of physics. The second term of this capstone experience involves individual research and a presentation. Restrictions: May not be enrolled in one of the following Class(es): Freshman, Sophomore