

PHYSICS

<https://www.physics.as.miami.edu>

Dept. Code: PHY

Introduction

The requirements for a major or minor in the Department of Physics are flexible and may be adapted to the needs of the individual student.

A grade of C- or better is required in all courses counted toward the major or minor with an overall GPA of 2.0. Any lecture course in the Physics department may be passed by means of a proficiency examination.

Note that more mathematics beyond two semesters of calculus is typically required for most of the physics courses at the 300 level or higher. In order to complete any Physics major sequence in four years, the student should begin elementary calculus as soon as possible. Students are encouraged to discuss an appropriate math sequence with the physics advisor. The minimum math requirement for physics major typically is as follow:

Code	Title	Credit Hours
MTH 151 or MTH 161 or MTH 171	Calculus I for Engineers Calculus I Calculus I	4-5
MTH 162 or MTH 172	Calculus II Calculus II	4
MTH 210 or PHY 315	Introduction to Linear Algebra Mathematical Tools for Physics	3
MTH 211 or MTH 310 or PHY 315	Calculus III Multivariable Calculus Mathematical Tools for Physics	3
MTH 311 or PHY 315	Introduction to Ordinary Differential Equations Mathematical Tools for Physics	3
Total Credit Hours		17-18

Requirements for the Master of Science and Doctor of Philosophy (<http://bulletin.miami.edu/graduate-academic-programs/arts-sciences/physics/>) degrees will be found in the Bulletin of the Graduate School.

PHY 101. College Physics I. 4 Credit Hours.

Elementary mechanics, thermal phenomena, fluids, waves. Courses 101-102-106-108 provide a ten-credit 'physics with lab' sequence without calculus. Prerequisite: MTH 105 or higher (excluding MTH 113). Corequisite: PHY 106.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 102. College Physics II. 4 Credit Hours.

Electromagnetism, optics, and modern physics.

Pre-requisite: PHY 101 And Co-requisite: PHY 108.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 103. General Physics. 3 Credit Hours.

Mechanics, waves, electromagnetism.

ARCHITECTURE MAJORS.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 106. Physics Laboratory 1. 1 Credit Hour.

First laboratory course to accompany all introductory Physics Courses

Pre/Corequisite: PHY 101 or PHY 201 or PHY 211 or PHY 222 or PHY 230.

Components: LAB.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 108. Physics Laboratory 2. 1 Credit Hour.

Second laboratory course to accompany all introductory physics courses.

Pre/Co-requisite PHY 102 or PHY 202 or PHY 212 or PHY 223 or PHY 230.

Components: LAB.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 110. Descriptive Astronomy. 3 Credit Hours.

For students not majoring in Mathematics or a Physical Science. brief non-technical treatment of the universe and its contents. Mathematical requirements are minimal with emphasis on our present knowledge about energy and matter in space. Not for major or minor.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 160. Physics of the Arts. 3 Credit Hours.

Newtonian mechanics, energy, wave motion, atoms, and electricity. Applications to music, art and communications.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 201. University Physics I for the Sciences. 4 Credit Hours.

Calculus based introductory physics: mechanics, heat, fluids, waves, with applications from the physical and life sciences.

Pre-requisite: MTH 141 Or MTH 151 Or MTH 161 Or MTH 171 And MTH 162 Or MTH 172 Or Co-requisite: MTH 162 Or Co-requisite: MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Fall & Spring.

PHY 202. University Physics II for the Sciences. 4 Credit Hours.

Calculus based introductory physics: electromagnetism, optics, modern physics, with applications from the physical and life sciences.

Prerequisite: PHY 201.

Components: LEC.

Grading: GRD.

Typically Offered: Fall & Spring.

PHY 211. University Physics I for PRISM. 4 Credit Hours.

Calculus based introductory physics: mechanics, heat, fluids, waves, with applications from the physical and life sciences. Designed for students in the PRISM program.

Pre/Corequisite: MTH 162 or MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

PHY 212. University Physics II for PRISM. 4 Credit Hours.

Calculus based introductory physics: electromagnetism, optics, modern physics, with applications from the physical and life sciences. Designed for students in the PRISM program.

Prerequisite: PHY 211.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 221. University Physics I. 3 Credit Hours.

Mechanics through gravity and harmonic motion, intended for science and engineering students.

Prerequisite: MTH 141 or MTH 151 or MTH 161 or MTH 171 OR Co-requisite: MTH 151. NOTE: Students taking MTH 161 concurrent can contact the Department for special permission.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 222. University Physics II. 3 Credit Hours.

Fluids, waves, optics, thermal phenomena, intended for science and engineering students.

Prerequisite: PHY 221 or PHY 205 And Pre/Corequisite: MTH 162 or MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 223. University Physics III. 3 Credit Hours.

Electromagnetism through Maxwell's equations, intended for science and engineering students.

Prerequisite: PHY 221 (or PHY 205) and Pre or Corequisite: MTH 162 or MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 224. University Physics II Lab. 1 Credit Hour.

Laboratory to accompany PHY 222.

Prerequisite: PHY 222 or PHY 230 or Corequisite: PHY 222 or PHY 230.

Components: LAB.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 225. University Physics III Lab. 1 Credit Hour.

Laboratory to accompany PHY 223.

Prerequisite: PHY 223 or PHY 230 or Corequisite: PHY 223.

Components: LAB.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 230. Honors University Physics II-III. 6 Credit Hours.

Fluids, waves, optics, thermal phenomena, electromagnetism. Combines PHY 222 and 223.

Prerequisite: PHY 221 and Pre- or Co-requisite: MTH 162 or MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 295. Transfer Credits. 1-5 Credit Hours.

Special topics taken at other institutions but having no direct equivalents here.

Components: LEC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 306. Intermediate Laboratory. 1 Credit Hour.

Laboratory: a review of some of the fundamental experiments in classical and modern physics.

Prerequisite: PHY 225 or PHY 209 And Pre/Corequisite: PHY 360.

Components: LAB.

Grading: GRD.

Typically Offered: Spring.

PHY 315. Mathematical Tools for Physics. 3 Credit Hours.

How to use mathematics. Series, complex algebra, vector analysis, differential equations, etc.

Prerequisite: MTH 141 or MTH 151 or MTH 161 or MTH 171 and Pre/Corequisite: PHY 206 and Pre/Corequisite: MTH 162 or MTH 172.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 321. Thermodynamics and Kinetic Theory. 3 Credit Hours.

An intermediate course in thermal phenomena, from both macroscopic and microscopic points of view.

Prerequisite: PHY 222 or PHY 206 And MTH 211 or MTH 310 Or PHY 315.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 325. Biological Physics I. 3 Credit Hours.

Applications of fundamental principles from fluids, electrostatics, statistical physics to biological phenomena at molecular and neuronal levels; emphasis on quantitative picture of well-known biological systems; discussion of current research at the interface of biology and physics.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 340. Classical Mechanics I. 3 Credit Hours.

Includes harmonic motion, orbit theory, coupled oscillations, rigid body motions.

Prerequisite: PHY 202 or PHY 212 Or PHY 222 and PHY 223 Or PHY 230 or PHY 206 and PHY 207 or (PHY 210) And Pre/Corequisite: MTH 210 and MTH 311 Or Prerequisite: PHY 315.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 350. Intermediate Electricity and Magnetism. 3 Credit Hours.

Includes the integral and differential forms of Maxwell's equations, circuit theory, and boundary value problems.

Prerequisite: PHY 202 or PHY 212 Or PHY 222 and PHY 223 Or PHY 230 or PHY 206 and PHY 207 or (PHY 210) And MTH 211 or MTH 310 And Pre/Corequisite: MTH 311 Or Prerequisite: PHY 315.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

PHY 351. Intermediate Electricity and Magnetism II. 3 Credit Hours.

A continuation of PHY 350. Includes further application of Maxwell's equations with emphasis on radiation theory.

Requisite: PHY 350.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 360. Introduction to Modern Physics. 3 Credit Hours.

Emphasis on the experimental foundations of modern physics. Relativity, quantization, atomic structure, radiation, nuclei.

(Prerequisite: PHY 202 or PHY 212 or PHY 230) or (prerequisite PHY 222 and Pre/Corequisite: PHY 223) And (Prerequisite: MTH 162 Or PHY 315.).

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

PHY 362. Modern Physics Honors Seminar. 1 Credit Hour.

Special Topics to accompany PHY 360. Co-requisite: PHY 360.

Pre-requisite: PHY 360 Or Co-requisite: PHY 360.

Components: SEM.

Grading: GRD.

Typically Offered: Fall.

PHY 401. Senior Thesis. 3 Credit Hours.

Research Leading to the writing of a senior thesis - First Semester.

Components: THI.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 402. Senior Thesis. 3 Credit Hours.

Research Leading to the writing of a senior thesis - Second Semester.

Components: THI.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 501. Research. 1-3 Credit Hours.

Project course introducing methods of research, individual investigation of current problems.

Components: THI.

Grading: GRD.

Typically Offered: Fall & Spring.

PHY 502. Research in Astrophysics. 1-3 Credit Hours.

Project course introducing methods of research, including modern computational tools such as image analysis, MonteCarlo simulations, spectral fitting. Individual investigation of current problems.

Components: RSC.

Grading: GRD.

Typically Offered: Fall, Spring, & Summer.

PHY 506. Advanced Laboratory. 1-2 Credit Hours.

Advanced experiments such as properties of the electron, optical spectra, electrical measurements, radioactive decay, absorption, etc.

Prerequisite: PHY 225 or PHY 209 And Pre/Corequisite: PHY 360.

Components: LAB.

Grading: GRD.

Typically Offered: Spring.

PHY 513. Mathematical Techniques in Physics. 3 Credit Hours.

Complex variables and applications. Infinite series and their uses, particularly in differential equations. Multiple integrals and Fourier series.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 516. Special Topics in Physics. 1-3 Credit Hours.

Special topics in Physics. Topics vary by semester.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 517. Special Topics in Physics. 1-3 Credit Hours.

Special topics in Physics. Topics vary by semester.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 518. Special Topics in Astrophysics. 1-3 Credit Hours.

Special topics in Physics. Topics vary by semester. The course includes the use of modern computational tools used in Astrophysics, such as image analysis, MonteCarlo simulations, spectral fitting.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 522. Solid State Physics. 3 Credit Hours.

Crystal structure, quantum theory of the electronic structure of solids, mechanical, electric, magnetic and optical properties of solids.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 530. Plasma Physics I. 3 Credit Hours.

Kinetic theory of plasmas, adiabatic motion of charged particles magneto fluid dynamics, transport properties of plasmas in electromagnetic fields.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 540. Classical Mechanics II. 3 Credit Hours.

Lagrangian formulation, rigid body dynamics. Topics selected from fluid dynamics, non-linear oscillations, normal modes, phase plane analysis.

Requisite: PHY 340.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

PHY 545. Introduction to Astrophysics. 3 Credit Hours.

Celestial mechanics, solar models, galaxies, distance scales, instruments. Includes the use of modern computation tools applied to astrophysics problems, such as image analysis, MonteCarlo simulations, spectral fitting.

Pre-requisite: PHY 360.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 552. Optical Physics. 3 Credit Hours.

Geometric optics, interference and diffraction, polarized light, optical pumping, coherence phenomena, applications to modern physical research.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.

PHY 560. Quantum Mechanics and Modern Physics I. 3 Credit Hours.

Introductory theory with applications to simple systems. Perturbation theory and atomic structure.

Pre-requisite: PHY 340 And PHY 350 Or Co-requisite: PHY 350.

Components: LEC.

Grading: GRD.

Typically Offered: Fall.

PHY 561. Quantum Mechanics and Modern Physics II. 3 Credit Hours.

Applications of quantum mechanics to atomic and molecular spectroscopy, quantum statistical mechanics, and nuclear physics.

Pre-requisite: PHY 560.

Components: LEC.

Grading: GRD.

Typically Offered: Spring.

PHY 565. Introduction to Quantum Computing. 3 Credit Hours.

This course covers the fundamentals of quantum computing, quantum algorithms (including those of Deutsch, Bernstein-Vazirani, Simon, Grover and Shor), and their implementation on IBM Q simulators and devices.

Math 210 - Introduction to Linear Algebra, or equivalent.

Components: LEC.

Grading: GRD.

Typically Offered: Offered by Announcement Only.