PHYSICS

http://www.physics.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:

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

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 for premedical students and others.
Prerequisite: MTH 105 or higher. 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. College Physics Laboratory I. 1 Credit Hour.
Laboratory course to accompany PHY 101.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

PHY 108. College Physics Laboratory II. 1 Credit Hour.
Laboratory course to accompany PHY 102.
Prerequisites: PHY 102 or PHY 202. Or Corequisites: PHY 102 or PHY 202.
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: Fall & 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: Spring.

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.

PHY 202. University Physics II for the Sciences. 4 Credit Hours.
Calculus based introductory physics: electromagnetism, optics, modern physics, with applications from the life sciences.
Prerequisite: PHY 201.
Components: LEC.
Grading: GRD.
Typically Offered: Fall & Summer.

PHY 205. University Physics I. 3 Credit Hours.
Mechanics through gravity and harmonic motion, intended for science and engineering students.
Prerequisites: MTH 151 or MTH 161 or MTH 171 or MTH 141. Or Corequisites: MTH 151 WITH a "B" IN MTH 105 or MTH 108 or Placement into Calculus by MTH Placement Exam. Or Corequisites: MTH 141 OR MTH 161.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

PHY 206. University Physics II. 3 Credit Hours.
Fluids, waves, optics, thermal phenomena.
Prerequisite: PHY 205 and MTH 162 or MTH 172. Or Co-requisite: MTH 162 or MTH 172.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

PHY 207. University Physics III. 3 Credit Hours.
Electromagnetism through Maxwell’s equations.
Prerequisite: PHY 205, and MTH 162 or MTH 172.
Components: LEC.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.
PHY 208. University Physics II Lab. 1 Credit Hour.
Laboratory to accompany PHY 206.
Prerequisite: PHY 206 or Corequisite: PHY 206.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

PHY 209. University Physics III Lab. 1 Credit Hour.
Lab to accompany PHY 207.
Prerequisite: PHY 207 Or Co-requisite: PHY 207.
Components: LAB.
Grading: GRD.
Typically Offered: Fall, Spring, & Summer.

PHY 210. Honors University Physics II-III. 5-6 Credit Hours.
Fluids, waves, optics, thermal phenomena, electromagnetism. Combines PHY 206 and 207.
Prerequisite: PHY 205 And 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 295. Transfer Credits. 1-5 Credit Hours.
Special topics taken at other institutions but having no direct equivalents here.
Components: LEC.
Grading: GRD.

PHY 306. Intermediate Laboratory. 1 Credit Hour.
Laboratory: a review of some of the fundamental experiments in classical and modern physics.
Prerequisite: PHY 209 or PHY 360. Or 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: Spring.

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 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: Fall.

PHY 340. Classical Mechanics I. 3 Credit Hours.
Includes harmonic motion, orbit theory, coupled oscillations, rigid body motions.
Prerequisite: PHY 206 and PHY 207 and Pre/Corequisite: MTH 210 and Pre/Corequisite: 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 206 and PHY 207 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 206 and Pre/Corequisite: PHY 207 and Prerequisite: MTH 172 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.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 402. Senior Thesis. 3 Credit Hours.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 500. Research. 1-3 Credit Hours.
Project course introducing methods of research, individual investigation of current problems.
Components: THI.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 506. Advanced Laboratory. 1-2 Credit Hours.
Advanced experiments such as properties of the electron, optical spectra, electrical measurements, radioactive decay, absorption, etc.
Pre-requisite: PHY 209 And PHY 360 Or Co-requisite: 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. Readings in Physics. 1-3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.

PHY 517. Readings in Physics. 1-3 Credit Hours.
Components: LEC.
Grading: GRD.
Typically Offered: Offered by Announcement Only.
PHY 518. Readings in Physics. 1-3 Credit Hours.
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 magnetofluid 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.
Pre-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.
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.
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.