

PHYSICS (PHY)

 - General Education Course

PHY 101 **Conceptual Physics** **3 Credit hours**

Introduces nonscience majors to applications of physics in life. Emphasizes conceptual understanding of basic principles in classical and modern physics. Recommended for science students with no high school physics.

Pre-req: (MTH 121 with a minimum grade of D or MTH 127 with a minimum grade of D or MTH 130 with a minimum grade of D or MTH 130E with a minimum grade of D or MTH 132 with a minimum grade of D or MTH 229 with a minimum grade of D or MTH 229H with a minimum grade of D or MTH 203 with a minimum grade of D or MTH 121B with a minimum grade of D) or MTH 130H with a minimum grade of D and PHY 101L (may be taken concurrently) with a minimum grade of D.

Concurrent PR: PHY 101L

Co-req: PHY 101L

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 101L **Conceptual Physics Lab** **1 Credit hour**

Conceptual Physics Laboratory. A laboratory course designed to include the principles and applications of physics that are introduced in Physics 101. (CR: PHY 101) 2 lab.

Co-req: PHY 101

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 190 **Overview of Physics (CT)** **3 Credit hours**

An algebra-based overview of well-established topics studied as part of a major in physics, including classical physics, special relativity, quantum mechanics, particle physics, and cosmology.

Attributes: Critical Thinking

Grade Mode: Normal Grading Mode

PHY 201 **College Physics I** **3 Credit hours**

First half of an introduction to physics for life-science students, using algebra and trigonometry, including kinematics and dynamics, force, energy, rotation, fluids, waves, and thermal phenomena.

Pre-req: (MTH 127 with a minimum grade of D and MTH 122 with a minimum grade of D) or (MTH 130 with a minimum grade of D and MTH 122 with a minimum grade of D) or MTH 132 with a minimum grade of D or (MTH 140 with a minimum grade of D and MTH 122 with a minimum grade of D) or MTH 229 with a minimum grade of D or MTH 229H with a minimum grade of D or MTH 140H with a minimum grade of D and PHY 202 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: PHY 202

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 202 **General Physics I Laboratory** **1 Credit hour**

Laboratory to accompany PHY 201 or PHY 211, focusing on mechanics concepts and applications.

Pre-req: PHY 201 (may be taken concurrently) with a minimum grade of D or PHY 211 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: PHY 201 or PHY 211

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 203 **College Physics II** **3 Credit hours**

Second half of an introduction to physics for life-science students, using algebra and trigonometry, including electric and magnetic fields, circuits, geometrical and physical optics, atomic and nuclear physics.

Pre-req: (PHY 201 with a minimum grade of C and PHY 202 with a minimum grade of C) and PHY 204 (may be taken concurrently) with a minimum grade of C.

Concurrent PR: PHY 204

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 204 **General Physics 2 Laboratory** **1 Credit hour**

Laboratory to accompany PHY 203 or PHY 213, focusing on classical E&M, circuits, and optics.

Pre-req: (PHY 203 (may be taken concurrently) with a minimum grade of D or PHY 213 (may be taken concurrently) with a minimum grade of D).

Concurrent PR: PHY 203 or PHY 213

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 211 **University Physics I** **4 Credit hours**

First half of an introduction to physics for physical science and engineering students, using calculus, and including kinematics and dynamics, force, energy, rotation, fluids, waves, and thermal phenomena.

Pre-req: (MTH 229 (may be taken concurrently) with a minimum grade of D or MTH 229H (may be taken concurrently) with a minimum grade of D) and PHY 202 (may be taken concurrently) with a minimum grade of D.

Concurrent PR: (MTH 229 or MTH 229H) and PHY 202

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 213 **University Physics II** **4 Credit hours**

Second half of an introduction to physics for physical science or engineering students, using calculus, including electric and magnetic fields, circuits, geometrical and physical optics, atomic and nuclear physics.

Pre-req: MTH 230 (may be taken concurrently) and PHY 204 (may be taken concurrently) and (PHY 201 with a minimum grade of C or PHY 211 with a minimum grade of C) and PHY 202.

Concurrent PR: MTH 230 and PHY 204

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 214 **Lab Methods in Physics** **1 Credit hour**

A laboratory course to accompany Physics 211-213. 3 lab.

Pre-req: PHY 213 (may be taken concurrently).

Concurrent PR: PHY 213

Attributes: Natural Sciences, Core II Natural Sciences

Grade Mode: Normal Grading Mode

PHY 222 **Investigate the Universe** **2 Credit hours**

A creative laboratory course designed to give students an opportunity to work with modern research equipment, with ample time to conduct experiments and/or investigate phenomenae of their choosing.

Pre-req: (MTH 122 and MTH 127) or (MTH 122 and MTH 130) or MTH 132.

Grade Mode: Normal Grading Mode

<p>PHY 261 Enhancement for Physics I 1 Credit hour Additional aspects in mechanics (calculus, array vectors and matrices, distributions), to make College Physics 1 equivalent to University Physics 1. Pre-req: PHY 201 with a minimum grade of C or MTH 229 with a minimum grade of C. Grade Mode: Normal Grading Mode</p>	<p>PHY 320 Intro Modern Physics 3 Credit hours An introductory study of atomic and molecular theories, relativity, quantum theory, and nuclear physics. 3 lec. Pre-req: MTH 230 and (PHY 203 or PHY 213). Co-req: PHY 421 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 263 Enhancement for Physics II 1 Credit hour Additional aspects in E&M and Optics, Modern Physics, (calculus and multipole functions) to make College Physics 2 equivalent to University Physics 2. Grade Mode: Normal Grading Mode</p>	<p>PHY 330 Mechanics 3 Credit hours An intermediate study of the fundamental principles of statics of particles and rigid bodies, momentum and energy, dynamics of particles, harmonic oscillations, and wave motion. 3 lec. Pre-req: MTH 231 and (PHY 203 or PHY 213). Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 280 Special Topics 1-4 Credit hours Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 340 Scientific Computing 3 Credit hours Introduction to some of the most important tools and techniques in scientific computing, including object-oriented design, version control, and MPI for high-performance computing. Pre-req: MTH 229 with a minimum grade of D or MTH 229H with a minimum grade of D or IST 163 with a minimum grade of D. Grade Mode: Normal Grading Mode</p>
<p>PHY 281 Special Topics 1-4 Credit hours Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 350 Biological Physics 3 Credit hours Physical principles underlying the mechanisms by which living organisms survive, adapt, grow. Will enhance writing skills and strategies. 2 lec - 2 lab. (PR: PHY 203 or 213, and PHY 204) Pre-req: PHY 203 (may be taken concurrently) or PHY 213 (may be taken concurrently) and PHY 204. Concurrent PR: PHY 203 or PHY 213 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 300 Electricity & Magnetism 3 Credit hours A course including the study of electrostatics, magnetostatics, electromagnetic induction, introduction to Maxwell's equations and electromagnetic waves. 3 lec. Pre-req: (PHY 203 or PHY 213) and MTH 231. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 360 Medical Physics 3 Credit hours Physical principles applied to devise methods for diagnostic and treatment of the human body. Will enhance writing skills and strategies. Pre-req: (PHY 203 with a minimum grade of D or PHY 213 with a minimum grade of D) and PHY 204 with a minimum grade of D. Grade Mode: Normal Grading Mode</p>
<p>PHY 302 Electricity & Magnetism II 3 Credit hours A study of Maxwell's equations and electromagnetic waves, radiation theory, optical phenomena, and electrodynamics. 3 lec. Pre-req: PHY 300. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 405 Optics Lab 2 Credit hours A course in optical experiments encompassing geometrical and physical optics. This course is to be taken with Physics 304. Pre-req: PHY 304 (may be taken concurrently). Concurrent PR: PHY 304 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 304 Optics 3 Credit hours An intermediate course in geometrical and physical optics. 3 lec. Pre-req: (PHY 203 or PHY 213) and (PHY 405 (may be taken concurrently) or PHY 505 (may be taken concurrently)). Concurrent PR: PHY 405 or PHY 505 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 408 Thermal Stat Physics 3 Credit hours Introduction to Thermodynamics, kinetic theory of gases, classical and quantum statistical mechanics, Bose-Einstein and Fermi-Dirac statistics, and application. 3 lec. Pre-req: MTH 231 with a minimum grade of D and (PHY 203 with a minimum grade of D and PHY 213 with a minimum grade of D). Grade Mode: Normal Grading Mode</p>
<p>PHY 308 Thermal Physics 3 Credit hours A study of thermodynamics, kinetic theory of gases, and an introduction to statistical mechanics 3 lec. Pre-req: (PHY 203 or PHY 213) and MTH 231. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	
<p>PHY 314 Electronic Physics 3 Credit hours A study of transistors, integrated circuits and their associated circuits. 3 lec. Pre-req: PHY 203 with a minimum grade of D or PHY 213 with a minimum grade of D and PHY 415 (may be taken concurrently) with a minimum grade of D. Concurrent PR: PHY 415 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	

<p>PHY 415 Electronics Lab 2 Credit hours A course in laboratory measurements encompassing transistors, integrated circuits, and their associated circuits. This course is to be taken with Physics 314. Pre-req: PHY 314 (may be taken concurrently) with a minimum grade of D. Concurrent PR: PHY 314 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 444 Advanced Laboratory 2 Credit hours Developments in producing and detecting correlated photon pairs has enabled implementation of undergraduate laboratories demonstrating fundamental quantum mechanical principles. This laboratory also incorporates fundamental solid state and materials science experiments. Pre-req: PHY 425 (may be taken concurrently) and PHY 442 (may be taken concurrently). Concurrent PR: PHY 425 and PHY 442 Co-req: PHY 425, PHY 442 Grade Mode: Normal Grading Mode</p>
<p>PHY 420 Astrophysics 3 Credit hours A detailed study of core problems in Astrophysics such as orbital dynamics, radiation processes, stellar structure and evolution, galactic dynamics, and cosmology. Pre-req: PHY 213 with a minimum grade of D and MTH 231 with a minimum grade of D. Grade Mode: Normal Grading Mode</p>	<p>PHY 445 Math Methods of Physics 3 Credit hours An introduction to theory of orthogonal functions, curvilinear coordinate systems, vector and tensor fields, and their applications in physics. Problems are drawn from different areas of physics. 3 lec. Pre-req: PHY 203 or PHY 213 and MTH 231. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 421 Modern Physics Lab 2 Credit hours Laboratory exercises on modern physics topics encompassing both experiments of historic significance and current applications. To be taken with Physics 320, or equivalent. Co-req: PHY 320 Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 446 Math Methods of Physics II 3 Credit hours A second semester of a full year course on methods of solving problems in physics: calculus of variations, ordinary and partial differential equations, and special functions with real physics problems. Pre-req: PHY 445. Grade Mode: Normal Grading Mode</p>
<p>PHY 425 Solid State Physics 3 Credit hours The course provides a broad introduction to the structure and physical properties of solids. It also serves as a basis for advanced courses in solid state and condensed matter physics. Pre-req: PHY 320 or PHY 442 or CHM 442. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 447 Mechanics for Teachers 4 Credit hours An indepth study of mechanics for education majors specializing in Physics with emphasis on problem solving techniques, demonstrations, experiments and computer applications. (PR: PHY 203, MTH 122 and MTH 140) Pre-req: PHY 203 or PHY 213. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 435 Computational Physics 3 Credit hours A course on using numerical methods and computer programming languages for solving complex physics problems and for the simulation of various physical processes. 2 lec-2 lab. Pre-req: PHY 213 with a minimum grade of D and PHY 330 with a minimum grade of D and (PHY 445 with a minimum grade of D or PHY 446 with a minimum grade of D) and MTH 231 with a minimum grade of D. Grade Mode: Normal Grading Mode</p>	<p>PHY 480 Special Topics 2-4 Credit hours By permission of department chairman. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 442 Quantum Mechanics 3 Credit hours A study of waves and particles, the Schroedinger and Heisenberg formulations, particles in potential fields, scattering and perturbation theories, and application to atomic and nuclear structure. 3 lec. Pre-req: MTH 335 and PHY 330. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 481 Special Topics 1-4 Credit hours By permission of department chairman. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 443 Quantum Mechanics II 3 Credit hours This is the second part of a two-semester introduction to quantum mechanics. Emphasis is on applications of quantum theory including approximation techniques and the study of more realistic quantum systems. Pre-req: PHY 442 with a minimum grade of D or CHM 442 with a minimum grade of D. Grade Mode: Normal Grading Mode</p>	<p>PHY 482 Special Topics 1-4 Credit hours By permission of department chairman. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 444 Advanced Laboratory 2 Credit hours Developments in producing and detecting correlated photon pairs has enabled implementation of undergraduate laboratories demonstrating fundamental quantum mechanical principles. This laboratory also incorporates fundamental solid state and materials science experiments. Pre-req: PHY 425 (may be taken concurrently) and PHY 442 (may be taken concurrently). Concurrent PR: PHY 425 and PHY 442 Co-req: PHY 425, PHY 442 Grade Mode: Normal Grading Mode</p>	<p>PHY 483 Special Topics 1-4 Credit hours By permission of department chairman. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 445 Math Methods of Physics 3 Credit hours An introduction to theory of orthogonal functions, curvilinear coordinate systems, vector and tensor fields, and their applications in physics. Problems are drawn from different areas of physics. 3 lec. Pre-req: PHY 203 or PHY 213 and MTH 231. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 485 Independent Study 1-4 Credit hours Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 446 Math Methods of Physics II 3 Credit hours A second semester of a full year course on methods of solving problems in physics: calculus of variations, ordinary and partial differential equations, and special functions with real physics problems. Pre-req: PHY 445. Grade Mode: Normal Grading Mode</p>	<p>PHY 486 Independent Study 1-4 Credit hours Attributes: No Textbook Required, Natural Sciences Grade Mode: Normal Grading Mode</p>
<p>PHY 447 Mechanics for Teachers 4 Credit hours An indepth study of mechanics for education majors specializing in Physics with emphasis on problem solving techniques, demonstrations, experiments and computer applications. (PR: PHY 203, MTH 122 and MTH 140) Pre-req: PHY 203 or PHY 213. Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>	<p>PHY 487 Independent Study 1-4 Credit hours Attributes: Natural Sciences Grade Mode: Normal Grading Mode</p>

PHY 488 Independent Study **1-4 Credit hours**

Attributes: Natural Sciences

Grade Mode: Normal Grading Mode

PHY 491  Capstone **1-2 Credit hours**

To give a capstone experience to physics majors in their junior or senior years by applying the principles of physics to the solution of real life problems. (PR: CSD 203, or 218 and lab).

Attributes: Capstone Course, Natural Sciences

Grade Mode: Normal Grading Mode

PHY 492  Capstone **1-2 Credit hours**

To give a capstone experience to physics majors in their junior or senior years by applying the principles of physics to the solution of real life problems. (PR: PHY 491)

Pre-req: PHY 491 with a minimum grade of D.

Attributes: Capstone Course, No Textbook Required, Natural Sciences

Grade Mode: Normal Grading Mode