# PHYSICS (PHYS)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>PHYS 1010</td>
<td>Conceptual Physics</td>
<td>3</td>
<td>Basic concepts of physics emphasizing the meaning of modern developments of the science. High school mathematics required. Fulfills three credit hours of the general science requirement. For non-science majors; does not apply toward the area of concentration with a major in physics.</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1015</td>
<td>Conceptual Physics</td>
<td>3</td>
<td>Basic concepts of physics emphasizing the meaning of modern developments of the science. High school mathematics required. Fulfills three credit hours of the general science requirement. For non-science majors; does not apply toward the area of concentration with a major in physics.</td>
<td>Attributes: Prof. Studies Students Only</td>
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<tr>
<td>PHYS 1050</td>
<td>Intro to Physics of Human Body</td>
<td>3</td>
<td>Discusses the physics of certain aspects of the working of the human body. Fulfills three credit hours of the general science requirement. Primarily for Occupational Therapy majors and, if there is room, for any other student to satisfy the science requirement.</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1110</td>
<td>Introduction to Physics</td>
<td>1</td>
<td>Broad survey of physics. Introduction to computational and laboratory methods. Enrollment limited to students majoring in physics.</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
</tr>
<tr>
<td>PHYS 1130</td>
<td>Introduction to Astronomy</td>
<td>1 or 3</td>
<td>Modern concepts of the physical nature of the astronomical universe. Fulfills three credit hours of the general science requirement. For non-science majors; does not apply toward the area of concentration with a major in physics.</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1220</td>
<td>General Physics I</td>
<td>3</td>
<td>Lectures, demonstrations, and laboratory in mechanics and heat. (Offered every Fall)</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
</tr>
<tr>
<td>PHYS 1235</td>
<td>General Physics I Lab</td>
<td>1</td>
<td>Should be taken concurrently with PHYS 1220. Laboratory topics on mechanics principles of motion, force, energy and waves.</td>
<td>Attributes: Natural Science Req (A&amp;S)</td>
</tr>
<tr>
<td>PHYS 1240</td>
<td>General Physics II</td>
<td>3</td>
<td>Lectures, demonstrations and laboratory in electricity, magnetism, wave motion, sound, optics and modern physics. (Offered every Spring)</td>
<td>Prerequisite(s): PHYS 1220, Corequisite(s): PHYS 1255, Restrictions: Enrollment limited to students in the Doisy College Health Sciences college. Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1255</td>
<td>General Physics II Lab</td>
<td>1</td>
<td>Should be taken concurrently with PHYS 1240. Laboratory on electricity and magnetism principles of fields, circuits and light.</td>
<td>Corequisite(s): PHYS 1240</td>
</tr>
<tr>
<td>PHYS 1310</td>
<td>College Physics I</td>
<td>3</td>
<td>Lectures and demonstrations in mechanics and heat. PHYS 1320 should be taken concurrently with PHYS 1310. (Offered every Fall)</td>
<td>Prerequisite(s): (MATH 1200, 1 Course from MATH 1410-4999, MATH 1400, or SLUMP with a minimum score of 1400), Corequisite(s): PHYS 1320, Restrictions: Students cannot enroll who have a major in Exercise Science. Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1320</td>
<td>College Physics I Laboratory</td>
<td>1</td>
<td>Should be taken concurrently with PHYS 1310. Laboratory in mechanics and heat. (Offered every Fall)</td>
<td>Corequisite(s): PHYS 1310, Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1330</td>
<td>College Physics II</td>
<td>3</td>
<td>Lectures and demonstrations in electricity, magnetism, wave motion, sound, optics and modern physics. (Offered every Spring)</td>
<td>Prerequisite(s): PHYS 1310, Corequisite(s): PHYS 1340, Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1340</td>
<td>College Physics II Laboratory</td>
<td>1</td>
<td>Laboratory in electricity, magnetism, wave motion, sound, optics and modern physics. (Offered every Spring)</td>
<td>Corequisite(s): PHYS 1330, Attributes: Natural Science Req (A&amp;S)</td>
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<tr>
<td>PHYS 1350</td>
<td>Aviation Physics</td>
<td>3</td>
<td>Units and measurement; vectors; force and motion; energy; momentum; gravitation; forces of drag and lift; rotational motion; equilibrium of forces during flight; harmonic motion; selected topics in fluid mechanics and thermodynamics; electricity; electrical energy; magnetism; electromagnetic induction; linear and wave optics; atmospheric optics; laboratory experiments relating to the topics above. Fall and Spring semesters. Prerequisite: Knowledge of high school algebra and trigonometry.</td>
<td>Corequisite(s): PHYS 1365, Attributes: Natural Science Req (A&amp;S)</td>
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PHYS 1365 - Aviation Physics Lab
Credit(s): 1 Credit
Should be taken concurrently with PHYS 1350. Laboratory topics on mechanics principles of motion, force, energy and waves.
Corequisite(s): PHYS 1350

PHYS 1610 - University Physics I
Credit(s): 3 Credits
Calculus and vector approaches to study of kinematics, statics and dynamics; work and energy; impulse and momentum; circular motion and gravity; rotational motion and equilibrium; vibrations, waves and sound; heat; fluid mechanics; elasticity.
Prerequisite(s): ((MATH 1510* with a grade of C- or higher or MATH 1400 with a grade of B or higher))
* Concurrent enrollment allowed.

Corequisite(s): PHYS 1365

PHYS 2620 - Modern Physics Lab
Credit(s): 1 Credit
(Offered every Fall)
Prerequisite(s): PHYS 2610 (Math Waiver per Advisor with a minimum score of 1520 or 1 Course from MATH 1520-4999)

* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

PHYS 2910 - Co-Op with Industry
Credit(s): 1-6 Credits (Repeatable for credit)
A full-time supervised work experience with an agency, firm or organization that employs persons in this degree field. This course is used for the first experiential learning session. Grading system is determined by department offering course. Offered every semester.
Attributes: Natural Science Req (A&S)

PHYS 2930 - Special Topics
Credit(s): 1-3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

PHYS 2980 - Independent Study
Credit(s): 1-3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

PHYS 3110 - Classical Mechanics
Credit(s): 3 Credits
The elementary theory of the statics, kinematics and dynamics of particles and rigid bodies. At the level of Symon's Mechanics.
Prerequisite(s): PHYS 1630
Attributes: Natural Science Req (A&S)

PHYS 3310 - Optics
Credit(s): 3 Credits
Lectures and demonstrations three hours per week. Physical and geometrical optics.
Attributes: Natural Science Req (A&S)

PHYS 3320 - Optics Laboratory
Credit(s): 1 Credit
The fundamental experiments of modern optics are repeated in this course. Three hours per week.
Corequisite(s): PHYS 3310
Attributes: Natural Science Req (A&S)

PHYS 3410 - Thermodynamics and Statistical Mechanics
Credit(s): 3 Credits
At the level of Schroeder's Thermal Physics.
Prerequisite(s): MATH 3550* and PHYS 1630

* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

PHYS 3510 - Analog & Digital Electronics
Credit(s): 0 or 3 Credits
Lecture-laboratory six hours per week. Fundamentals of digital circuits with applications to computers. Operational amplifiers. Interfacing of computers with experimental equipment for data collection and control.
Prerequisite(s): PHYS 3511*

* Concurrent enrollment allowed.
Corequisite(s): PHYS 3510
Attributes: Natural Science Req (A&S)
PHYS 3511 - Analog & Digital Electronics Lab
Credit(s): 1 Credit
This is laboratory component of the Analog & Digital Electronics course.
It is designed to give practical experience with building, debugging, and
testing analog and digital circuits, including micro-controller-operated
circuits, power regulation, operational amplifiers, etc.
Prerequisite(s): PHYS 3510

* Concurrent enrollment allowed.
Attributes: Natural Science Req (A&S)

PHYS 3610 - Atomic, Molecular and Solid-State Physics
Credit(s): 3 Credits
This course will provide an upper level introduction to topics in Modern
Physics including Atomic Physics, Statistical Physics, Molecular Physics,
Solid State Physics, Nuclear Physics, Elementary particle Physics,
Astrophysics, and Cosmology.
Attributes: Natural Science Req (A&S)

PHYS 3860 - Physics Research I
Credit(s): 0 Credits (Repeatable for credit)
First of three course sequence required for B.S. degree in Physics.
Attributes: Natural Science Req (A&S)

PHYS 3910 - Co-Op with Industry
Credit(s): 1-6 Credits (Repeatable for credit)
A full-time supervised work experience with an agency, firm or
organization that employs persons in this degree field. This course is
used for the second experiential learning session. (Offered every Fall,
Spring and Summer)
Prerequisite(s): PHYS 2910
Attributes: Natural Science Req (A&S)

PHYS 3915 - Internship with Industry
Credit(s): 1-6 Credits (Repeatable for credit)
A work experience with an agency, firm or organization that employs
persons in this degree field. This experience may be full time or part-
time as required by the industry sponsor. This course is used for the first
experiential learning session. (Offered every semester)
Restrictions:
Enrollment limited to students with a classification of Junior or Senior.
Attributes: Natural Science Req (A&S)

PHYS 3930 - Special Topics
Credit(s): 3 Credits (Repeatable for credit)

PHYS 3980 - Independent Study
Credit(s): 1-3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

PHYS 4010 - Nanoscience Frontiers
Credit(s): 0 or 3 Credits
The Nanoscale Science and Nanotechnology applications have
become increasingly important for industry and manufacturing. This
interdisciplinary physics course is designed to introduce concepts and
take a detailed look at how to study, understand and present
interdisciplinary science that has significant experimental design
components. This course will be devoted to several topics such as
Nanoscale Physics, Nanomaterials Engineering, Nanofabrication and
Nanolithography.
Prerequisite(s): CHEM 1110 with a grade of C or higher; MATH 2530 with
a grade of C or higher; PHYS 1630 with a grade of C or higher
Attributes: Natural Science Req (A&S)

PHYS 4020 - Experimental Physics
Credit(s): 3 Credits
Experimental Physics teaches students basic techniques such as
principles of ultra high vacuum, IV curve and resistance measurements,
computer automation, microwave circuit design and measurements. We
will also measure microwave resonators and quantum bits at 50 mK. All
class work will consist of lab work in a studio classroom.
Attributes: Natural Science Req (A&S)

PHYS 4110 - Intro to Biophysics
Credit(s): 3 Credits
This course covers the basic concepts in biophysics at the fluid, cellular,
macromolecular, and molecular levels, including diffusion processes, self-
assembly, cooperative transitions, ion pumping, basic ideas of molecular
machines, and passage of action potentials in neurons.
Prerequisite(s): PHYS 3410
Attributes: Natural Science Req (A&S)

PHYS 4210 - Electricity & Magnetism I
Credit(s): 3 Credits
Lecture three hours per week. At the level of Griffiths, Introduction to
Electrodynamics. (Offered every Spring)
Prerequisite(s): MATH 3550
Attributes: Natural Science Req (A&S)

PHYS 4220 - Electricity & Magnetism II
Credit(s): 3 Credits
Lecture three hours per week. Electromagnetic Fields at an advanced
level, a continuation of PHYS 4210. (Offered every Fall)
Attributes: Natural Science Req (A&S)

PHYS 4410 - General Relativity
Credit(s): 3 Credits
This course is an introduction to Einstein's Theory of General Relativity.
The special theory of relativity is reviewed, tensor analysis is introduced,
and the general theory is approached through an examination of curved
space-time and geodesic trajectories. Applications including black holes
and cosmology are explored.
Prerequisite(s): MATH 3550; PHYS 2610
Attributes: Natural Science Req (A&S)

PHYS 4610 - Quantum Mechanics
Credit(s): 3 Credits
At the level of Griffiths, Introduction to the Quantum Mechanics.
Prerequisite(s): PHYS 2610; PHYS 3110
Attributes: Natural Science Req (A&S)

PHYS 4620 - Application of Quantum Mechanics
Credit(s): 3 Credits
Further development of Quantum Mechanics with applications to
statistical mechanics, quantum optics, atomic, nuclear, particle and solid
state physics. (Offered every Spring)
Prerequisite(s): PHYS 4610
Attributes: Natural Science Req (A&S)

PHYS 4840 - Senior Inquiry: Thesis
Credit(s): 0 Credits
Attributes: Natural Science Req (A&S)

PHYS 4870 - Physics Research II
Credit(s): 0 Credits (Repeatable for credit)
Second of three course sequence required for B.S. degree in Physics.
Attributes: Natural Science Req (A&S)
PHYS 4880 - Senior Inquiry: Research Project  
Credit(s): 3 Credits (Repeatable for credit)
Third of three course sequence required for B.S. degree in Physics (3 Cr), or satisfies senior inquiry requirement for B.A. degree in Physics (0-3 Cr).  
Attributes: Natural Science Req (A&S)

PHYS 4890 - Senior Inquiry: Comprehensive Examination  
Credit(s): 0 Credits  
Attributes: Natural Science Req (A&S)

PHYS 4910 - Co-Op with Industry  
Credit(s): 1-6 Credits (Repeatable for credit)
A full-time supervised work experience with an agency, firm or organization that employs persons in this degree field. This course is used for the third experiential learning session. (Offered every Fall, Spring and Summer)
Prerequisite(s): PHYS 3910  
Attributes: Natural Science Req (A&S)

PHYS 4915 - Internship with Industry  
Credit(s): 1-6 Credits (Repeatable for credit)
A work experience with an agency, firm or organization that employs persons in this degree field. This experience may be full time or part-time as required by the industry sponsor. (Offered every Fall, Spring and Summer)
Prerequisite(s): PHYS 3915  
Attributes: Natural Science Req (A&S)

PHYS 4930 - Special Topics  
Credit(s): 3 Credits (Repeatable for credit)
Attributes: Natural Science Req (A&S)

PHYS 4955 - Capstone Project 1  
Credit(s): 3 Credits  
A capstone project for the BS degree combined with the beginning of research toward the MS degree; process of design; proposal development; project planning and scheduling; prototyping; quality; testing; research ethics; design review; teamwork; oral and written reports. Restricted to students in the Accelerated BS-MS Program in Engineering/Engineering Physics.

PHYS 4960 - Masters Project  
Credit(s): 1-3 Credits (Repeatable for credit)
Masters Project is for students in the MS Non-Thesis degree program who will conduct a small project under the supervision of their Faculty Advisor. No more than 3 hours will be devoted to the Project.

PHYS 4980 - Independent Study  
Credit(s): 1 or 3 Credits (Repeatable for credit)

PHYS 4990 - Thesis Research  
Credit(s): 0-6 Credits (Repeatable for credit)

PHYS 5010 - Nanoscience and Nanofabrication Frontiers  
Credit(s): 0 or 3 Credits  
Nanoscale Science and Nanotechnology applications have become increasingly important for industry and manufacturing. This course is designed to introduce concepts and take a detailed look at how to study, understand and present interdisciplinary science. The course will be devoted to several topics in Nanoscale physics, Nanochemistry, Nanomaterials, Nanofabrication and Nanolithography.

PHYS 5020 - Experimental Physics  
Credit(s): 3 Credits  
Experimental Physics teaches students basic techniques such as principles of ultra high vacuum, IV curve and resistance measurements, computer automation using LabVIEW, computer drafting of micro scale circuitry using L-Edit, and microwave simulations using Sonnet. All class work will consist of lab work in a studio classroom. Offered periodically in even years.

PHYS 5030 - Mathematical Methods in Physics  
Credit(s): 3 Credits  
This course introduces a variety of powerful mathematical techniques of great utility to physics. Topics covered include differential and integral equations, complex analysis, Green’s functions, and variational methods, including Lagrangian and Hamiltonian formalism of classical mechanics. Mathematical methods are illustrated with examples from electrodynamics, statistical, quantum, and classical mechanics.

PHYS 5310 - Optics for Educators  
Credit(s): 3 Credits  
This course will provide an upper level introduction to the concepts and techniques of modern optics, including: Review of ray optics and optical properties of lenses; Wave properties of light; Wave interference (including beats); Interference from two discrete sources of light; Interference from N discrete sources of light; Diffraction of light passing through apertures and past obstacles (plugs); Quantum nature of light (including photon counting); Laser physics. (Offered every Spring)

PHYS 5610 - Modern Physics for Educators  
Credit(s): 3 Credits  
This course will provide an upper level introduction to topics in Modern Physics including Atomic Physics, Statistical Physics, Molecular Physics, Solid State Physics, Nuclear Physics, Elementary particle Physics, Astrophysics, and Cosmology.

PHYS 5930 - Special Topics  
Credit(s): 3 Credits (Repeatable for credit)

PHYS 5955 - Capstone Project 1  
Credit(s): 3 Credits  
A capstone project for the BS degree combined with the beginning of research toward the MS degree; process of design; proposal development; project planning and scheduling; prototyping; quality; testing; research ethics; design review; teamwork; oral and written reports. Restricted to students in the Accelerated BS-MS Program in Engineering/Engineering Physics.