

PHYSICS (PHYS)

PHYS 10100 Introduction to Physics I (LA)

Principles and concepts of classical physics (algebra-based). Mechanics, including rotational motion and energy and momentum conservation, properties of matter. Three lectures and one recitation/laboratory per week or three two-hour lecture/recitation/laboratory sessions per week. Prerequisites: Math placement score 2 or higher, math placement assessment score of 54 or greater, or completion of MATH 10400, MATH 10800, or MATH 11000 (with a C- or better). (F,Y)
Attributes: 2A, ENRE, NS
4 Credits

PHYS 10200 Introduction to Physics II (LA)

A continuation from PHYS 10100 of the principles and concepts of classical physics (algebra-based). Standing waves and sound, physical and geometrical optics, electrostatics, magnetism, DC circuits, fluids, heat, and thermodynamics. Three lectures and one recitation/laboratory per week or three two-hour lecture/recitation/laboratory sessions per week. Prerequisite: PHYS 10100. (S,Y)
Attributes: ABSS
4 Credits

PHYS 11000 Introductory Mathematical and Computational Methods for Physics (LA)

Bridges mathematics and computational skills to physical applications and prepares students for future study in Physics and Astronomy. The aim of this course is to develop tools for quantitatively analyzing problems common to courses in the Physics and Astronomy majors; topics will include applying algebraic tools, concepts from trigonometry, and use of spreadsheets to collect and analyze data in the Physics context. Prerequisites: Math placement in group 1 or higher, math placement assessment score of 76 or greater, MATH 10800 (may be taken concurrently) OR MATH 11100 (may be taken concurrently). (F,Y)
2 Credits

PHYS 12100 Light and Special Relativity (LA)

Intended as an introductory course for physics majors and science enthusiasts. Covers algebra-based topics in the physics core curriculum: light waves, optics, quantum properties of light, and special relativity. Emphasis is placed on the mathematical analysis of concepts as well as on developing conceptual understanding through active learning. Three two-hour lecture/recitation/laboratory sessions per week. Prerequisites: Math group 2 or higher, OR PHYS 11000 (may be taken concurrently). (F,Y)
4 Credits

PHYS 12200 Momentum, Energy, and Heat (LA)

Introductory calculus-based physics for students majoring in STEM fields. Topics include vectors, kinematics in one and two dimensions, dynamics, work, energy, momentum, heat, the first and second laws of thermodynamics, and entropy. Emphasis is placed on the mathematical analysis of concepts as well as developing conceptual understanding through active learning. Three two-hour lecture/recitation/laboratory sessions per week. Prerequisites: MATH 10800 or MATH 11100. (S,Y)
4 Credits

PHYS 12300 Classical Fields: Gravity, Electricity, & Magnetism (LA)

Introductory calculus-based physics for students majoring in STEM fields. Topics include gravity and the gravitational field, static electric fields and Coulomb's law, electric potential, capacitors, Ohm's law, the magnetic field and Ampere's law, induction and Faraday's law, and an introduction to fluids. Emphasis is placed on mathematical analysis as well as developing conceptual understanding through active learning. Three two-hour lecture/recitation/laboratory sessions per week. Prerequisites: PHYS 10100 OR PHYS 12200; MATH 11200. (F,Y)
4 Credits

PHYS 14200 Physics of Music (LA)

Survey of the physical production of music, sound wave behavior, the perception of music by the human ear and brain, the production of musical sound by the voice and instruments (including electronic synthesis), and an analysis of how music propagates in different physical spaces. No previous knowledge of physics or music is assumed. Prerequisites: Math placement score 3 or higher, math placement assessment score of 46 or greater, or completion of MATH 10000 (with a C- or better). (Y)
Attributes: SC, TIII
3 Credits

PHYS 14300 Power: Energy Options for a Global Society (LA)

Survey of energy. Topics include energy technologies and energy resources (fossil fuels, nuclear, solar, wind, geothermal, biomass). Students are introduced to electricity, heat production and transfer, heat engines, energy efficiency, and sustainable energy systems. Energy use sectors such as residential, commercial, and transportation are examined. The course begins with a look at energy use in the home and gradually expands to complex subjects such as the electrical grid, national energy policy, deregulation, and international fusion research. The emphasis is on energy literacy and the goal is to provide students with the basic technical principles necessary to design energy projects of their own and to evaluate their costs and benefits. 3 credits. (S,E)
Attributes: 2A, HSIS, NS
3 Credits

PHYS 14700 Time to Act: The Science and Politics of Global Climate Change (LA)

Blends science with the social, economic, and political aspects of climate change to highlight the importance of rapid action to ensure a sustainable future. Course topics include an overview of climate science and its use in the detection, attribution, and prediction of climate and societal impacts, energy systems and their role in warming our planet, climate skepticism, existing and proposed mitigation and adaptation strategies. PHYS 14700 and ENVS 14700 are crosslisted; students cannot earn credit for both. (E)
Attributes: HSIS, SC, TIII, TPJ, TQSF, TWOS
3 Credits

PHYS 16000 Physics of Sound (LA)

Physical basis of sound, with an emphasis placed on musical instruments, the human voice, and sound recording and reproduction. Physics concepts are introduced and developed as needed to understand these areas. Open to all students. Prerequisites: Math placement score 2 or higher, math placement assessment score of 54 or greater, or completion of MATH 10400, MATH 10800, or MATH 11000 (with a C- or better). (Y)
Attributes: 2A, NS
3 Credits

PHYS 17100 Earth: Evolution of a Habitable World (LA)

Formation and evolution of planet Earth from the astronomer's perspective: creation of elements, the first rocks, development of oceans, the first atmosphere, formation of the moon, records of climate history, and how life on Earth fits into the context of life in the universe. Examination of Venus and Mars as possible analogs for Earth's evolution (past and future). Other topics include the influence of the sun on Earth's climate, the greenhouse effect, the geologic record of the development of continents, and the asteroid and comet impact hazard. Emphasis is placed on our sources of knowledge, the errors of our measurements, and the attendant model uncertainties in predicting Earth's future. Students may not receive credit for both PHYS 17100 and PHYS 17200. Prerequisites: Math placement score 3 or higher, math placement assessment score of 46 or greater, or completion of MATH 10000 (with a C- or better). (S,Y)

Attributes: 2A, HSIS, NS

3 Credits

PHYS 17200 Earth: Evolution of a Habitable World with Lab (LA)

Formation and evolution of planet Earth from the astronomer's perspective: creation of elements, the first rocks, development of oceans, the first atmosphere, formation of the moon, records of climate history, and how life on Earth fits into the context of life in the universe. Examination of Venus and Mars as possible analogs for Earth's evolution (past and future). Other topics include the influence of the sun on Earth's climate, the greenhouse effect, the geologic record of the development of continents, and the asteroid and comet impact hazard. Emphasis is placed on our sources of knowledge, the errors of our measurements, and the attendant model uncertainties in predicting Earth's future. Students enrolled in this course attend the lecture of PHYS 17100, but also meet for an additional weekly lab. Students may not receive credit for both PHYS 17100 and PHYS 17200. Prerequisites: Math placement in group 3 or higher, math placement assessment score of 46 or greater, or completion of MATH 10000 (with a C- or better). (S,Y)

Attributes: 2A, NS

4 Credits

PHYS 17801 Professional Physics and Astronomy Seminar I (NLA)

Introduction to the physics program for all beginning physics majors or those considering the major. Discussions about career opportunities, the various physics degree paths, and strategies for being a successful and engaged physics major. Participation in the physics department seminar required. (F,Y)

1 Credit

PHYS 21000 Intermediate Mathematical and Computational Methods for Physics (LA)

Applies quantitative and analytical techniques to physical applications and supports students in their intermediate course study of Physics and Astronomy. Topics include practice applying mathematical and computational tools such as single variable integration, series, the complex plane, ordinary differential equations and computer programming to physical situations. Prerequisites: PHYS 11000; MATH 11200. (F,Y)

2 Credits

PHYS 22400 Classical and Quantum Waves (LA)

Completes a comprehensive introduction to the principles of physics necessary for advanced coursework in the field. Topics include: mechanical oscillations of one and several particles, the classical wave equation and the behavior of its solutions, one-dimensional quantum mechanics, classical angular momentum, and an introduction to quantum mechanics in three dimensions. Emphasizes analytical techniques common across both classical and quantum domains. Prerequisites: PHYS 12100; PHYS 12300; PHYS 21000; MATH 21100. (S,Y)

4 Credits

PHYS 23900 Introductory Independent Study: Physics (LA)

One-semester course in which a student may pursue a topic of interest in physics. Offered on demand only. May be repeated up to a total of six credits. Permission of instructor required. (IRR)

0.5-3 Credits

PHYS 24300 Sustainable Energy: Powering the World (LA)

Survey of energy. Topics include solar, wind, geothermal, electricity, fossil fuels, heat transfer, and the economic and environmental opportunities created by energy efficiency and sustainable energy systems. The course culminates with a final Energy Design Project. PHYS 24300 and ENVS 24300 are cross-listed. Students may not earn credit for both ENVS 24300 and PHYS 24300. Prerequisite: Math placement score 2 or higher, math placement assessment score of 54 or greater, or completion of MATH 10400, MATH 10800, or MATH 11000 (with a C- or better). (S,Y)

Attributes: HSIS, NS, QL, SC, TQSF

4 Credits

PHYS 25000 Intermediate Applied Physics Design Laboratory (LA)

Intermediate design laboratory course in which students conduct investigations in various areas of applied physics. Emphasis is placed on the development of good laboratory techniques, simple circuit building, computer interfacing to equipment for data-taking, data analysis, data presentation (using computer graphical interface), and formal report writing. Prerequisites: PHYS 12100; PHYS 12300; PHYS 21000 (maybe taken concurrently) or COMP 17100 (may be taken concurrently). (S,Y)

2 Credits

PHYS 26000 Intermediate Physics Laboratory (LA)

Intermediate laboratory course in which students conduct three investigations in various areas of physics. Emphasis is placed on the development of good laboratory techniques, data-taking procedures, data analysis, data presentation (using computer graphical interface), and formal report writing. Prerequisite: PHYS 12100; PHYS 12300; PHYS 21000 or COMP 17100 (may be taken concurrently). (S,Y)

2 Credits

PHYS 27800 Professional Physics and Astronomy Seminar II (NLA)

Continuation of professional preparation for careers in physics and astronomy. Covers introduction to effective communication skills, effective teamwork strategies, and includes tutorials in software commonly used in physics careers. Students will also engage in a series of discussions about undergraduate research, summer opportunities for research and internships, and careers in physics, and will draft resumes and cover letters. (F,Y)

1 Credit

PHYS 28000 Learning Assistant Practicum in Physics (NLA)

This course prepares our undergraduate Learning Assistants with the foundations of pedagogy necessary to assist our introductory physics students with their coursework. Additionally, this course provides procedural support for the Learning Assistants by strengthening students' pedagogical content knowledge. Prerequisites: B or higher in PHYS 10100, PHYS 10200, PHYS 10400, PHYS 11700, PHYS 11800, PHYS 16000, ASTR 17400, or ASTR 17500. (F,S)

1 Credit

PHYS 29900-29910 Introductory Physics Research (LA)

Original research participation with a faculty member in a specialized field. Prerequisites: Sophomore standing or above; permission of instructor. Six credit limit. (F-S,Y)

0.5-3 Credits

PHYS 31000 Advanced Mathematical and Computational Methods for Physics (LA)

Applies analytical and computational techniques to physical applications, and supports students in their advanced course study of Physics and Astronomy. Topics include practice applying mathematical tools such as multivariate calculus, fields, linear algebra, and advanced differential equations to physical situations. Applications include the use of mathematical techniques in advanced computational analysis. Prerequisites: COMP 17100; PHYS 22400. (F,Y)

4 Credits

PHYS 32200 Classical Mechanics (LA)

Intermediate mechanics, including statics and dynamics of particles and rigid bodies, central forces, planetary motion, and Lagrange's equations. Extensive computer analysis. Culminates in a computational simulation of a physical system based on the equations of motion. Prerequisites: Either PHYS 31000 or the combination of PHYS 22400 and MATH 21400. (S,Y)

4 Credits

PHYS 32300 Electromagnetism (LA)

Intermediate course in electricity and magnetism that builds on the foundation received in PHYS 12300. Topics include electric and magnetic fields, Gauss's law, electric potential, circuits, Ampere's law, Faraday's law, and Maxwell's equations. Explores electromagnetic phenomena through both analytical and computational exercises. Prerequisites: COMP 17100; PHYS 22400. (F,Y)

4 Credits

PHYS 32400 Quantum Mechanics (LA)

Advanced theory course with emphasis on understanding the nature of quantum theory and how it differs from classical ideas. Topics include the Stern-Gerlach experiments and quantum measurements, the Schrödinger equation and solutions to various potentials, angular momentum, and the hydrogen atom. Prerequisites: Either PHYS 31000 or the combination of PHYS 22400, MATH 21400, and MATH 23100. (S,Y)

4 Credits

PHYS 32500 Thermal Physics (LA)

Topics include laws of thermodynamics with applications, thermodynamic functions and potentials, kinetic theory, statistical mechanics, real and idealized systems, and intermolecular processes. Prerequisites: COMP 17100 and PHYS 22400. (F,Y)

4 Credits

PHYS 33900 Intermediate Independent Study: Physics (LA)

One-semester course in which a student may pursue a topic of interest in physics. Offered on demand only. May be repeated for a total of six credits. Permission of instructor required. Prerequisites: PHYS 22400. (IRR)

0.5-3 Credits

PHYS 35000 Advanced Applied Physics Design Laboratory (LA)

Advanced laboratory course in which students will learn how to apply the engineering design process to identify a design need, consider the associated requirements and constraints of the project, brainstorm design solutions, analyze the proposed solutions to identify the strongest option, build a prototype, and iterate through stages of testing and improvement until a viable end product is produced. Students work as part of a design team with individual responsibilities and will practice presenting their design through "pitches" and customer presentations. All students will complete post-design reflections. Prerequisites:

COMP 17100; PHYS 25000; PHYS 27800. (F,Y)

Attributes: QL

4 Credits

PHYS 36000 Advanced Physics Laboratory (LA)

Advanced laboratory course in which students are expected to conduct four or five investigations in areas such as mechanics, optics, thermodynamics, and electricity and magnetism. Emphasis is placed on the development of good laboratory techniques and data-taking procedures. Students are expected to become familiar with modern developments in instrumentation, formal report writing (in LaTeX), and the statistical basis for data and uncertainty analysis. Includes both independent work and work in teams. Prerequisites: COMP 17100; PHYS 22400; PHYS 26000; PHYS 27800. (S,Y)

Attributes: ENRE, NS, QL

4 Credits

PHYS 39900-39910 Intermediate Physics Research (LA)

Original research participation with a faculty member in a specialized field. Intended for students with prior experience from PHYS 29900-29910. Prerequisites: Permission of instructor. Six credit limit. (F-S,Y)

0.5-3 Credits

PHYS 42300 Electrodynamics (LA)

Building on the foundation gained in PHYS 32300, this course completes the mathematical treatment of electromagnetic fields, including: electric and magnetic fields in matter, energy and momentum of EM fields, EM waves, EM potential theory, EM radiation, and special relativity. Prerequisites: PHYS 31000; PHYS 32300. (IRR)

4 Credits

PHYS 43000 Selected Topics in Advanced Physics (LA)

Advanced course in which students apply their physics skills to advanced topics. Current topics will be chosen based on faculty and student interests and may include environmental science, geophysics, and physics topics such as atomic, condensed matter, nuclear, and optical physics. This course may be repeated for credit for selected topics on different subjects. Prerequisites: PHYS 22400. (Y)

2-4 Credits

PHYS 47900 Internship in Physics (NLA)

Designed to offer applications of physics concepts in a setting appropriate to students' interest and training. Internships are arranged individually at the student's request with an instructor and a sponsoring agency and with departmental approval. Students must follow the guidelines of the School of Humanities and Sciences and complete the H&S internship application. Permission of instructor required. (IRR)
1-12 Credits

PHYS 49000 Professional Physics and Astronomy Seminar Capstone (LA)

Provides opportunities for students to explore connections between the integrative core curriculum, the physics major, other learning experiences while at Ithaca College or abroad, and future goals. Students will develop a written reflection and engage in career preparation activities. (FY)
Attributes: CP
1 Credit

PHYS 49300 Senior Project Proposal (LA)

First half of the capstone experience in which students design, conduct, and report on a senior project. The final project can be a research paper, theory project, computational project, engineering project, or experimental project. Emphasis placed on independent work. Culminates in a formal written proposal. Prerequisites: PHYS 36000, PHYS 32600 or PHYS 35000 (any of which may be taken concurrently); WRTG 10600 or equivalent. (IRR)
Attributes: WI
1 Credit

PHYS 49500 Senior Project (LA)

Second half of the capstone experience in which students complete a senior project, culminating in a formal written project report. Emphasis placed on independent work. Prerequisite: PHYS 49300; WRTG 10600 or equivalent. (IRR)
Attributes: WI
2 Credits

PHYS 49900-49910 Advanced Physics Research (LA)

Original research participation with a faculty member in a specialized field. Intended for students with prior experience from PHYS 39900-39910. Prerequisites: Permission of instructor. Six credit limit. (F-S,Y)
0.5-3 Credits