PHYSICS (PHYS)

PHYS 100 HOW THINGS WORK (3 credits)
Introduction to physical concepts behind modern technology. Studies of science of every day phenomena considered, including how electricity is generated, how refrigerators operate, and how CDs and DVDs contain information. Lecture, readings, writing, and discussion.
Prerequisites: MATH 105 or equivalent recommended.
(NATURAL WORLD)

PHYS 101 DESCRIPTIVE ASTRONOMY (3 credits)
The solar system, stars and their evolution, galaxies and cosmology. Emphasis on observational evidence. Lecture, discussion, and occasional evening observing sessions.
(NATURAL WORLD)

PHYS 207 ENERGY AND SUSTAINABILITY (ALSO LISTED AS ENVS 207) (3 credits)
Introduction to the scientific principles of energy technologies with a focus on assessing sustainability including environmental, climate, and life-cycle analysis. A wide range of renewable and nonrenewable energy sources will be studied, along with our use of energy for applications including electricity, transportation, heat, materials, and food production. Quantitative methods for making comparisons will be emphasized. The outlook for various renewable energy technologies will be discussed. Offered as stacked course with PHYS/ENVS 307. May not take both PHYS/ENVS 207 and PHYS/ENVS 307 for credit.
Typically offered: Fall Semester, Even Years
(QUANTITATIVE REASONING)

PHYS 210 INTRODUCTION TO MECHANICS (5 credits)
Introduction to the various ways in which the mechanical universe is described, using the concept of particles, waves, and flows. Extensive treatment of Newtonian mechanics, including motion, forces, energy, and waves. The special theory of relativity and basic ideas of quantum mechanics are introduced. Lecture, discussion, and laboratory.
Total Course fees: $15.00
Prerequisites: MATH 170 (may be taken concurrently).
(QUANTITATIVE REASONING)

PHYS 211 INTRODUCTION TO ELECTROMAGNETISM (5 credits)
Introduction to the study of electromagnetic force, including the basic laws of electricity and magnetism, the concept of a field, Maxwell's equations, basic circuits, electromagnetic radiation, and optics. The relationship of electromagnetism to the special theory of relativity. Lecture, discussion, and laboratory.
Total Course fees: $15.00
Prerequisites: PHYS 210 and MATH 170. MATH 175 recommended to be taken concurrently.
(QUANTITATIVE REASONING)

PHYS 215 MODERN PHYSICS (4 credits)
Developments since 1900; relativity, the nature of radiation and matter and their interaction, radioactivity, elementary quantum mechanics, introductory atomic and nuclear physics. Lecture and discussion.
Prerequisites: PHYS 211 and MATH 175. PHYS 385 and CHEM 210 recommended to be taken concurrently.
Typically offered: Fall Semester
(NATURAL WORLD)

PHYS 220 THERMAL & STATISTICAL PHYSICS (3 credits)
Study of solids, liquids, and gases at the atomic level to develop appreciation for and mathematical understanding of their thermal properties. Topics derive from thermodynamics, statistical mechanics, and solid state physics including transport processes, energy distributions, classical and quantum statistical development. CHEM 210 recommended.
Prerequisites: PHYS 211 and MATH 175. CHEM 210 recommended.
Typically offered: Spring Semester

PHYS 298 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)
See specific sections for descriptions.
Prerequisites: IDST 098 previous fall.

PHYS 303 INTRODUCTION TO MATERIALS SCIENCE (ALSO LISTED AS ENGR 303) (3 credits)
Introduction to the science of materials (metals, ceramics, polymers, composites, and semiconductors). Crystal structures and designations. Techniques of materials characterization. Mechanical, thermal, electrical, and magnetic properties. Forming and materials processing. Problem solving, lecture, discussion, and field trips.
Prerequisites: PHYS 215.

PHYS 307 ENERGY & SUSTAINABILITY (ALSO LISTED AS ENVS 307) (4 credits)
Introduction to the scientific principles of energy technologies with a focus on assessing sustainability including environmental, climate, and life-cycle analysis. A wide range of renewable and nonrenewable energy sources will be studied, along with our use of energy for applications including electricity, transportation, heat, materials, and food production. Quantitative methods for making comparisons will be emphasized. The outlook for various renewable energy technologies will be discussed. This course will include higher level scientific modeling and analysis than ENVS 207 and is recommended for science and mathematics majors. May not take both PHYS/ENVS 207 and PHYS/ENVS 307 for credit.
Prerequisites: One of MATH 175, PHYS 210, CHEM 210, ENVS 201, or consent of instructor; a year-long laboratory science course is recommended.
Typically offered: Fall Semester, Even Years
(QUANTITATIVE REASONING)

PHYS 315 CIRCUITS AND ELECTRONICS I (ALSO LISTED AS ENGR 315) (4 credits)
Electrical concepts and measurements. Circuit laws and theorems. Analysis of dc and ac steady state circuits, including phasor analysis techniques and Bode plots. Operational amplifiers and diodes. Digital combinational and sequential logic circuitry. Lecture, discussion, and laboratory.
Prerequisites: MATH 170. PHYS 211, junior standing recommended.
Typically offered: Fall Semester, Even Years
(NATURAL WORLD)

PHYS 316 CIRCUITS AND ELECTRONICS II (ALSO LISTED AS ENGR 316) (4 credits)
Semiconductor materials and solid-state devices. Diode and transistor circuits. Selected topics such as magnetism, inductors, and transformers; second-order ac and dc circuit analysis; Laplace and Fourier transforms; analog to digital conversion; and electronic system design. Completion of an independent project. Lecture, discussion, and laboratory.
Prerequisites: PHYS 315.
Typically offered: Spring Semester, Odd Years
(QUANTITATIVE REASONING)

PHYS 325 COMPUTATIONAL PHYSICS (4 credits)
Use of various numerical methods (solving ODE's, numerical integration, statistical analysis, Monte-Carlo simulation) coded in Python. Detail explorations in scientific writing style using LaTeX. Laboratory and lecture.
Prerequisites: MATH 170 and PHYS 211 or consent of instructor.
(QUANTITATIVE REASONING)

PHYS 370 ADVANCED TOPICS IN PHYSICS (3 credits)
Selected advanced physics topics.
Prerequisites: PHYS 215 or consent of instructor.

PHYS 385 GREAT EXPERIMENTS IN PHYSICS (1 credit)
Experiments in modern physics, thermal physics, and electricity and magnetism. Introduction to planning and executing physics experiments. Introduction to writing reports in the standard journal style.
Prerequisites: PHYS 215 (may be taken concurrently).

PHYS 386 EXPLORATION IN EXPERIMENTAL PHYSICS (1 credit)
Design and execution of physics experiments. Most projects will be drawn from topics in modern physics, thermal physics, and electricity and magnetism. Results will be reported using standard journal style.
Prerequisites: PHYS 385.
Typically offered: Spring Semester

PHYS 398 SPECIAL TOPICS: JAN TERM TRAVEL (4 credits)
See individual sections in specific terms for descriptions. 4 credits.
Prerequisites: IDST 098 previous fall.
(GLOBAL PLURALISM, NATURAL WORLD)

PHYS 420 CLASSICAL MECHANICS (4 credits)
Classical theories and analytical methods of statics and dynamics: kinematics, vectors and tensors, potential theory, moving coordinate systems and generalized methods. Lecture and discussion. MATH 210 recommended.
Prerequisites: PHYS 211 and MATH 200. MATH 210 recommended.
Typically offered: Fall Semester

PHYS 445 ELECTRICITY & MAGNETISM (4 credits)
Review of vector analysis, electrostatic and magnetostatic theory, electrodynamics, and electromagnetic waves. Lecture and discussion.
Prerequisites: MATH 210 is recommended. PHYS 211.
Typically offered: Fall Semester, Alternate Years

PHYS 475 QUANTUM PHYSICS (4 credits)
Quantum mechanics and its application in studies of atomic systems and nuclei. Lecture and discussion. PHYS 420, MATH 210, MATH 250 and junior standing recommended.
Prerequisites: PHYS 215 and MATH 200. PHYS 420, MATH 210, MATH 250 and junior standing recommended.
Typically offered: Spring Semester

PHYS 480 INDEPENDENT STUDY (1-5 credits)
Supplemental work for students with advanced standing in physics. By permission.

PHYS 485 PHYSICS COLLOQUIUM (1 credit)
Presentations of topics of current interest by visiting speakers, faculty, and students. May be repeated for credit.

PHYS 488 RESEARCH (1-5 credits)
Individual research projects for Physics and Applied Physics majors. Work done in collaboration with faculty. Departmental permission required. May be repeated for credit.
Prerequisites: Departmental permission required.

PHYS 489 THESIS RESEARCH (1-5 credits)
Required of all Physics and Applied Physics majors in the senior year.
Prerequisites: PHYS 386.

PHYS 490 SENIOR THESIS (3 credits)
Comprehensive written report on advanced level individual investigative project. Also requires public oral presentation of project and participation in Physics Colloquium. Baccalaureate thesis required of all Physics and Applied Physics majors.
Prerequisites: PHYS 489 or ENGR 489 and senior standing.
Typically offered: Spring Semester
(MAJOR WRITING INTENSIVE)