
Physics Course Descriptions

Note:

Frequency of course offerings: Physical Science is offered each term while the introductory sequences of College and University Physics are offered yearly. Some upper division course are offered yearly; others possibly every third or fourth term or "as demand warrants."

PHYS 195, 295, 395, 495 – Special Topics (1-12)

PHYS 198, 298, 398, 498 – Tutorial (1-3)

PHYS 100 – Physical Science (3) A course for non-science majors and constructed to meet the needs and requirements of students in the Elementary Education curriculum. The laboratory activities are the central focus of the class, using active inquiry and collaborative group work to guide students toward discovering the nature of physical phenomena. The topics studied are chosen broadly from physics, typically including consideration of properties of matter and mechanical behavior, light, heat, the causes of geophysical phenomena such as tides, seasons and the movement of celestial objects. Lab required. Fall and Spring. Gen Ed: SP & LB credit.

PHYS 101 – College Physics I (4) The first term of a non-calculus two term sequence (with PHYS 202) of introductory physics. The course is constructed to meet the needs of students who desire an introductory physics course of two-term duration. The first term covers motion and mechanical forces; work, energy and power; gravity; oscillations, waves and sound; heat. College Physics places a greater emphasis on an understanding of qualitative properties and less on the development of skill in analytical methods and computation compared to University Physics. Fall. Gen Ed: SP & LB credit.

PHYS 103 – University Physics I (4) This is the first course in the sequence intended for physics majors, 3/2 engineering, and other science majors who want a more detailed introduction to physics with calculus as a co-requisite. Topics covered fall under the heading of mechanics; i.e. motion, Newton's laws, dynamics, work, energy, momentum, and rotation. Lab required. Co-requisite: MATH 151. Fall. Formerly General Physics I. Gen Ed: SP & LB.

PHYS 111 – Laser and Light (3) Studies of ordinary light that led to the development of the LASER, a wonderful invention of modern times. Studies, including lab experiments, of the nature and behavior of light:

reflection, refraction, polarization, interference, diffraction, absorption and emission, the formation of images, color science, holography, fiber optics, the human eye and optical phenomena in the natural world such as rainbows, Northern lights and mirages. As demand warrants, usually in Winterim. Gen Ed: SP credit.

PHYS 120 – Physics and Poets (3) Like poetry, physics is a creative activity that engages the emotions and intellect. In this course, mathematics is kept at a minimum and great effort is made to illuminate the concepts, structure, and developments as well as beauty in the guiding principles of basic physics. Creative activities of a physicist will be compared to those of a poet. Elementary mathematics will be used in solving problems, which illustrate the concepts. Lecture demonstrations and laboratory projects are integral parts of the course. As demand warrants, usually in Winterim. Gen Ed: SP credit.

PHYS 130 – Musical Acoustics (3) The physics of music and sound. A study of the physical properties and processes related to the production of sound with particular attention to musical sounds: vibrations and oscillations as the sources of waves and wave properties, and those of sound waves in particular; the mathematical and psychophysical basis

of musical scales; the structure and function of the human ear and how it detects and processes sounds; how musical instruments produce the sounds that they do and the similarities and differences among them; the physical properties behind musical characteristics, such as pitch, loudness and timbre (quality): aspects of environmental sound, including loudness, reflection and absorption. Examples of the phenomena are furnished by classroom demonstrations using oscillation and wave apparatus and actual musical instruments. Neither high school physics nor prior musical instruction is expected or required. Students enrolling in this course are encouraged to register at the same time for PHYS 131, when it is offered. Gen Ed: SP credit.

PHYS 131 – Musical Acoustics Laboratory (1) Laboratory activities are designed to complement the topics studied in PHYS 130 and furnish the student with the experience of making and interpreting measurements of musical properties. Registration in PHYS 131 without co-registering in PHYS 130 is possible with permission of the instructor. Offered when possible. Gen Ed: LB credit.

PHYS 202 – College Physics II (4) The second term of a non-calculus two-term sequence of introductory physics (preceded by PHYS 101). Electricity, magnetism, electrical circuits, optics, atomic, modern and nuclear physics, and a closer look at particular topics (e.g., biomechanics) depending on the curricular and career paths of the class. Prerequisite: PHYS 101. Spring. Gen Ed: SP & LB credit.

PHYS 204 – University Physics II (4) Part II of the calculus-based sequence and covering statics, wave motion, sound, heat, and thermodynamics. Lab required. Co-requisite: MATH 152. Prerequisite: PHYS 103. Spring. Formerly General Physics II. Gen Ed: SP & LB credit.

PHYS 305 – University Physics III (4) Laws of electromagnetic are fundamental to understanding of the behavior of matter from tiny atom to enormous galaxies. Studies of electric charges, currents, field and circuits, the magnetic field, and properties of light. Exploration of electromagnetic phenomena, understanding of basic electrical machines, lab experiments in electricity, magnetism and optics. Intended for students interested in science or engineering, technology and applications of mathematics. Lab required. Pre-requisite: PHYS 204. Fall. Formerly General Physics III. Gen Ed: WI, SP & LB credit.

PHYS 306 – Modern Physics (4) Major developments in physics beginning around 1900. Topics include the mind-warping theory of Einstein's relativity and the behavior of particles at high speed, and the quantum physics of the tiny worlds of the electron in atoms and molecules. Laboratory work includes study of pioneering experiments leading to the frontiers of present day research and development and developing problem solving skills in the study of matter at small scales, specifically, at the quantum level. Lab required. Prerequisite: PHYS 305. Spring.

PHYS 320 – Mathematics, Science, and Philosophy (3) Selected writings by scientists and philosophers studied with concurrent progress in mathematical and scientific thought from ancient to modern times. Credit not counted toward Physics Major or Minor. Prerequisite: one year of calculus. As demand warrants. Gen Ed: SP & WI.

PHYS 325 – Energy and the Environment (3) Presents basic physical and quantitative concepts which are needed to understand energy and its environmental interaction. The physical laws come from mechanics, heat and thermodynamics, electricity, and nuclear reactions. A recurring theme is the extraction, transportation, conversion, distribution, end use, and dispersal of energy and the environmental impact of each step. Credit not counted toward the Physics Major or Minor. Prerequisite: one semester of college science. As demand warrants. Gen Ed: SP credit.

PHYS 330 – Meteorology (3) Components of the atmosphere, atmospheric dynamics, weather elements, weather phenomena and their physical courses, weather maps, weather predictions, operation and use of weather instruments. Prerequisite: one semester of college science. Fall or as demand warrants. Gen Ed: SP credit.

PHYS 335 – Astronomy (3) Topics include: solar system structure and dynamics, stellar composition and evolution, binary and multiple star systems, galactic structure and evolution, and theories describing the known universe. Included also is the study of the evening sky, constellations, planetary movement, and astronomical instrumentation. Prerequisite: one semester of college science. Spring or as demand warrants. Gen Ed: SP credit.

PHYS 350 – Elements of Special Relativity (2) Basic principles of special relativity and their application to four-dimensional space-time and particle reactions. As demand warrants.

PHYS 355 – Electronics (4) This course involves the study of electronic components and their function in electronic circuits, the application of that information to the design of circuits, and a study of the circuits themselves. Topics include: the theory, design, and function of common passive circuit elements, active discrete and integrated solid state devices, analog, and digital circuits. Lab required. Prerequisite: PHYS 305 or equivalent. As demand warrants.

PHYS 360 – Advanced Physical Laboratory I (3) Advanced experimental work in electricity, magnetism, optics, and atomic, nuclear, and solid state physics. Prerequisites: PHYS 305 or permission. Fall or as demand warrants. Gen Ed: WI credit.

PHYS 361 – Advanced Physical Laboratory II (3) Continuation of PHYS 360. Prerequisite: PHYS 306 or permission. Spring or as demand warrants.

PHYS 370 – Mathematical Physics (3) Mathematical ideas and methods from linear algebra, multivariate calculus, and differential equations are studied and applied to physical problems. Prerequisite: MATH 152. Spring.

PHYS 386 – Optics (3) A study of geometrical and wave optics. Topics include: reflection, refraction, dispersion, diffraction, polarization, lenses, mirrors, optical systems, and fiber optics. Prerequisite: PHYS 305 or equivalent. As demand warrants.

PHYS 390 – Nuclear Physics (3) A study of nuclear and particle physics. Topics include: natural and artificial radioactivity, nuclear detection devices, particle scattering, models of the nucleus, modern developments in particle physics. Prerequisite: PHYS 305 or equivalent. As demand warrants.

PHYS 440 – Physics Laboratory Techniques (1-2) Senior Physics Majors gain experience as supervisors of physics laboratories at various levels and/or serve as interns gaining experience in the college planetarium. Prerequisites: PHYS 103, 204, 305, 306 and permission. As demand warrants.

PHYS 450 – Condensed Matter Physics (3) Studies of what made the computer revolution possible. Course materials are directed towards understanding of the physics of condensed matter, formerly known as Solid State Physics. Major topics are studies of crystalline structure, electromagnetic optical properties of matter, conductors, insulators and semiconducting materials as in diodes and transistors, present day research and applications. Prerequisites: CHEM 106 and PHYS 306 or permission. As needed.

PHYS 465 – Physics Research I (1-3) Designing, performing, interpreting, and summarizing research project in a field of pure or applied physics. Prerequisite: Instructor approval. Fall and Spring.

PHYS 466 – Physics Research II (1-3) A continuation of PHYS 465.

PHYS 475 – Mechanics (3) A study of classical mechanics following the theories of Newton, Lagrange, and Hamilton. Topics include: single and multiple particle motion, rigid body dynamics, moving coordinate systems, and particle interactions. Prerequisites: PHYS 305 and 370 or equivalent. Fall.

PHYS 480 – Electromagnetic Theory I (3) The Industrial Revolution in Europe and elsewhere was the result of progress in theoretical and experimental work in electromagnetism. The course explores the fundamental laws of electromagnetism and the developments at the forefront of techno-

logical world. Major topics are electrostatics, magnetostatics, Maxwell's equations, electromagnetic waves and their interactions with matter, electromagnetic optical properties and their applications. Prerequisites: PHYS 305 and 370. As demand warrants.

PHYS 481 – Electromagnetic Theory II (3) Continuation and further development of topics in PHYS 480. Prerequisite: PHYS 480. As demand warrants.

PHYS 484 – Thermodynamics and Statistical Mechanics (3) A study of heat, thermodynamics, and statistical mechanics. Topics include: heat, heat engines, entropy and the second law of thermodynamics, thermodynamic potentials, phase transitions, and an introduction to statistical mechanics. Prerequisites: PHYS 305 and 370 or equivalent. Spring or as demand warrants.

PHYS 490 – Quantum Physics I (3) Exploring the world of quantum physics that cannot be explained by classical physics based on Sir Isaac Newton's work. Seeking answer to why it came to be accepted as the best description of physics. Learning the techniques of problem solving that include computational work. Major topics include old quantum theory, wave particle duality, uncertainty principle, Schrodinger's equation, square well potential, harmonic oscillator, the hydrogen atom problem, angular momentum theory, electron spin, fine structure, hyperfine structure, spin-orbit interaction, angular momentum coupling schemes and quantum theory of scattering of particles. Prerequisites: PHYS 305 and 370 or equivalent. As demand warrants.

PHYS 491 – Quantum Physics II (3) Continuation and further development of topics in PHYS 490. Prerequisite: PHYS 490. As demand warrants.

PHYS 494 – Physics Seminar (1-3) Students study and discuss contemporary research problems and results in the fields of pure and applied physics. Prerequisite: 22 semester hours of physics courses. As demand warrants. Gen Ed: SI credit.