

PHYSICS (PHY)

PHY 101 Methods, Skills, and Strategies for Physics 3

Knowledge, skills, and strategies for surviving and excelling at physics. Includes essential analytical skills, key physics ideas, problem-solving techniques, critical-thinking practice, and academic success tips.

PHY 101L Methods, Skills, and Strategies for Physics Lab 1

Modeling many of the concepts and techniques from the lecture portion of the course using basic computer applications, such as Excel.

PHY 205 Conceptual Physics 3

Introduction to basic laws of physics made by extensive use of demonstrations. Concepts emphasized and mathematical manipulations held to a minimum.

GE Core: GNS

LEC: GPS

Notes: No student may receive credit for this course if credit has previously been earned for PHY 211, PHY 212, PHY 291, or PHY 292. Registration in laboratory (PHY 205L) optional.

PHY 205L Conceptual Physics Laboratory 1

The discovery approach will be used to conduct experiments in mechanics, fluids, heat, electricity and magnetism, optics and modern physics.

GE Core: GNS

LEC: GPS

Corequisites: PHY 205 .

PHY 211 General Physics I 4

Introduction of laws and properties of matter, sound, heat, optics, electricity, and magnetism. Algebra and trigonometry used in development of this material.

GE Core: GNS

LEC: GPS

Prerequisites: A grade of C or better in MAT 151 or MAT 190, or permission of instructor.

Notes: Laboratory is included in PHY 211 and PHY 212. No student may receive credit for PHY 211 or PHY 212 if credit has previously been earned for PHY 211A or PHY 212A or PHY 291 or PHY 292.

PHY 211A General Physics I 4

A NSF funded version of PHY 211/212 featuring a laboratory-centered environment. See course description for PHY 211/212. Check with department for details.

GE Core: GNS

LEC: GPS

Prerequisites: MAT 150 or permission of instructor.

Notes: Laboratory is included in PHY 211A and PHY 212A. No student may receive credit for PHY 211A or PHY 212A if credit has previously been earned for PHY 211 and PHY 212 or PHY 291 and PHY 292.

PHY 211L General Physics Lab I 0

PHY 212 General Physics II 4

Introduction of laws and properties of matter, sound, heat, optics, electricity, and magnetism. Algebra and trigonometry used in development of this material.

GE Core: GNS

LEC: GPS

Prerequisites: A grade of C or better in PHY 211 or permission of instructor.

Notes: Laboratory is included in PHY 211 and PHY 212. No student may receive credit for PHY 211 or PHY 212 if credit has previously been earned for PHY 211A or PHY 212A or PHY 291 or PHY 292.

PHY 212A General Physics II 4

A NSF funded version of PHY 211/212 featuring a laboratory-centered environment. See course description for PHY 211/212. Check with department for details.

GE Core: GNS

LEC: GPS

Prerequisites: PHY 211A.

Notes: Laboratory is included in PHY 211A and PHY 212A. No student may receive credit for PHY 211A or PHY 212A if credit has previously been earned for PHY 211/PHY 212 or PHY 291/PHY 292.

PHY 212L General Physics Lab II 0

PHY 291 General Physics I with Calculus 4

Introduction to the laws and properties of mechanics and heat using calculus.

GE Core: GNS

LEC: GPS

Prerequisites: Grade of C or better in PHY 101 and MAT 151. or grade of C or better in PHY 101 and MAT 190; or grade of C or better in MAT 191; or permission of instructor;

Corequisites: MAT 191 or MAT 292.

Notes: Laboratory is included in PHY 291. students must register for PHY 291L concurrently. PHY 291 and PHY 292 together constitute a one-year university physics course. No student may receive credit for this course if credit has previously been earned for PHY 211 or PHY 211A.

PHY 291L General Physics I with Calculus Lab 0

Laboratory supporting PHY 291.

LEC: GPS

Corequisites: PHY 291.

Notes: No grade is awarded with this course number. Grades are awarded with the lecture course.

PHY 292 General Physics II with Calculus 4

Introduction to the laws and properties of electricity, magnetism, sound, and optics using calculus.

LEC: GPS

Prerequisites: Grade of C or better in MAT 292 and PHY 291.

Notes: Laboratory is included in PHY 292. students must register for PHY 292L concurrently. PHY 291 and PHY 292 together constitute a one-year university physics course. No student may receive credit for this course if credit has previously been earned for PHY 212 or PHY 212A.

PHY 292L General Physics II with Calculus Lab 0

Laboratory supporting PHY 292.

LEC: GPS

Corequisites: PHY 292.

Notes: No grade is awarded with this course number. Grades are awarded with the lecture course.

PHY 294 Introduction to Computational Physics Laboratory 1

Introduction to computational techniques used in physics and engineering. Use of software to solve problems in physics and astronomy, including simulation of interesting physical situations.

Prerequisites: Grade of C or better in PHY 292. or grade of C or better in PHY 291 and concurrent registration in PHY 292; Pr. or Coreq.: PHY 292.

PHY 321 Introduction to Modern Physics 3

Fundamental concepts of atomic, molecular, nuclear, and solid state physics from quantum-mechanical and special relativity points of view. Topics include special relativity, wave-particle dualism, Schrödinger equation, hydrogen atom, atomic spectra, nuclear structure, radioactivity, nuclear reactions, and molecular and solid state physics.

Prerequisites: Grade of C or better in PHY 292 [or PHY 211 (or PHY 212 with permission of instructor)]. grade of C or better in MAT 390 (or MAT 394) with concurrent registration in MAT 394 (or MAT 390); Pr. or Coreq.: MAT 390 or MAT 394.

PHY 321L Modern Physics Laboratory 1

Performance of atomic, nuclear, and solid state physics experiments and analysis of data in a quantitative and scientific manner. Simple computer programs used to study the concepts of error and least-square-fit techniques.

Prerequisites: Completion of or current registration in PHY 321. Pr. or Coreq.: PHY 321.

PHY 323 Mechanics 3

Mathematical treatment of classical kinematics and dynamics of a particle in a uniform field, in oscillatory motion and simple motions of systems of particles. Analytical and numerical techniques of problem solution stressed.

Prerequisites: Grade of C or better in PHY 292. grade of C or better or concurrent registration in MAT 390 (or MAT 394); Pr. or Coreq.: MAT 390 or MAT 394.

PHY 323L Classical Physics Laboratory 1

Performance of experiments emphasizing concepts of classical physics. Topics include force, energy, resonance, and relaxation.

PHY 325 Electricity and Magnetism I 3

A study, developing and using techniques of vector algebra and calculus, of topics in the theory of static electric and magnetic fields including the divergence and Stokes' theorems and the law of Gauss, Biot-Savart, and Ampere. Application to the properties of conductors, dielectric, and magnetic materials.

PHY 325L Electricity and Magnetism Laboratory 1

Performance of electricity and magnetism and electronic experiments with analysis of these basic phenomena as applied to research laboratory.

Prerequisites: Completion of or concurrent registration in PHY 325.

Corequisites: PHY 325 (if not satisfied as a prerequisite)

PHY 327 Thermal Physics 3

Properties of matter developed by combining thermodynamic reasoning with molecular theory.

PHY 330 Astrophysics 3

Stellar evolution through study of white dwarves and black holes; galaxy structure and cosmology. Observational project will use Three College Observatory. Intended as follow-up to introductory astronomy and physics.

Prerequisites: Grade of C or better in PHY 292 .

PHY 331 Experimental Physics 1

Advanced courses in laboratory techniques as involved in special laboratory problems.

PHY 332 Experimental Physics 1

Advanced courses in laboratory techniques as involved in special laboratory problems.

PHY 333 Selected Topics 1-3

Primarily intended for those who are not physical science majors. Topics vary with instructor and with semester. Contemporary topics may include subjects such as analysis of physical resources, their inherent energy limitations and new sources of energy (such as solar, geothermal, etc.); development and adaptation of nuclear energy to electric power plants and armaments systems and the ensuing environmental and political problems. No previous science course required. Interested students should inquire at Physics and Astronomy Department office for further details. Selected topics for science majors may also be given upon request.

PHY 345 20th-Century Physics: A Liberal Art 3

20th-century developments in description of physical universe, including small (quantum mechanics), fast (Einstein's relativity), energetic (nuclear). Emphasize understanding, societal impact, minimal mathematics.

PHY 395 Computational Physics Laboratory II 1

Use of numerical methods and computational models to simulate and investigate the behavior of various physical systems, including ODE integration, PDE mesh relaxation, and/or Monte Carlo methods.

PHY 400 Seminar 1-3

Selected topics of current interest in physics are studied.

PHY 401 Physics Senior Seminar 1

Topics from current physics literature, and presentations by students, faculty and guest lecturers. Oral reports on research topics. Attendance at weekly seminars required.

Prerequisites: PHYS major. senior standing;

Notes: Required of all Physics majors. Grade: Pass/Not Pass (P/NP).

PHY 412 Electronics for Scientists 3

Electronic circuits useful for measurement, signal processing, and control. This course is especially designed to meet needs of experimental scientists.

PHY 413 Microcomputer Interfacing for Scientists 3

Methods and techniques of electronic connection between computer and other devices and programming methods to facilitate use of the computer as a laboratory instrument are introduced.

PHY 419 Advanced Laboratory 1-3

Methods and techniques of electronic connection between computer and other devices and programming methods to facilitate use of the computer as a laboratory instrument are introduced. Assembly language used primarily.

PHY 420 Selected Topics in Physics 3

A topic of special interest is studied in depth.

PHY 421 Modern Physics with Quantum Mechanics 3

Modern theories of matter are studied by applying quantum mechanics to atomic, molecular, nuclear, and solid state systems.

Prerequisites: Grade of C or better in PHY 321 and PHY 325 .

PHY 423 Analytical Mechanics 3

Classical laws of particle motion are extended to the treatment of general motion of a rigid body, noninertial reference frames, generalized coordinates, normal coordinates, and to topics and techniques based on calculus of variations.

Prerequisites: Grade of C or better in PHY 323 and MAT 390.

PHY 425 Optics 3

Analytical treatment of geometrical optics (thin and thick lenses, image formation, theory of optical instruments) and physical optics (electromagnetic waves, interference, polarization, diffraction, optical properties of materials).

Prerequisites: Grade of C or better in PHY 325, or permission of instructor .

PHY 425L Optics Laboratory 1

Performance of geometrical and physical optics experiments with both microwaves and visible light.

PHY 426 Electricity and Magnetism II 3

Continuation of PHY 325. The properties of time-varying electric and magnetic fields, including Faraday's law, and the development of Maxwell's equations are studied. Results are applied to alternating current circuit theory, electromagnetic waves, and radiation.

PHY 495 Research Experience in Physics 3

A significant research project directed by faculty member. Student must submit written proposal, develop approved written plan, and deliver formal report of results.

PHY 496 Individual Study 1-3

The student and at least one member of the graduate faculty will develop a plan to study a topic of particular interest to the student.

Prerequisites: Permission of instructor .

PHY 502 Conceptual Physics for Teachers 3

The basic laws of physics are introduced by extensive use of demonstrations. Concepts are emphasized and mathematical manipulation is minimal. Teaching materials and strategies are developed.

PHY 543 Biophysics 3

Introduction to cellular biophysics, with emphasis on the physical properties of membranes, including membrane transport mechanisms and electrical properties of membranes.

Prerequisites: BIO 355. CHE 111 and CHE 114; MAT 191; PHY 211 and PHY 212 (or PHY 291 and PHY 292); or permission of instructor;

Notes: Same as BIO 543.

PHY 601A Basic Concepts in Physics 3**PHY 601B Selected Topics in Physics 3****PHY 603 General Physics for Teachers 3**

Concepts and theories, with some performance of demonstration and laboratory experiments. Develop basic knowledge of mechanics, properties of matter, heat, waves, electromagnetic fields, atomic structure and spectra, particle and wave theories.

PHY 605A Adv Placement Physics Teachers 3**PHY 605B Adv Placement Physics Teachers 3****PHY 607 Modern Physics for Teachers 3**

Recent developments in physics.

PHY 608 Modern Physics for Teachers 3

Recent developments in physics.

PHY 612C Experimental Physics For Teachers 1-3**PHY 711 Experimental Course 3**

This number reserved for experimental courses. Refer to the Course Schedule for current offerings.