

PHYSICS (PHYS)

PHYS 115 Descriptive Physics

Description: Qualitative approach to physics for the non-science major that emphasizes concepts and how they are used to understand the everyday physical world. Newton's description of motion and forces, the atomic view of matter, kinds and transformations of energy, the nature of electricity and magnetism, sound and light waves, and subatomic particles. Some topics selected according to student interest. Recommended for all students wanting a nonmathematical look at basic discoveries of physics.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

ACE: ACE 4 Science

PHYS 141 Elementary General Physics I

Prerequisites: MATH 102 or higher; or qualifying score on Math Placement Exam for MATH 106 or higher.

Notes: Credit toward the degree may be earned in only one of: PHYS 141, 141H and 151.

Description: Mechanics, heat, waves and sound.

Credit Hours: 5

Max credits per semester: 5

Max credits per degree: 5

Format: LEC

Prerequisite for: AGRO 458, AGRO 858, NRES 458, NRES 858, SOIL 458; ATHT 249; FDST 363, MSYM 363; GEOL 400; MSYM 232; MSYM 262; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452; PHYS 142; PHYS 142H

ACE: ACE 4 Science

PHYS 141H Honors: Elementary General Physics I

Prerequisites: Good standing with the University Honors Program; MATH 102 or higher; or qualifying score on Math Placement Exam for MATH 106 or higher.

Notes: Credit toward the degree may be earned in only one of: PHYS 141, 141H and 151.

Description: For course description, see PHYS 141.

Credit Hours: 5

Max credits per semester: 5

Max credits per degree: 5

Format: LEC

Prerequisite for: AGRO 458, AGRO 858, NRES 458, NRES 858, SOIL 458; ATHT 249; FDST 363, MSYM 363; GEOL 400; MSYM 262; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452; PHYS 142; PHYS 142H

ACE: ACE 4 Science

PHYS 142 Elementary General Physics II

Prerequisites: PHYS 141 or 141H.

Description: Continuation of PHYS 141. Electricity, magnetism, optics, relativity, atomic and nuclear physics.

Credit Hours: 5

Max credits per semester: 5

Max credits per degree: 5

Format: LEC

Prerequisite for: GEOL 344; PHYS 343; PHYS 361

PHYS 142H Honors: Elementary General Physics II

Prerequisites: Good standing in the University Honors program or by invitation; PHYS 141 or 141H.

Notes: Lab fee required.

Description: For course description, see PHYS 142.

Credit Hours: 5

Max credits per semester: 5

Max credits per degree: 5

Format: LEC

Prerequisite for: GEOL 344; PHYS 343; PHYS 361

PHYS 151 Elements of Physics

Prerequisites: MATH 102 or higher; or qualifying score on Math Placement Exam for MATH 106 or higher.

Notes: Credit toward the degree may be earned in only one of: PHYS 141, 141H and 151.

Description: Short course, without laboratory, for those who need one semester of elementary general physics. Emphasis on understanding our physical environment through application of principles of mechanics, heat, sound, electricity, and light.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: ARCH 333, CNST 305; ATHT 249; CNST 306; FDST 363, MSYM 363; MSYM 109L; MSYM 232; MSYM 262; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452; PHYS 153

ACE: ACE 4 Science

PHYS 153 Elements of Physics Laboratory

Prerequisites: PHYS 151 or parallel.

Notes: Optional lab to accompany PHYS 151.

Description: Laboratory experiments in mechanics, heat, and wave motion.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LAB

Prerequisite for: CNST 306

PHYS 198 Special Topics in Physics

Description: Topic varies.

Credit Hours: 1-6

Min credits per semester: 1

Max credits per semester: 6

Max credits per degree: 6

Format: LEC

PHYS 201 Modern Topics in Physics and Astronomy

Prerequisites: Must be a PHYS major or minor with freshman or sophomore status.

Description: Seminar/workshop that introduces students to topics in modern physics research in basic and applied areas. Students given an understanding of how their studies relate to current progress in physics and astronomy and to prepare for careers in physics-related disciplines.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LEC

PHYS 211 General Physics I

Prerequisites: One year high school physics or PHYS 141 or 141H or 151 or permission; MATH 106 or parallel

Description: Calculus-based course intended for students in engineering and the physical sciences. Mechanics, fluids, wave motion, and heat.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: AREN 211; ASTR 204; BSEN 244; BSEN 317; ECEN 211; GEOL 400; MECH 223; MECH 223H; MECH 250; METR 205; METR 311; METR 323; MSYM 232; MSYM 262; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452; PHYS 212; PHYS 212H; PHYS 221

ACE: ACE 4 Science

PHYS 211H Honors: General Physics I

Prerequisites: Physics major or good standing with the University Honors Program; MATH 106 or parallel.

Notes: Ambitious students who are not in the Honors Program are encouraged to request permission to enroll.

Description: For course description, see PHYS 211.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: AREN 211; ASTR 204; BSEN 244; BSEN 317; ECEN 211; GEOL 400; MECH 223; MECH 223H; MECH 250; METR 205; METR 311; METR 323; MSYM 232; MSYM 262; MSYM 342; MSYM 354, SOIL 354, WATS 354; MSYM 364; MSYM 452, MSYM 852, WATS 452, AGRO 452; PHYS 212; PHYS 212H; PHYS 221

ACE: ACE 4 Science

PHYS 212 General Physics II

Prerequisites: PHYS 211 or 211H; MATH 107 or 107H or parallel.

Description: Continuation of PHYS 211. Electricity, magnetism, and optics.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: AGEN 325, BSEN 325; ECEN 306; GEOL 344; MATL 260; MATL 360; MECH 200; MECH 200H; MECH 421, MECH 821, ENGR 421; PHYS 213; PHYS 213H; PHYS 222; PHYS 231; PHYS 311; PHYS 343; PHYS 361

ACE: ACE 4 Science

PHYS 212H Honors: General Physics II

Prerequisites: Physics major or good standing with the University Honors Program; PHYS 211 or 211H; MATH 107 or 107H or parallel.

Notes: Ambitious students who are not in the Honors Program are encouraged to request permission to enroll.

Description: For course description, see PHYS 212.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: AGEN 325, BSEN 325; ECEN 306; GEOL 344; MATL 260; MATL 360; MECH 200; MECH 200H; MECH 421, MECH 821, ENGR 421; PHYS 213; PHYS 213H; PHYS 222; PHYS 231; PHYS 311; PHYS 343; PHYS 361

ACE: ACE 4 Science

PHYS 213 General Physics III

Prerequisites: PHYS 212 or 212H; MATH 208 or 208H or parallel.

Description: Continuation of PHYS 212. Relativity, quantum mechanics, atoms, and nuclei.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: PHYS 223

PHYS 213H Honors: General Physics III

Prerequisites: Physics major or good standing with the University Honors program; PHYS 212 or 212H; MATH 208 or 208H, or parallel.

Notes: Ambitious students who are not in the Honors Program are encouraged to request permission to enroll.

Description: For course description, see PHYS 213.

Credit Hours: 4

Max credits per semester: 4

Max credits per degree: 4

Format: LEC

Prerequisite for: PHYS 223

PHYS 221 General Physics Laboratory I

Prerequisites: PHYS 211 or 211H or parallel.

Notes: Optional lab to accompany PHYS 211.

Description: Experiments in mechanics, heat and wave motion.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LAB

PHYS 222 General Physics Laboratory II

Prerequisites: PHYS 212 or 212H or parallel.

Notes: Optional lab to accompany PHYS 212.

Description: Laboratory experiments in electromagnetism and optics.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LAB

Prerequisite for: PHYS 231

PHYS 223 General Physics Laboratory III

Prerequisites: PHYS 213 or 213H or parallel.

Notes: Optional lab to accompany PHYS 213.

Description: Experiments in atomic and nuclear physics.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LAB

PHYS 231 Electrical and Electronic Circuits

Prerequisites: PHYS 212 and 222.

Description: Diode, transistor, and operational amplifier circuits and analog applications; gates, flip-flops, and elementary digital electronics.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 260 Liberal Arts Physics: Matter and Motion

Prerequisites: MATH 101 or higher; or qualifying score on Math Placement Exam for MATH 102, 104, or higher.

Notes: PHYS 260 and 261 are independent and may be taken in any order.

Description: Basic concepts of physics in a historical context and in relationship to the intellectual development of humankind. Mechanics, heat gravitation, and structure of the universe.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

Prerequisite for: PHYS 262

PHYS 261 Liberal Arts Physics: Atoms and Fields

Prerequisites: MATH 101 or higher; or qualifying score on Math Placement Exam for MATH 102, 104, or higher.

Description: Basic concepts of physics in a historical context and in relationship to the intellectual development of humankind. Atomic structure of matter, states of matter, waves, and light. Practical consequences of the properties of matter and physical phenomena.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

Prerequisite for: PHYS 262

PHYS 262 Physical Sciences by Inquiry

Prerequisites: PHYS 260 or PHYS 261 or parallel.

Notes: Intended for students planning to be elementary or middle-level teachers

Description: Selected physical science concepts using inquiry methods.

Credit Hours: 1

Max credits per semester: 1

Max credits per degree: 1

Format: LAB

PHYS 298 Special Topics in Physics

Prerequisites: Permission.

Credit Hours: 1-12

Min credits per semester: 1

Max credits per semester: 12

Max credits per degree: 12

Format: LEC

PHYS 311 Mechanics

Prerequisites: PHYS 212 or 212H or parallel, MATH 221 or 221H or parallel.

Description: Review of vector operations and of the kinematics and dynamics of a particle. Dynamics of a system of particles, motion of rigid bodies, central force problems, collisions, Lagrangian techniques, oscillations, and coupled oscillators.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

Prerequisite for: PHYS 401, PHYS 801

PHYS 343 Physics of Lasers and Modern Optics

Prerequisites: PHYS 142 or 142H or 212 or 212H.

Description: Physical principles and techniques of lasers and modern optics. Emphasis on practical experience with state-of-the-art techniques and applications.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

ACE: ACE 10 Integrated Product

PHYS 361 Concepts of Modern Physics

Prerequisites: PHYS 142 or 212 with a grade of C+ or better.

Description: Some of the concepts and ideas underlying modern areas of physics through readings from non-technical works by noted physicists and science writers. Includes quantum mechanics, relativity, cosmology, chaos, and examples of modern technology.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 391 Undergraduate Research

Prerequisites: Permission.

Description: Research participation.

Credit Hours: 1-4

Min credits per semester: 1

Max credits per semester: 4

Max credits per degree: 8

Format: IND

PHYS 399H Honors Course

Prerequisites: Permission.

Credit Hours: 1-4

Min credits per semester: 1

Max credits per semester: 4

Max credits per degree: 4

Format: IND

PHYS 401 Computational Physics

Crosslisted with: PHYS 801

Prerequisites: PHYS 311 or parallel.

Description: Re-formulation of physics problems for solution on a computer, control of errors in numerical work, and programming.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 422 Introduction to Physics and Chemistry of Solids

Crosslisted with: PHYS 822, ECEN 422, ECEN 822

Prerequisites: PHYS 213 or CHEM 481/881, MATH 221/821.

Description: Introduction to structural, thermal, electrical, and magnetic properties of solids, based on concepts of atomic structure, chemical bonding in molecules, and electron states in solids. Principles underlying molecular design of materials and solid-state devices.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 431 Thermal Physics

Crosslisted with: PHYS 831

Prerequisites: PHYS 213

Description: Thermal phenomena from the point of view of thermodynamics, kinetic theory, and statistical mechanics.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 441 Experimental Physics I

Crosslisted with: PHYS 841

Prerequisites: PHYS 213, 223 and 231

Notes: Lab fee required.

Description: Methods and techniques of modern experimental physics.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

ACE: ACE 10 Integrated Product

PHYS 442 Experimental Physics II

Crosslisted with: PHYS 842

Prerequisites: PHYS 441/841 or permission

Notes: Lab fee required.

Description: Continuation of PHYS 441/841.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

ACE: ACE 10 Integrated Product

PHYS 443 Experimental Physics III

Crosslisted with: PHYS 843

Prerequisites: PHYS 442/842 or permission.

Description: Continuation of PHYS 442/842.

Credit Hours: 1-3

Min credits per semester: 1

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 451 Electromagnetic Theory

Crosslisted with: PHYS 851

Prerequisites: PHYS 213; MATH 221/821.

Description: Theory of electric and magnetic fields and their interaction with charges and currents, Maxwell's equations, electric and magnetic properties of matter.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 452 Optics and Electromagnetic Waves

Crosslisted with: PHYS 852

Prerequisites: PHYS 451/851

Description: Production of electromagnetic waves, wave guides and cavities, properties of waves, plane waves, reflection and refraction, interference and coherence phenomena, polarization. Optical properties of matter.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 461 Quantum Mechanics

Crosslisted with: PHYS 861

Prerequisites: PHYS 213 and 311; or permission.

Description: Basic concepts and formalism of quantum mechanics with applications to simple systems.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 462 Atoms, Nuclei, and Elementary Particles

Crosslisted with: PHYS 862

Prerequisites: PHYS 461

Description: Basic concepts and experimental foundation for an understanding of the physics of atoms, nuclei, and elementary particles.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 480 Introduction to Lasers and Laser Applications

Crosslisted with: ECEN 480, ECEN 880, PHYS 880

Prerequisites: PHYS 213/(UNO) PHYS 2130.

Description: Physics of electronic transition production stimulated emission of radiation. Threshold conditions for laser oscillation. Types of lasers and their applications in engineering.

Credit Hours: 3

Max credits per semester: 3

Max credits per degree: 3

Format: LEC

PHYS 491 Special Topics in Physics

Crosslisted with: PHYS 891

Prerequisites: PHYS 213 and permission.

Description: Topics vary.

Credit Hours: 1-3

Min credits per semester: 1

Max credits per semester: 3

Max credits per degree: 9

Format: LEC