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
Grading Option: Graded with Option
ACE: ACE 4 Science

PHYS 141 Physics for Life Sciences I
Prerequisites: MATH 102, 103, or Math Placement Exam score for MATH 106. Credit toward the degree may be earned in only one of: AGST 109, MSYM 109, PHYS 141, PHYS 141H, or PHYS 151.
Notes: This is the first in a two-course sequence. Lab fee required.
Description: Introduces physics in biological context, investigating the fundamental physics that govern living systems. Topics include mechanics, fluids, heat, and waves, and sound.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: AGST 216; AGST 232; AGST 262; AGST 342; AGST 354, SOIL 354; AGST 362; AGST 452, AGST 852, PLAS 452; ARCH 333, CNST 305; ASTR 204; FDST 363, AGST 363; GEOL 400; PHYS 142; PHYS 142H; PLAS 458, AGRO 858, NRES 458, NRES 858, SOIL 458
ACE: ACE 4 Science
Course and Laboratory Fee: $55

PHYS 141H Honors: Physics for Life Sciences I
Prerequisites: Good standing with the University Honors Program; MATH 102, 103, or Math Placement Exam score for MATH 106. Credit toward the degree may be earned in only one of: AGST 109, MSYM 109, PHYS 141, PHYS 141H, or PHYS 151.
Notes: Lab fee required.
Description: Physics in biological context, investigating the fundamental physics that govern living systems. Mechanics, fluids, heat, waves, and sound.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded
Offered: FALL/SPR
Prerequisite for: AGST 216; AGST 262; AGST 342; AGST 354, SOIL 354; AGST 362; AGST 452, AGST 852, PLAS 452; ASTR 204; FDST 363, AGST 363; GEOL 400; PHYS 142; PHYS 142H; PLAS 458, AGRO 858, NRES 458, NRES 858, SOIL 458
ACE: ACE 4 Science
Course and Laboratory Fee: $55

PHYS 142 Physics for Life Sciences II
Prerequisites: Grade of C, P, or better in PHYS 141 or 141H.
Notes: This is the second in a two-course sequence
Description: Introduces physics in biological context, investigating the fundamental physics that govern living systems. Topics include electricity and magnetism, circuits, optics, atomic and nuclear physics.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: BIOC 440; PHYS 343; PHYS 361
Course and Laboratory Fee: $55

PHYS 142H Honors: Physics for Life Sciences II
Prerequisites: Good standing in the University Honors program; grade of C, P, or better in PHYS 141 or 141H. Credit toward the degree cannot be earned in both PHYS 142 and PHYS 142H.
Notes: Lab fee required.
Description: For course description, see PHYS 142.
Credit Hours: 5
Max credits per semester: 5
Max credits per degree: 5
Grading Option: Graded
Offered: FALL/SPR
Prerequisite for: BIOC 440; PHYS 343; PHYS 361
Course and Laboratory Fee: $55

PHYS 151 Elements of Physics
Prerequisites: MATH 102 or higher; or qualifying score on Math Placement Exam for MATH 106 or higher. Credit toward the degree may be earned in only one of: AGST 109, MSYM 109, PHYS 141, PHYS 141H, or PHYS 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
Grading Option: Graded with Option
Prerequisite for: AGST 109L; AGST 216; AGST 232; AGST 262; AGST 342; AGST 354, SOIL 354; AGST 362; AGST 452, AGST 852, PLAS 452; ARCH 333, CNST 305; CNST 306; FDST 363, AGST 363; 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
Grading Option: Graded with Option
Course and Laboratory Fee: $55

PHYS 192 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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

PHYS 211 General Physics I
Prerequisites: MATH 106
Notes: One year of either high school physics or algebra-based college physics is expected.
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
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: AGST 216; AGST 232; AGST 262; AGST 342; AGST 354, SOIL 354; AGST 362; AGST 452, AGST 852, PLAS 452; ARCH 333, CNST 305; AREN 211; ASTR 204; BSEN 244; BSEN 317; BSEN 410; ECEN 211; GEOL 400; MECH 223; MECH 223H; MECH 250; METR 205; METR 311; METR 323; 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. Credit toward the degree cannot be earned in both PHYS 211 and PHYS 211H.
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
Grading Option: Graded
Offered: FALL/SPR
Prerequisite for: AGST 232; AGST 262; AGST 342; AGST 354, SOIL 354; AGST 362; AGST 452, AGST 852, PLAS 452; AREN 211; ASTR 204; BSEN 244; BSEN 317; ECEN 211; GEOL 400; MECH 223; MECH 223H; MECH 250; METR 205; METR 311; METR 323; PHYS 212; PHYS 212H; PHYS 221
ACE: ACE 4 Science

PHYS 212 General Physics II
Prerequisites: A grade of C, P, or better in PHYS 211 or PHYS 211H; MATH 107 or MATH 107H.
Description: Continuation of PHYS 211. Electricity, magnetism, and optics.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: AGEN 325, BSEN 325; AREN 330; BIOC 440; BSEN 244; ECEN 306; MATL 260; MATL 360; 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; A grade of C, P, or better in PHYS 211 or PHYS 211H; MATH 107 or MATH 107H. Credit toward the degree cannot be earned in both PHYS 212 and PHYS 212H.
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
Grading Option: Graded
Offered: FALL/SPR
Prerequisite for: AGEN 325, BSEN 325; AREN 330; BIOC 440; BSEN 244; ECEN 306; MATL 260; MATL 360; 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: A grade of C, P, or better in PHYS 212 or 212H; MATH 208 or 208H.
Description: Continuation of PHYS 212. Relativity, quantum mechanics, atoms, and nuclei.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Grading Option: Graded with Option
Offered: FALL/SPR
Prerequisite for: PHYS 223

PHYS 213H Honors: General Physics III
Prerequisites: Physics major or good standing with the University Honors program; A grade of C, P, or better in PHYS 212 or 212H; MATH 208 or 208H. Credit toward the degree cannot be earned in both PHYS 213 and PHYS 213H.
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
Grading Option: Graded
Offered: FALL/SPR
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
Grading Option: Graded with Option
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option
Prerequisite for: PHYS 231
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option
Course and Laboratory Fee: $55

PHYS 292 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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option

PHYS 398 Undergraduate Research
Prerequisites: Permission.
Description: Research participation.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Graded with Option

PHYS 401 Computational Physics
Crosslisted with: PHYS 801
Prerequisites: A grade of P, C or better in PHYS 311.
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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

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
Grading Option: Graded with Option
Prerequisite for: PHYS 442, PHYS 842
ACE: ACE 10 Integrated Product
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option
Prerequisite for: PHYS 443, PHYS 843
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option
Course and Laboratory Fee: $55

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
Grading Option: Graded with Option

PHYS 452 Optics and Electromagnetic Waves
Crosslisted with: PHYS 852
Prerequisites: A grade of P, C or better in 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
Grading Option: Graded with Option

PHYS 461 Quantum Mechanics
Crosslisted with: PHYS 861
Prerequisites: A grade of P, C or better in PHYS 213 and 311.
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
Grading Option: Graded with Option

PHYS 462 Atoms, Nuclei, and Elementary Particles
Crosslisted with: PHYS 862
Prerequisites: A grade of P, C or better in 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
Grading Option: Graded with Option

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
Grading Option: Graded with Option

PHYS 492 Special Topics in Physics
Crosslisted with: PHYS 892
Prerequisites: PHYS 213 and permission.
Description: Topics vary.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded with Option

PHYS 499 Undergraduate Thesis
Prerequisites: Permission.
Description: Independent research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option

PHYS 499H Honors Undergraduate Thesis
Prerequisites: Permission. Credit toward the degree cannot be earned in both PHYS 499 and PHYS 499H.
Description: Independent research leading to a thesis.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 6
Grading Option: Graded with Option