Physics (PHYS)

PHYS 1110. Elementary Physics Laboratory.
This course explores and illustrates some of the basic principles covered in PHYS 1310 and PHYS 1320. This lab should be taken as the second of two courses, PHYS 1310 and PHYS 1320. Prerequisite: PHYS 1315. Co-requisite: PHYS 1315. MATH 1317 is recommended. about Elementary Physics Laboratory
1 Credit Hour. 0 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: PHYS 1110
about Elementary Physics Laboratory

PHYS 1125. General Physics II Laboratory.
Second of two laboratory courses in General Physics for science-related majors. Course introduces students to the basics of measurement. Topics cover mechanics and heat. Prerequisite or Corequisite: PHYS 1315. about General Physics II Laboratory
1 Credit Hour. 0 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: PHYS 1125
about General Physics II Laboratory

PHYS 1140. Introductory Laboratory in Astronomy.
An introduction to the constellations, the uses of telescopes, and other material relating to the study of stars and planets. This course is designed to be taken with PHYS 1340 or PHYS 1350 or those students desiring a laboratory course. about Introductory Laboratory in Astronomy
1 Credit Hour. 0 Lecture Contact Hours. 2 Lab Contact Hours.
Grade Mode: Standard Letter
TCCN: PHYS 1140
about Introductory Laboratory in Astronomy

PHYS 1310. Elementary Physics.
A non-mathematical survey of mechanics, properties of matter, heat and sound. These topics are described in a conceptual way with applications relating to the world around us. The laboratory experience may be obtained in a separate one-hour credit lab (PHYS 1110). PHYS 1310 and PHYS 1320 are designed for the liberal arts student. The order in which they are taken is not important. They are not recommended for pre-engineering students or majors and minors in science. The laboratory experience is recommended with the second course. about Elementary Physics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core|Lab Required
Grade Mode: Standard Letter
TCCN: PHYS 1310
about Elementary Physics

PHYS 1315. General Physics I.
The first course in a two-semester sequence which is a survey of the basic laws and principles of physics and includes the topics of mechanics, heat, electricity, magnetism, optics, modern physics, electromagnetic waves, and wave motion. Designed for students whose program requires technical physics, but who are not pre-engineering students or majors and minors in physics. Prerequisite: MATH 1315 with a grade of “C” or higher. about General Physics I
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Co-requisite(s): PHYS 1115
Course Attribute(s): Life & Physical Sciences Core
Grade Mode: Standard Letter
TCCN: PHYS 1301
about General Physics I

PHYS 1320. Elementary Physics.
A non-mathematical survey of electricity, magnetism, light, relativity, and atomic and nuclear physics. These topics are described in a conceptual way with applications relating to the world around us. The laboratory experience may be obtained in a separate one-hour credit lab (PHYS 1110). PHYS 1310 and PHYS 1320 are designed for the liberal arts student. The order in which they are taken is not important. They are not recommended for pre-engineering students or majors and minors in science. The laboratory experience is recommended with the second course. about Elementary Physics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core|Lab Required
Grade Mode: Standard Letter
TCCN: PHYS 1312
about Elementary Physics

PHYS 1325. General Physics II.
Second course in a two-semester sequence which is a survey of the basic laws and principles of physics and includes the topics of waves, light, electricity and magnetism. Designed for students whose program requires technical physics, but who are not pre-engineering students or majors and minors in physics. Prerequisites: PHYS 1315 and MATH 1315 with a grade of “C” or higher. MATH 1317 and concurrent enrollment in PHYS 1125 are recommended. about General Physics II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Co-requisite(s): PHYS 1125
Course Attribute(s): Life & Physical Sciences Core
Grade Mode: Standard Letter
TCCN: PHYS 1313
about General Physics II

A study of the solar system. Topics included are a study of the sun, the planets and their satellites, the comets, and other components of the solar system. Some aspects of telescopes and ancient astronomy will be included also. about Astronomy: Solar System
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core
Grade Mode: Standard Letter
TCCN: PHYS 1311
about Astronomy: Solar System
PHYS 1350. Astronomy: Stars and Galaxies.
A study of the universe beyond the solar system. Topics included are a study of the stars and star clusters, nebulae, galaxies, and an introduction to some aspects of cosmology.
about Astronomy: Stars and Galaxies
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core
Grade Mode: Standard Letter
TCCN: PHYS 1311
about Astronomy: Stars and Galaxies

This course covers the principles of classical mechanics through problem solving and laboratory investigations. PHYS 1430, PHYS 2425, and PHYS 2435 are designed for students majoring and minoring in physics and/or other disciplines within the college of science and engineering. Credit for both PHYS 1315 and PHYS 1115 and PHYS 1430 cannot be given. Pre or Co-requisite: MATH 2471 with a C or higher or concurrent enrollment in MATH 2471. (MC).
about Mechanics
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core|Lab Required
Grade Mode: Standard Letter
TCCN: PHYS 2425
about Mechanics

PHYS 2425. Electricity and Magnetism.
This course is a study of the field of electricity and magnetism for physics majors and minors. PHYS 1430, PHYS 2425, and PHYS 2435 are designed for those students majoring or minoring in physics and for pre-engineering students. Credit for both PHYS 1325 and PHYS 1125 and PHYS 2425 cannot be given. Prerequisites: PHYS 1430 and MATH 2472 with grades of C or higher.
about Electricity and Magnetism
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Life & Physical Sciences Core|Lab Required
Grade Mode: Standard Letter
TCCN: PHYS 2426
about Electricity and Magnetism

PHYS 2435. Waves and Heat.
This course is a study of the fields of wave motion, sound, light, and heat at a beginning level for physics majors and minors. Prerequisites: PHYS 1430 and MATH 2471 with grades of C or higher. Co-requisite: MATH 2472.
about Waves and Heat
4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
TCCN: PHYS 2427
about Waves and Heat

PHYS 3210. Physics Cognition and Pedagogy.
This course is an introduction to physics-specific pedagogy and the methods and results of physics education research (PER). Students will investigate relevant literature in PER and cognitive science, engage in discussions about physics teaching and learning, and reflect on their own teaching practice in the role of Physics Learning Assistants. (WI).
about Physics Cognition and Pedagogy
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter
about Physics Cognition and Pedagogy

A survey of the physics of sound and acoustic measurement. Special emphasis will be placed on sound production, propagation, and perception as applied to music. Prerequisites: PHYS 1410 and PHYS 1420 or equivalent.
about Musical Acoustics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Musical Acoustics

PHYS 3311. Mechanics I.
This course discusses the fundamentals of classical mechanics focusing on the physical description of the behavior of single and multiple particle systems. Topics included are advanced problem solving strategies for systems with position and velocity dependent forces, simple harmonic oscillators, and non-inertial reference frames. Prerequisite: PHYS 2435 with a C or higher. Co-requisite: PHYS 3320.
about Mechanics I
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Mechanics I

PHYS 3312. Modern Physics.
This course is an introduction to the foundations of modern physics, including the following topics: relativistic mechanics, kinetic theory of matter, quantization of charge, light and energy, the atom, wave nature of particles, and the Schroedinger equation. Prerequisite: PHYS 2435 with a C or higher. PHYS 2425 with a grade of C or higher, or concurrent enrollment allowed.
about Modern Physics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Modern Physics

PHYS 3315. Thermodynamics.
This course is a fundamental study of thermodynamics and statistical mechanics. Prerequisites: MATH 3323 and (PHYS 2435 or PHYS 1325 and PHYS 1125 or (PHYS 2425 and ENGR 2300)).
about Thermodynamics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Thermodynamics
PHYS 3320. Introduction to Mathematical Physics.
An introduction to the mathematical methods of theoretical physics with emphasis on the vectorial-functional approach emphasized in current research literature. Applications will be made to certain fundamental problems of mechanics and electromagnetic field theory. Prerequisites: PHYS 2425 and MATH 3373 with grades of C or higher; MATH 3323 with a grade of C or higher, or concurrent enrollment.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
Course Attribute(s): Writing Intensive
about Undergraduate Research

PHYS 3411. Advanced Physics Laboratory.
Experiments in modern physics, with emphasis on demonstrating quantum effects and introducing nuclear physics. Prerequisites: PHYS 2425 with a grade of C or higher; PHYS 3312 with a grade of C or higher, or concurrent enrollment. (WI).

4 Credit Hours. 2 Lecture Contact Hours. 6 Lab Contact Hours.
Course Attribute(s): Lab Required|Writing Intensive
Grade Mode: Standard Letter
about Advanced Physics Laboratory

This Laboratory/lecture course is an introduction to electronic test bench methods for the construction, operation and analysis of important DC/AC circuits utilizing resistors, capacitors, diodes, BJTs, FETs, and OpAmps. The behavior of the circuits will be modeled in SPICE. Elementary semiconductor device physics and microfabrication methods will be discussed. Prerequisites: PHYS 2425 and PHYS 2435 with grades of C or higher. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 4 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Applied Electronics

PHYS 3417. Optics.
This course is a one-semester survey of geometrical and physical optics accompanied by laboratory experience. Topics covered include electromagnetic waves and their propagation, geometrical optics, polarization, interference, diffraction, Fourier optics, and holography. Prerequisites: PHYS 2425 and PHYS 2435 with grades of C or higher. (WI).

4 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Lab Required
Grade Mode: Standard Letter
about Optics

PHYS 4221. Undergraduate Research.
This course represents a student’s research project in physics to be carried out under the supervision of a faculty member. The student must contact a faculty member in advance to arrange the topic and specific course objectives. This course may be repeated for credit. Instructor’s approval required.

2 Credit Hours. 0 Lecture Contact Hours. 6 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Undergraduate Research

PHYS 4305. Statistical Physics.
This course will examine the physics that describes the equilibrium thermal properties of systems. Statistical physics explains the microscopic properties of systems that give rise to their measurable macroscopic behavior. This includes thermodynamic properties, transport processes, fluctuations from equilibrium, phase transitions and critical phenomena, and quantum fluids. Prerequisites: PHYS 3312, PHYS 3320, and MATH 3323 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Statistical Physics

PHYS 4310. Electromagnetic Field Theory I.
An introduction to the electromagnetic field theory of classical physics for static fields. Topics included will be the electrostatic field, polarization and dielectrics, electrostatic energy, magnetic field of steady currents, magneto static energy, and magnetic properties of matter. Prerequisites: MATH 3323, MATH 3373 and PHYS 3320 with grades of "C" or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Electromagnetic Field Theory I

Application of physics principles to solid materials. Topics include crystal structure and the reciprocal lattice, including x-ray diffraction, crystal binding and elastic properties, lattice vibrations, energy bands, semiconductors and metals. Prerequisites: PHYS 3312 and PHYS 3320 with grades of C or higher.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Condensed Matter Physics

PHYS 4312. Quantum Mechanics I.
An introductory course in quantum mechanics. Topics include mathematical foundations, fundamental postulates, time development, and one dimensional problems. Prerequisites: MATH 3323, PHYS 3312, and PHYS 3320 with grades of C or higher; and six additional hours of advanced physics.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Quantum Mechanics I
PHYS 4313. Quantum Mechanics II.
An advanced course in quantum mechanics intended as an elective for students intending to pursue graduate study in physics. Topics include angular momentum, three dimensional problems, matrix mechanics, and perturbation theory. Prerequisite: PHYS 4312 with a C or higher. about Quantum Mechanics II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter about Quantum Mechanics II

PHYS 4314. Mechanics II.
Fundamentals of Classical Mechanics focusing on the physical description of the behavior of single and multiple particle systems. Topics include central force motion, rigid body rotation, and coupled oscillations. This course is intended as an elective for students intending to pursue graduate study in physics. Prerequisites: PHYS 3311 and MATH 3323 with grades of C or higher. about Mechanics II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter about Mechanics II

PHYS 4315. Electromagnetic Field Theory II.
An introduction to the electromagnetic field theory of classical physics for time varying fields. Topics included will be electromagnetic induction, time varying electric and magnetic fields, Maxwell’s equations, electromagnetic energy, electromagnetic waves and radiation, and a brief introduction to some specialized topics. Prerequisite: PHYS 4310 with a C or higher. about Electromagnetic Field Theory II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter about Electromagnetic Field Theory II

PHYS 4317. Computational Physics.
Introduction to computational techniques for problem-solving and research beyond the standard techniques of most physics courses. Numerical, symbolic, and simulation methods applied to modern physics using advanced mathematical software and a high level programming language. Prerequisites: PHYS 3320 and six additional hours of advanced physics or instructor approval. about Computational Physics
3 Credit Hours. 3 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter about Computational Physics

PHYS 4320. Selected Study in Physics.
Topics are chosen in theoretical and experimental areas of current interest in physics with specific topic to be discussed agreed upon prior to registration. May be repeated once with different emphasis and professor for additional credit. Prerequisite: Instructor approval. about Selected Study in Physics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter about Selected Study in Physics

PHYS 4321. Undergraduate Research.
A research project in physics to be carried out under the supervision of a faculty member by upper division physics majors. Student must contact a faculty member in advance to arrange topic and specific course objective. Course may be repeated only as an elective towards the BS or BA in physics. Prerequisite: Instructor approval. about Undergraduate Research
3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter about Undergraduate Research

PHYS 4340. Materials Physics Laboratory.
A laboratory based course introducing a broad array of materials synthesis and characterization methods. The specific subjects will be coordinated with topics of current interest in the literature and will be chosen by mutual consent of the student and faculty advisor. Prerequisites: PHYS 3416, PHYS 3411, and PHYS 4311. (Wi)
about Materials Physics Laboratory
3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter about Materials Physics Laboratory

PHYS 4350A. Thin Film Photovoltaic Devices.
This course is a survey of the Physics of photovoltaic devices with emphasis on device physics including the photovoltaic effect, photon absorption, electrons and holes, generation and recombination, the pn-junction, charge separation, monocrystalline solar cells, thin film solar cells, and losses. Prerequisites: PHYS 2425 and PHYS 2435 with grades of C or higher. about Thin Film Photovoltaic Devices
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter about Thin Film Photovoltaic Devices

PHYS 4350B. Relativity.
This course includes a review of Special Relativity, an introduction to the mathematics of tensor calculus and differential geometry, and such topics from General Relativity as the Schwarzschild solution and black holes, tests of General Relativity, cosmological models, and applications of relativity in the Global Positioning System (GPS). Prerequisites: PHYS 2425 and PHYS 2435 with grades of C or higher. about Relativity
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter about Relativity

PHYS 5100. Professional Development.
This course covers topics related to teaching, research, and employment responsibilities. The completion of this course is required as a condition of employment for graduate assistants. This course does not earn graduate degree credit, is repeatable with different emphasis, and is graded on a credit (CR), no-credit (F) basis. about Professional Development
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Course Attribute(s): Graduate Assistantship|Exclude from Graduate GPA
Grade Mode: Leveling/Assistantships about Professional Development
PHYS 5110. Seminar in Physics.
A course designed to acquaint the graduate student with current research areas in physics. May be repeated twice for total of three semester hour's credit.
about Seminar in Physics
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Seminar in Physics

PHYS 5195. Fundamentals of Research.
This course is designed to acquaint the graduate student with materials and methods of physics research. It is open to graduate students on an individual basis by arrangement with the department of Physics. This course may be repeated with prior approval of the department.
Instructor's approval required.
about Fundamentals of Research
1 Credit Hour. 0 Lecture Contact Hours. 3 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Fundamentals of Research

PHYS 5199B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.
about Thesis
1 Credit Hour. 1 Lecture Contact Hour. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

PHYS 5295. Fundamentals of Research.
This course is designed to acquaint the graduate student with materials and methods of physics research. It is open to graduate students on an individual basis by arrangement with the department of Physics. This course may be repeated with prior approval of the department.
Instructor's approval required.
about Fundamentals of Research
2 Credit Hours. 0 Lecture Contact Hours. 6 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter
about Fundamentals of Research

PHYS 5299B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.
about Thesis
2 Credit Hours. 2 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit
about Thesis

This course discusses the fundamentals of classical mechanics focusing on the physical description of the behavior of single and multiple particle systems. This is a graduate leveling course and does not earn graduate degree credit.
about Classical Mechanics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships
about Classical Mechanics

PHYS 5302. Electricity and Magnetism.
An introduction to the electromagnetic field theory of classical physics for static fields. Topics included will be the electrostatic field, polarization and dielectrics, electrostatic energy, magnetic field of steady currents, magneto static energy, and magnetic properties of matter. This is a graduate leveling course in Electricity and Magnetism (stacked with PHYS 4310). This course does not earn graduate degree credit.
about Electricity and Magnetism
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships
about Electricity and Magnetism

PHYS 5303. Quantum Mechanics.
An introductory course on quantum mechanics. Hamiltonian operator and Schroedinger equation, harmonic oscillator, matrix formulation of quantum mechanics, uncertainty principle, potential barrier problems, and the hydrogen atom. This is a graduate leveling course in Quantum Mechanics (stacked with PHYS 4312). This course does not earn graduate degree credit.
about Quantum Mechanics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from Graduate GPA|Leveling
Grade Mode: Leveling/Assistantships
about Quantum Mechanics

PHYS 5312. Quantum Mechanics II.
A study of quantum mechanics including combination of two or more quantum mechanical systems, addition of angular momentum, time independent perturbation theory, and time dependent perturbation theory.
about Quantum Mechanics II
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Quantum Mechanics II

PHYS 5313. Mathematical Methods of Physics.
This course is a survey of mathematical methods of physics as they apply to areas in classical mechanics, quantum mechanics, electrodynamics, and nuclear physics.
about Mathematical Methods of Physics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Mathematical Methods of Physics

PHYS 5314. Statistical Mechanics.
A study of statistical mechanics including a brief review of equilibrium thermodynamics, fundamentals of statistical mechanics, transport processes, fluctuations from equilibrium, phase transitions and critical phenomena, and quantum fluids.
about Statistical Mechanics
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
about Statistical Mechanics
A study of electronic properties of materials using classical and quantum mechanical models, simple band theory of a solid and some device. Also included is an introduction to band theory applied to other properties of solids such as magnetism, dielectric functions, transport properties, and superconductivity. Prerequisites: PHYS 5312.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5322. Semiconductor Device Microfabrication.
An in-depth overview of the physics and technology of VLSI and ULSI silicon semiconductor device microfabrication. Topics including electronic material preparation, thin film growth, silicon oxidation and etching, lithography processing, impurity diffusion, ion implantation and yield analysis will be covered.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5324. Thin Film Materials Laboratory.
An intensive laboratory introduction to the physics and materials fabrication and characterization. At the discretion of the instructor, laboratory projects introducing techniques such as sputtering, furnace/oven preparation, scanning probe microscopy, scanning electron microscopy, energy dispersive spectroscopy, four point probe transport methods, magnetometry and x-ray analysis may be offered. This course is preparatory for students seeking to apply for an experimental materials physics master’s thesis project. This course may be repeated with permission from the instructor.

3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5326. Electrical Characterization of Materials and Devices.
A laboratory/lecture course introducing electric characterization methods important to semiconductor materials and devices. Various measurement techniques and methods will be reviewed. Students will learn to work with industrial equipment. Prerequisite: PHYS 2425.

3 Credit Hours. 0 Lecture Contact Hours. 9 Lab Contact Hours.
Grade Mode: Standard Letter

The application of solid state physics for describing important examples of thin film device operation with a special emphasis on semiconductor devices. Additional topics may include photon and phonon effects on electronic properties, quantum phenomena, many body effects in solids, carrier transport properties, micro-electromechanical systems, and materials interface issues.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

Review of models of a solid and energy band theory. Additional topics may include interaction of electromagnetic waves with solids, lattice vibrations and phonons, many body effects in solids, device physics, quantum phenomena, carrier transport properties, current device configurations, and materials interface problems. Prerequisite: PHYS 5320.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

An introduction to the physical mechanisms governing the important failure modes of semiconductor integrated circuit devices and other emerging thin film devices. The application of materials physics characterization techniques for detecting the signatures of these failure mechanisms will also be reviewed. Prerequisites: PHYS 5324 and PHYS 5328, or instructor permission.

3 Credit Hours. 2 Lecture Contact Hours. 4 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5330. Advanced Dynamics.
Classical mechanics at an advanced level. Topics covered may include special relativity in classical mechanics, Hamilton equation of motion, canonical transformations, and Hamilton-Jacobi theory.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5331. Electromagnetic Field Theory.
Introduction to electrodynamics at the graduate level. Topics include applications of special functions to problems in electrostatics and magnetostatics, time varying fields, Maxwell’s equations, electromagnetic energy, Maxwell’s stress tensor, radiation, and special theory of relativity.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5332A. Thin Film Photovoltaic Devices.
This course is a survey of the Physics of photovoltaic devices with emphasis on device physics including the photovoltaic effect, photon absorption, electrons and holes, generation and recombination, the pn-junction, charge separation, monocrystalline solar cells, thin film solar cells, and losses.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

PHYS 5350A. Thin Film Photovoltaic Devices.
This course is an introduction to the physics of photovoltaic devices with a special emphasis on device physics including the photovoltaic effect, photon absorption, electrons and holes, generation and recombination, the pn-junction, charge separation, monocrystalline solar cells, thin film solar cells, and losses.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter
PHYS 5350B. Relativity.
This course includes a review of Special Relativity, an introduction to the mathematics of tensor calculus and differential geometry, and such topics from General Relativity as the Schwarzschild solution and black holes, tests of General Relativity, cosmological models, and applications of relativity in the Global Positioning System (GPS).

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing|Topics
Grade Mode: Standard Letter

PHYS 5370. Problems in Advanced Physics.
Open to graduate students on an individual basis by arrangement with the Department of Physics. May be repeated with prior approval of the department.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5395. Fundamentals of Research.
Course is available to graduate students only at the invitation of the department. May be repeated with prior approval of the department.

3 Credit Hours. 0 Lecture Contact Hours. 6 Lab Contact Hours.
Grade Mode: Standard Letter

PHYS 5398. Industry Internship.
Supervised work experience in an appropriate high tech industry. Students will be required to keep a daily journal and make a final presentation (both written and oral) describing their accomplishments. Graded on a credit (CR), no credit (F) basis.

3 Credit Hours. 0 Lecture Contact Hours. 40 Lab Contact Hours.
Grade Mode: Credit/No Credit

PHYS 5404. Experimental Methods.
Experiments in modern physics, with emphasis on demonstrating quantum effects and introducing nuclear physics.

4 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter

PHYS 5599B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

5 Credit Hours. 5 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit

PHYS 5999B. Thesis.
This course represents a student's continuing thesis enrollments. The student continues to enroll in this course until the thesis is submitted for binding. Graded on a credit (CR), progress (PR), no-credit (F) basis.

9 Credit Hours. 9 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Credit/No Credit