PHYS Physics

PHYS 5090G Selected Topics in Physics
2-4 Credit Hours. 0-5 Lecture Hours. 0-6 Lab Hours.
A course allowing for investigation of selected topics in Physics; it will be taught on a one-time basis. Lecture only course can be for two, three, or five credit hours. For laboratory courses, one credit hour will be given for every three hours spent working in lab. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): A minimum grade of "C" in PHYS 1112 or PHYS 2212.
Cross Listing(s): ASTR 5090, ASTR 5090G, PHYS 5090.

PHYS 5151G Classical Mechanics
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
Provides physics majors and students of applied mathematics and engineering with the fundamentals of analytical mechanics. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): MATH 3230 and a minimum grade of "C" in PHYS 2211 and PHYS 2212.
Cross Listing(s): PHYS 5151.

PHYS 5152G Classical E and M Theory
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
Provides physics majors and students of applied mathematics and engineering with the fundamentals of electromagnetic field theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 5151.
Cross Listing(s): PHYS 5152.

PHYS 5530G Thermal Physics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A course in classical thermodynamics and kinetic theory. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): MATH 2243 and a minimum grade of "C" in PHYS 2211 and PHYS 2212.
Cross Listing(s): PHYS 5530.

PHYS 5536G Studies in Physics for Secondary Teachers
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Designed to acquaint the student with some of the problems encountered in high school physics presentations. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): MATH 1113.
Cross Listing(s): PHYS 5536.

PHYS 5557G Quantum Mechanics
5 Credit Hours. 5 Lecture Hours. 0 Lab Hours.
A study of the basic postulates of quantum mechanics with solutions to Schrödinger’s wave equation for simple applications: the techniques of calculating position, energy and momentum with operators and the elements of perturbation theory with application to atomic spectra. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do.
Prerequisite(s): PHYS 3536, PHYS 3537, and MATH 3230.
Cross Listing(s): PHYS 5557.

PHYS 5890G Physics Research Experience
1-4 Credit Hours. 0-3 Lecture Hours. 0 Lab Hours.
An independent physics research experience in which a student will investigate a research question under the direction of a faculty member. Students will be expected to maintain a laboratory notebook, prepare a written summary of the research, and give an oral presentation at the end of the experience. Graduate students will be given an extra assignment determined by the instructor that undergraduates will not be required to do. Permission of instructor required.
Cross Listing(s): ASTR 5890, ASTR 5890G, PHYS 5890, PHYS 5890H, PHYS 5890S.

PHYS 6131 Solid State Materials
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduction to the physical and chemical properties of solids. Topics may include: periodic structure, symmetry of crystals, diffraction, reciprocal lattice, chemical bonding, lattice dynamics, phonons, thermal properties, and free electron gas. Bloch theorem, band structure, nearly free electron approximation, tight binding method, Fermi surface, semiconductors, electrons, holes, impurities, optical properties, excitons, and magnetism will be introduced.
Prerequisite(s): MATH 2242 with a minimum grade of "C".

PHYS 6132 Applied Optics
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course offers an introduction to laboratory optics, optical principles, and optical devices and systems. The course covers a wide range of topics, including: polarization properties of light, reflection and refraction, coherence and interference, Fraunhofer and Fresnel diffraction, holography, imaging and transforming properties of lenses, spatial filtering, and two-lens coherent optical processor. In addition, this course covers: optical properties of materials, lasers, electro-optic, acousto-optic and liquid-crystal light modulators, optical detectors, optical waveguides and fiber-optic communication systems. Students engage in extensive oral and written communication exercises.
Prerequisite(s): MATH 2242 with a minimum grade of "C".

PHYS 6133 Photonics, Plasmonics and Metamaterials
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The course offers an introduction into theory and models related to photonics and electronics of photonic crystals, plasmonic metal nanostructures, metal-dielectric metamaterials and metasurfaces, localized scatterers and emitters. Students will improve their overall understanding of how these methods and models apply to practical systems related to spectroscopy, imaging, excitation and control over condensed, chemical and biological nano- and microstructures. The course covers a broad range of topics including: dielectric properties of materials in relation to their electronic structure, propagation and emission of radiation in strongly inhomogeneous and anisotropic materials, introduction into plasmonics, properties of photonic crystals and metamaterials, Mie theory of light scattering and near-fields at micro and nanoparticles, optical forces and tweezers, energy and momentum transfer in light-matter interactions and others.

PHYS 6231 Thin-Film Coating
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will cover the physics and chemistry of thin film coating. Topics covered will include thermal, optical, electric, and mechanical properties of multi-layer metallic coatings and coating manufacturing techniques. Special topics will be given by experts from local coating industry.
Prerequisite(s): PHYS 6237 with a minimum grade of "C".
PHYS 6237  Applied Quantum Mechanics  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
This course is designed to review Schrodinger's theory of quantum mechanics for application in modern devices and systems. Topics covered are quantum statistics, multi-electron atoms, molecules, one and two dimension system, and neon particle system. Calculation techniques introduced are matrix diagonalization, perturbation theory, variational method, time-dependent perturbation theory to apply to optical absorption, and nonlinear optical properties of materials.

PHYS 6730  Master of Science in Physical Science Internship  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
This course is the required internship for the Masters of Science in Physics Science degree. Students will apply their skills and knowledge to a current problem in a professional setting, either on campus or at the site of a participating sponsor.

PHYS 7090  Selected Topics in Physics  
1-6 Credit Hours.  0-6 Lecture Hours.  0-6 Lab Hours.  
A course allowing for investigation of selected topics in Physics.

PHYS 7330  Principles and Practice of Pre-clinical Drug Development  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
This course introduces key issues and aspects of developing a new small molecule or biological drug, with focus on the guidelines from regulatory agencies on the data required for the Investigational New Drug (IND) application. Major issues in Pharmacology, Toxicology, Safety Pharmacology, Pharmacokinetics, Chemistry, Manufacturing and Control (CMC) sections of the IND submission process are described. Practices of laboratory animal efficacy models, pharmacokinetics models, toxicology study protocols, master batch record generation and the concepts of Good Laboratory Practice (GLP)/Good Manufacturing Practices (GMP) will be covered, with particular emphasis on the Code of Federal Regulations Title 21 part 58, 210 and 211.  
Prerequisite(s): CHEM 5333 with a minimum grade of "C".

PHYS 7630  Graduate Seminar  
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.  
This course will consist of formal seminars and informal sessions on current topics of interest to the program as presented by visiting lecturers, local researchers, and students. All MS-APS students must attend a set number of seminars each term they are enrolled in the program. Thesis track students in their final semester will prepare a comprehensive presentation on their thesis research as well as submit a report reviewing the topics covered during the seminar series.

PHYS 7999  Thesis  
1-3 Credit Hours.  0 Lecture Hours.  0 Lab Hours.  
Results of an individual, independent research project will be presented as a thesis in partial fulfillment of the Master of Science in Physical Science degree. The thesis requires defense of the design, execution, analysis, and interpretation of the research project.