

DEPARTMENT OF PHYSICS

Science and Technology Center (McNulty Hall)

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shu.edu/physics/ (<https://www.shu.edu/physics/>)

Faculty: Lopez; Sahiner (*Chair*); Shojania-Feizabadi; Troha; Wang (*Director of Graduate Studies*), Jiang.

Term Faculty: Morales; Konjhodzic

Adjunct Faculty: Schoene; Yurko

- Applied Physics and Engineering (M.S.) (<http://catalogue.shu.edu/graduate/college-arts-sciences/department-physics/applied-physics-engineering-ms>)

Note to Students: The following listing represents those courses that are in the active rotation for each department, i.e., have been offered in the past five years. Some departments have additional courses offered more rarely but still available – to find the complete list of all official courses for a department, please use the “Course Catalogue Search” function in Self-Service Banner.

Course Descriptions

PHYS 6002 Literature Seminar (0 Credits)

Colloquium, seminars on Physics related subjects by departmental or guest speakers

PHYS 6100 Literature Sem - Thesis (1 Credit)

PHYS 6101 Research in Physics (2 Credits)

Graduate research in experimental or theoretical physics

PHYS 6102 Research in Physics II (2 Credits)

PHYS 6103 Research in Physics III (2 Credits)

PHYS 6104 Research in Physics IV (2 Credits)

PHYS 6121 Advanced Mechanics (3 Credits)

Graduate level Classical Mechanics course, variational principles, Lagrange's Equations, Hamiltonian equations of motion, rigid body and oscillations, classical chaos.

PHYS 6186 Electricity and Magnetism II (3 Credits)

PHYS 6211 Math Methods for Scientists I (4 Credits)

Graduate level mathematical methods course covering ordinary differential equations, integral transforms, complex variables, Fourier series, Sturm-Liouville theory.

PHYS 6219 Statistical Physics (3 Credits)

Graduate level Statistical Physics course, probability theory, phase space, partition functions, entropy, thermodynamics laws, harmonic oscillators, quantum gas, Bose-Einstein condensation, ferromagnetism, critical exponents

PHYS 6221 Solid State Physics (3 Credits)

Upper UG / Graduate level Solid State Physics course covering crystal structures, diffraction and reciprocal lattice, elastic constants, phonons and lattice vibrations Brillouin zones, inelastic scattering, Debye and Einstein Models, Free Electron Fermi Gas, energy bands, Fermi surfaces, semiconductors, and metals, superconductivity and magnetism

PHYS 6227 Plasma and Gas Discharge Phys (3 Credits)

Graduate level Plasma Physics course, charged particle motion in electric and magnetic fields; electron and ion emission; ion-surface interaction; electrical breakdown in gases; dark discharges and DC glow discharges; confined discharge; AC, RF, and microwave discharges; arc discharges, sparks, and corona discharges; nonthermal gas discharges at atmospheric pressure; and discharge and low-temperature plasma generation.

PHYS 6228 Plasma Processing (3 Credits)

Graduate level Plasma Physics course, the course commences by reviewing basic plasma physics, some atomic processes, and plasma diagnostics. The course then delves into plasma production using DC glow discharges and RF glow discharges such as magnetron discharges. Broad topics studied in detail are plasma-surface interaction; sputter deposition of thin films; reactive ion etching, ion milling, and texturing; electron beam-assisted chemical vapor deposition; and ion implantation. Further, the topics of sputtering systems, ion sources, electron sources, and ion beam handling will be covered in the course.

PHYS 6229 Cellular Engineering (3 Credits)

The main goal of this course was to study and understand cell structure-function relationships with an emphasis on the investigation of the physical concepts behind the process of mitosis and the roles of biofilaments and other proteins in connection with it.

PHYS 6230 Semiconductor Devices and Renewable Energy Engineering (3 Credits)

The main goal of this course was to study and understand the physics and engineering of semiconductor devices used in renewable energy. The course will cover the device physics, engineering, resources, and storage of renewable energy.

PHYS 6412 Quantum Mechanics II (3 Credits)

PHYS 6511 Advanced Quantum Mechanics (3 Credits)

Graduate level quantum mechanics course covering quantum theory of radiation, relativistic quantum mechanics, covariant perturbation theory