PHYSICS (3650)

3650:130. Descriptive Astronomy. (4 Credits)
Qualitative introduction to astronomy, intended primarily as a first science course for non-science majors. Includes laboratory and observational activities.

3650:133. Music, Sound & Physics. (4 Credits)
Qualitative introduction to the physics of sound, its properties, perception and reproduction, including acoustical principles of musical instruments. Laboratory and observational activities included.

3650:137. Light. (4 Credits)
Introductory, qualitative course dealing with the nature of light and the interaction of light with various materials to produce common visual effects. Laboratory activities provide experience in scientific investigation.

3650:261. Physics for Life Sciences I. (4 Credits)
Prerequisites: high school algebra, trigonometry or 3450:149 as corequisite or permission. Introductory course for professional work in biology and health professions and services. Emphasizes life science applications. Mechanics: laws of motion, force, torque, work, energy, power; properties of matter: gases, liquids, solids, fluid mechanics. Includes laboratory activities.

3650:262. Physics for Life Sciences II. (4 Credits)
Prerequisite: 3650:261. Laws of thermodynamics, kinetic theory. Wave phenomena: sound, light, optics; electricity and magnetism; atomic and nuclear physics; radioactivity. Includes laboratory activities.

3650:267. Life Science Physics Computations I. (1 Credit)

3650:268. Life Science Physics Computations II. (1 Credit)

3650:291. Elementary Classical Physics I. (4 Credits)
Prerequisite: Completion of 3450:221 with a grade of "C" or better, or AP Calculus AB, or BC test score of 3 or better. Introductory physics for students of science and engineering. Classical kinematics and dynamics as related to contemporary physics. Oscillations, thermodynamics. Vectors and some calculus introduced as needed. Includes laboratory activities.

3650:292. Elementary Classical Physics II. (4 Credits)
Prerequisite: 3650:291. Fluid mechanics, mechanical and electromagnetic waves and wave phenomena, basic laws of electromagnetism, interference and diffraction, coherence, geometrical and physical optics. Includes laboratory activities.

3650:293. Physics Computations I. (1 Credit)
Corequisite: 3650:291. Optional companion courses to 3650:291 and 3650:292 provides experience in problem solving, and elaborates application of calculus to simple physical phenomena. Particularly recommended for a freshman and for student with modest preparation in mathematics or physical sciences.

3650:294. Physics Computations II. (1 Credit)
Corequisite: 3650:292. Optional companion courses to 3650:291 and 3650:292 provides experience in problem solving, and elaborates application of calculus to simple physical phenomena. Particularly recommended for a freshman and for student with modest preparation in mathematics or physical sciences.

3650:301. Elementary Modern Physics. (3 Credits)
Prerequisite: 3650:292. Special relativity, introduction to quantum physics, hydrogen atom and complex atoms, atomic spectra, topics in nuclear and solid-state physics.

3650:322. Intermediate Laboratory I. (3 Credits)
Prerequisite: 3650:262 or 3650:292. Laboratory course stressing measurement techniques with contemporary laboratory apparatus. Experiment design, instrument calibration and reporting emphasized. Modern physics experiments and measurement of fundamental natural constants.

3650:323. Intermediate Laboratory II. (3 Credits)
Prerequisite: 3650:262 or 3650:292. Laboratory course stressing measurement techniques with contemporary laboratory apparatus. Experiment design, instrument calibration and reporting emphasized. Modern physics experiments and measurement of fundamental natural constants.

3650:340. Thermal Physics. (3 Credits)
Prerequisite: 3650:262 or 3650:292. Basic principles of thermal and statistical physics. Ensembles, laws of thermodynamics, equilibrium, irreversibility, equipartition theorem, canonical distribution, Maxwell distribution, phase changes, cyclic processes, transport processes.

3650:350. Modeling & Simulation. (4 Credits)
Prerequisites: [3650:262 or 3650:292] and [3460:208 or 3460:209]. Interdisciplinary course stressing modeling of natural phenomena using fundamental principles and their simulation. Topics may include growth phenomena, fault propagation, kinetics, chemical reactions, wave phenomena.

3650:399. Undergraduate Research. (1-6 Credits)
(May be repeated) Prerequisite: Permission of instructor. Participation in current research project in department under supervision of faculty member.

3650:401. Everyday Physics. (4 Credits)
Prerequisite: Permission of instructor. College-level physics content for future teachers. Inquiry, discovery, activities, discussion, and experiential learning take place in a laboratory/embedded-lecture environment.

3650:406. Optics. (3 Credits)

3650:431. Mechanics I. (3 Credits)

3650:432. Mechanics II. (3 Credits)
Prerequisite: 3650:431. Advanced mechanics at the senior or beginning graduate level, moving coordinate systems, mechanics of continuous media, Lagrange's equations, tensor algebra and stress analysis, rotation of rigid bodies, vibration theory.
3650:436. Electromagnetism I. (3 Credits)
Prerequisites: 3650:291, and 3650:350, and 3450:335. Electricity and magnetism at intermediate level. Electrostatics and magnetostatics, electric field, scalar potential, dielectrics, Laplace's and Poisson's equations, currents, magnetic field, vector potential, magnetic materials, inductance.

3650:437. Electromagnetism II. (3 Credits)
Prerequisite: 3650:436. Special relativity, four vectors, Maxwell's equations in covariant form; propagation, reflection and refraction of electromagnetic waves; multipole radiation.

3650:441. Quantum Physics I. (3 Credits)
Prerequisites: 3650:301, and 3650:350, and 3450:335. Introduction to quantum theory, Schrödinger equation, observables, angular momentum, perturbation theory, variational principle, bound states, scattering theory, radiative interactions, spin and the Pauli Principle.

3650:442. Quantum Physics II. (3 Credits)
Prerequisite: 3650:441. Applications of quantum mechanics to atomic, nuclear and solid state physics. Tunneling and alpha decay, periodic potential, hydrogen and helium atoms, interatomic forces, quantum statistics.

3650:451. Advanced Laboratory I. (3 Credits)
Prerequisite: 3650:323. Experimental techniques, applicable to research-type projects in contemporary physics. FT-IR spectroscopy, optical spectroscopy, lasers and thin-film growth and characterization.

3650:452. Advanced Laboratory II. (3 Credits)
Prerequisite: 323 or permission of instructor. Experimental projects applicable to contemporary physics. Diode and dye lasers, NMR, SPM, chaos, electron tunneling and fiber optics.

3650:470. Introduction to Solid-State Physics. (3 Credits)
Prerequisite: 3650:441. Account of basic physical processes occurring in solids, with emphasis on fundamental relation between these processes and periodicity of crystalline lattice.

3650:481. Methods of Mathematical Physics I. (3 Credits)
Prerequisites: 3650:292, 3650:350, 3450:335 and senior or graduate standing in a physical science or engineering. Vectors, generalized coordinates, tensors, calculus of variations, vector spaces, linear transformations, matrices, eigenvalues, Hilbert space, boundary value problems, transcendental functions, complex variables, analytic functions, Green's functions, integral equations.

3650:482. Methods of Mathematical Physics II. (3 Credits)
Prerequisites: 3650:292, 3450:335 and senior or graduate standing in a physical science or engineering. Vectors, generalized coordinates, tensors, calculus of variations, vector spaces, linear transformations, matrices, eigenvalues, Hilbert space, boundary value problems, transcendental functions, complex variables, analytic functions, Green's functions, integral equations.

3650:488. Selected Topics: Physics. (1-4 Credits)
(May be repeated) Prerequisite: Permission. Consideration of selected topics, procedures, techniques, materials or apparatus of current interest in physics.

3650:490. Workshop: Physics. (1-4 Credits)
(May be repeated) Group studies of special topics in physics. May not be used to meet undergraduate or graduate major requirements in physics. May be used for elective credit only.

3650:497. Independent Study: Physics. (1-4 Credits)
(May be repeated) Prerequisite: Permission. Further investigations of various selected topics in physics, under guidance of faculty member.

3650:498. Physics Colloquium. (1 Credit)
Lectures on current research topics in physics by invited speakers. May be repeated but only one credit counts toward the M.S. Degree. Offered on a credit/noncredit basis only.