

PHYSICS (PHY)**311 Moulton Hall, (309) 438-8756****PHY.IllinoisState.edu****Chairperson:** Daniel Holland.**Graduate Faculty:** Christensen, Grobe, Harris, Holland, Martin, Marx, Rosa, Rosenblatt, Rutherford, Su.**Programs Offered**

Graduate degrees are not granted in the Department of Physics, but coursework is available as supplemental study or as electives.

Physics Courses**310 READINGS FOR TEACHING HIGH SCHOOL PHYSICS****3 sem. hrs.**

Essential background readings for teaching high school physics that center around developing scientific literacy in students. Prerequisites: Completion of 10 hours in Physics.

311 TEACHING HIGH SCHOOL PHYSICS**3 sem. hrs.**

Strategies, curricula, and resources for the teaching of high school physics. Application of knowledge of physics, adolescent psychology, and pedagogical theory to secondary teaching. Includes Clinical Experience: 10 hours. Prerequisites: PHY 310; 18 hours in Physics; grade of C or better in TCH 216, or concurrent registration.

312 PHYSICS TEACHING FROM THE HISTORICAL PERSPECTIVE**3 sem. hrs.**

Qualitative overview of the development of classical scientific thought relating to physical phenomena with applications to pedagogy. Prerequisites: Completion of 20 hours in Physics; Admission to Professional Studies.

318 METHODS OF COMPUTATIONAL SCIENCE**3 sem. hrs.**

Introduction to a wide variety of computational techniques and their application to problems in chemistry and physics. Also offered as CHE 318. Prerequisites: IT 165; CHE 140; PHY 109 or 111; CHE 360 or PHY 220; or concurrent registration; or consent of the instructor.

320 MECHANICS II**3 sem. hrs.**

Coordinate transformations, nonlinear oscillations, Hamilton's Principle, Lagrangian and Hamiltonian mechanics, rigid body motion. Prerequisites: PHY 220 and MAT 340.

355 SOLID STATE PHYSICS**3 sem. hrs.**

Crystal structures, X-ray and electron diffraction, lattice vibrations and thermal properties, binding energy, conduction of electrons, band theory, dielectric and magnetic properties, defects, metals, semiconductors, and insulators. Prerequisite: PHY 325.

375 ELECTRONICS FOR SCIENTISTS**3 sem. hrs.**

DC and AC circuit analysis with an introduction to the electrical properties of semiconductors; theoretical and experimental analysis of semiconductor diode, transistor, and operational amplifier circuits. Lecture and lab. Prerequisite: PHY 111.

380A80 TOPICS IN CONTEMPORARY PHYSICS: BIOPHYSICS OF NEUROLOGICAL SYSTEMS**3 sem. hrs.**

Biophysical principles of cell signaling and communication, including mathematical modeling, computer simulations and hands-on lab activities. Prerequisites: Completion of 75 hours. Consent of the instructor.

384 QUANTUM MECHANICS II**3 sem. hrs.**

Operator formalism, Dirac bra and ket notation, angular momentum, perturbation theory, applications to laser physics. Prerequisites: PHY 284 and MAT 340.

387 METHODS OF MATHEMATICAL PHYSICS**3 sem. hrs.**

Finite- and infinite-dimensional vector spaces, matrices and determinants, Fourier analysis, complex analysis, differential equations, emphasis on physical applications. Prerequisites: PHY 240 and MAT 340 or concurrent registration.

388 ADVANCED COMPUTATIONAL PHYSICS**3 sem. hrs.**

Application of computational methods to contemporary topics in physics, including nonlinear classical and quantum dynamics or physical problems that involve many degrees of freedom. Prerequisites: PHY 220, 240, 284, and 318, or consent of the instructor.

400 INDEPENDENT STUDY**1-4 sem. hrs.**

Refer to General Courses. Prerequisite: Consent of the instructor.

413 TEACHING HIGH SCHOOL PHYSICS II**3 sem. hrs.**

Employs goal setting, self-assessment, and instructional design as a way of improving the physics teacher's inquiry practice. Prerequisite: Open only to licensed, inservice high school teachers of physics and/or physical science with a minimum of two years teaching experience.

480 SPECIAL TOPICS IN PHYSICS EDUCATION RESEARCH**3 sem. hrs.**

Investigation of the research literature surrounding specially selected topics in physics education and the implications of this research for teaching. Prerequisites: Enrollment requires experience in physics teaching and consent of the instructor.