PHYSICS (PHY)

PHY 500 PHYSICS EDUCATION RESEARCH SEMINAR
3, 3/0
Designed for practicing or future high school physics teachers. Includes reading and discussion of current research in physics education, evaluation and discussion of the application of this research to the New York State physics core curriculum, and the exploration and practice of assessment techniques in high school physics.

PHY 502 INITIAL PHYSICS TEACHING EXPERIENCE FOR ALTERNATIVE CERTIFICATION
3-6, 3/0
Prerequisite: Acceptance to the alternative certification in physics program. Full-time physics teaching with college supervision and school supervision: lesson and unit design, classroom management, designing and implementing student assessment, participation in school community.

PHY 507 ENERGY AND FORCE INTERACTIONS FOR K-8 TEACHERS
3, 1/4
Designed for elementary teachers to better understand physics and the nature of science. Focus on interactions and energy: energy, force, friction, gravity, magnetic fields, light, and electricity. Not appropriate for students with extensive physics background.

PHY 510 REGENT'S PHYSICS SCIENCE PRACTICES
4, 2/4
Prerequisites: Graduate standing, Introductory physics sequence or permission of instructor. Students apply the Next Generation Science Standards (NGSS Lead States, 2013) practices of asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics, constructing explanations, and engaging in argument from evidence. Students apply these practices to physics concepts. Offered summer sessions.

PHY 511 COMPUTATIONAL PHYSICS FOR TEACHERS
3, 3/0
Prerequisites: PHY 111, PHY 112 and PHY 213 or instructor permission. Study of problems from various physics content areas using a variety of computational tools (e.g. spreadsheets, computer programming) and techniques (Newton's method, Runge-Kutta). Physical systems including harmonic oscillator with damping, gravitational force (orbits, central force problem), electric and magnetic field and potential calculations, thermal and statistical physics, motion with air friction, wave motion, quantum mechanical tunneling and scattering. Pedagogical issues associated with using computation in the high school classroom.

PHY 518 WAVE PHENOMENA AND OPTICS FOR TEACHERS
3, 3/0
Wave phenomena, including types, motion, interaction, and propagation; diffraction and interference; geometrical optics. Emphasizes research-based profiles of student conceptual difficulties and instructional strategies to remedy them.

PHY 520 MODERN PHYSICS FOR TEACHERS
3, 3/0
Major developments in twentieth and twenty-first century physics and how they changed our understanding of the nature of space and time and the structure of matter. Application of physics education research to teaching relativity and quantum physics in a high school physics course.

PHY 521 EXPERIMENTS IN MODERN PHYSICS FOR TEACHERS
3, 0/6
Prerequisite: PHY 520 or equivalent. Hands-on activities and advanced experiments chosen from the areas of optics, modern physics, nuclear physics, and solid state physics with the goals of learning modern laboratory techniques, data analysis, and lab report writing.

PHY 522 ENERGY: SUSTAINABILITY AND RENEWABILITY FOR TEACHERS
3, 2/2
Prerequisites: PHY 107 and PHY 108. Different energy sources, their global supply, and physical laws governing their present use in the world. Topical energy sources and physical laws for the hydrogen fuel cell, solar cell and wind turbine; using them in applications and devices.

PHY 525 NUCLEAR AND PARTICLE PHYSICS FOR TEACHERS
3, 3/0
Major developments in nuclear and particle physics in the twentieth and twenty-first century, culminating in the standard model. Discussion of how these developments changed our understanding of the structure or matter.

PHY 588 TOPICS COURSE
3, 3/0

PHY 590 INDEPENDENT STUDY
1-3, 0/0

PHY 594 GRADUATE WORKSHOP
1-3, 0/0
In-depth study of a current issue in physics for grade school physics teachers culminating in a professional presentation or manuscript. Offered occasionally.

PHY 596 GRADUATE CONFERENCE
1-3, 0/0
Prepare and conduct a scholarly presentation (poster or paper) on physics for school teaching at a regional, national or international professional academic conference. Offered occasionally.

PHY 620 MECHANICS FOR HIGH-SCHOOL TEACHERS
6, 3/6
Prerequisites: PHY 111 and PHY 510, or instructor permission. Designed for practicing or future high school physics teachers. Activities and laboratory experiences develop ideas in force, motion, and energy. Exemplary pedagogical techniques are modeled and examined. Offered every alternate summer.

PHY 622 ELECTRICITY AND MAGNETISM FOR HIGH SCHOOL TEACHERS
6, 3/3
Prerequisites: PHY 510 and PHY 112, or instructor permission. Designed for high school physics teachers. Activities and laboratory experiences develop ideas in electricity and magnetism. Exemplary pedagogical techniques are modeled and examined. Offered summer only.

PHY 690 MASTER'S PROJECT
1-3, 0/0
Study of a problem of special interest, preapproved by the physics graduate committee and submitted in acceptable form according to directions given by the Physics Department.

PHY 721 THESIS/PROJECT CONTINUATION
0, 0/0

PHY 722 THESIS/PROJECT EXTENDED
0, 0/0