Physics

Ruprecht Machleidt, Interim Dept. Chair of Physics (311A Engineering/Physics Bldg. 83844-0903; phone 208/885-6380.

Credit Limitations: Phys 100 carries no credit after 111 or 211; Phys 111 carries no credit after 211; 112 carries no credit after 212.

Phys **100 Fundamentals of Physics** (4 cr). *May be used as core credit in J-3-b.* For students in nontechnical fields. Conceptual study of laws of nature and their application, including mechanics, heat, electricity and magnetism, light, and modern physics. Three lec and one 2-hr lab a wk. (Spring only)

Phys **103 General Astronomy** (3 cr). *May be used as core credit in J-3-b.* Descriptive and physical astronomy; development of astronomical thought; properties and evolution of the solar system, stars, galaxies, and the universe. (Fall only)

Phys **104 Astronomy Lab** (1 cr). *May be used as core credit in J-3-b.* Naked eye, telescopic, and photographic observations of constellations, stars, and planets. One 2-hr lab a wk; some evening meetings. Prereq or coreq: Phys 103.

Phys **111 General Physics I** (4 cr). (C) *May be used as core credit in J-3-b.* Kinematics, forces and dynamics, conservation laws, thermodynamics, waves. Three lec, one recitation, and one 2-hr lab a wk. Prereq: Math 143.

Phys **112 General Physics II** (4 cr). (C) *May be used as core credit in J-3-b.* Electricity, magnetism, optics, and modern physics. Three lec, one recitation, and one 2-hr lab a wk. Prereq: Phys 111.

Phys **200** (s) **Physics Seminar** (1 cr, max 8). Introductory-level discussion of topics in modern physics; introduction to physics research topics and scientific information search techniques; written and/or oral reports of a pertinent topic in current physics. (Fall only)

Phys **211 Engineering Physics I** (4 cr; 5 cr Idaho Falls). *May be used as core credit in J-3-b.* Kinematics and dynamics, Newton's laws, work and energy, rotational dynamics, linear and angular momentum, collisions, static equilibrium, oscillations, gravity and central forces; 5-cr course also includes fluid dynamics, waves in elastic media, sound waves. Three lec, one recitation, and one 2-hr lab a wk (5-cr course available only in Idaho Falls: four lec and one 2-hr lab a wk). Prereq or coreq: Math 170.

Phys **212 Engineering Physics II** (4 cr; 5 cr Idaho Falls). *May be used as core credit in J-3-b.* Electric fields and potentials, magnetic fields, capacitance and inductance, DC and AC circuits, electromagnetic waves; 5-cr course also includes temperature, heat and thermodynamics, kinetic theory, geometric and physical optics. Three lec, one recitation, and one 2-hr lab a wk (5-cr course available only in Idaho Falls: four lec and one 2-hr lab a wk). Prereq: Phys 211. Prereq or coreq: Math 175.

Phys **213 Engineering Physics III** (4 cr). Fluid dynamics, waves in elastic media, sound waves, temperature, heat and thermodynamics, kinetic theory, geometric and physical optics. Three lec, one recitation, and one 2-hr lab a wk. Prereq: Phys 211. Prereq or coreq: Math 175. (Spring only)

Phys **301 Junior Physics Lab** (2 cr). Experimental techniques in modern physics, including optics, atomic, nuclear, and solid state physics; computer uses, error analysis, and scientific literature searches. One 1-hr lec and one 3-hr lab a wk. Prereq: Phys 213 or perm. (Spring only)

Phys **305 Modern Physics** (3 cr). Quantum and relativity theories with applications to atomic, solid state, nuclear, and elementary particle physics. Prereq: Phys 212, 213. Coreq; Math 275. (Spring only)

Phys **321-322 Analytical Mechanics** (3 cr). Statics; kinematics and dynamics of a particle; systems of particles; rigid continuous media; intro to Lagrange's equations. Prereq: 213 and Math 275. Prereq for Phys 322: Phys 321.

Phys **341-342 Electromagnetic Fields I-II** (3 cr). Theory using vector calculus; electrostatics; magnetostatics, electromagnetism, analysis of AC and DC circuits; Maxwell's equations; radiation and propagation of electromagnetic waves. Prereq: 212 , 213 and Math 275. Prereq for Phys 342: Phys 341.

Phys **351 Introductory Quantum Mechanics I** (3 cr). One-dimensional theory; free particle, bound states, potential barriers, harmonic oscillator, matrix methods, and Dirac notation; interpretations of quantum theory. Prereq: Phys 305, 371.

Phys **352 Introductory Quantum Mechanics II** (3 cr). Three-dimensional theory; angular momentum, motion in central potential, identical particles and spin, perturbation theory and variational methods. Prereq: Phys 351.

Phys **ID371 Mathematical Physics** (3 cr). Same as Math 371. WSU Phys 371. Mathematical techniques needed in upper-division physics courses, including vector analysis, matrices, Sturm-Liouville problems, special functions, partial differential equations, complex variables. Prereq: Phys 212, Math 275.

Phys **400** (s) **Seminar** (cr arr). Prereq: perm.

Phys **403** (s) **Workshop** (cr arr). Prereq: perm.

Phys **404** (s) **Special Topics** (cr arr). Prereq: perm.

Phys **411 Physical Instrumentation I** (3 cr). Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two lec and one 3-hr lab a wk. Prereq: Phys 212 or 213, and Math 275.

Phys **412 Physical Instrumentation II** (3 cr). Methods and instruments used in experimental physics; electronic techniques; design problems in electronic measurement of physical quantities encountered in research. Two lec and one 3-hr lab a wk. Prereq: Phys 411.

Phys **ID-J425/J525 Relativity** (3 cr). WSU Phys 425. Introduction to the Special and General Theories of Relativity. Principle of relativity, Poincare and Lorentz transformations and their consequences. Four-dimensional formulation of relativistic mechanics and electromagnetism. Principle of equivalence and the geometric theory of gravitation. Prereq: Phys 305 and Sr standing.

Phys **ID-J428/J528 Computational Physics** (3 cr). WSU Phys 428. Numerical techniques for differentiation, quadrature, and integration of differential equations. Matrix operations. Monte Carlo methods. Applications to physical problems. Prereq: Phys 305.

Phys **431 Thermodynamics and Kinetic Theory** (3 cr). Laws of thermodynamics, kinetic theory, and their application to topics in physics. Coreq: Phys 305.

Phys **J443/J543 Optics** (3 cr). Geometrical optics, wave optics and physical optics with emphasis on modern instrumentation and methods of measurement. Additional projects/assignments reqd for grad cr. Prereq Phys 443: Phys 212 or 213, Math 175, and Sr standing or perm. Prereq Phys 543: Admission to Physics Grad program or perm.

Phys **J444/J544 Quantum Optics** (3 cr). Introduction to the physics of lasers, laser spectroscopy, non-linear optical effects, and the interaction of radiation and matter. Additional projects/assignments reqd for grad cr. Prereq Phys 444: Phys 212 or 213, Math 175, and Sr standing or perm. Prereq Phys 544: Admission to Physics Grad program or perm.

Phys **ID&WS463 Introduction to Solid State** (3 cr). WSU Phys 463. Physics of bulk matter; structure and types of solids, elastic and thermal properties of solids, electric and magnetic properties of solids, theory of conduction in metals and semiconductors. Prereq: Phys 305 and 321.

Phys **ID&WS-J465/ID&WS-J565 Particle and Nuclear Physics** (3 cr). WSU Phys 465/565. Particle production and detection, properties and classification of particles, the quark model of hadrons, symmetries and conservation laws, interactions, grand unification, the strong interaction and nuclear forces, models for nuclear structure and reactions. Additional projects/assignments required for graduate credit. Prereq: Phys 305.

Phys **ID&WS-J484/J584 Astrophysics** (3 cr). WSU Astr 435. Structure and evolution of stars and star systems; celestial mechanics; special and general relativity; cosmology. Prereq for Phys 484: Phys 103, 305, Math 275, or perm. Prereq for Phys 584: Admission to physics grad program or perm.

Phys **490 Research** (1-6 cr, max 6). Undergrad thesis. Prereq: Jr standing in physics and perm of dept.

Phys **497** (s) **Practicum in Tutoring** (1 cr, max 2). Tutorial services performed by advanced students under faculty supervision. Graded P/F. Prereq: perm.

Phys **499** (s) **Directed Study** (cr arr). Prereq: perm.

Phys **500 Master's Research and Thesis** (cr arr).

Phys **501** (s) **Seminar** (cr arr). Graded P/F. Prereq: perm.

Phys **502** (s) **Directed Study** (cr arr). Prereq: perm.

Phys **503** (s) **Workshop** (cr arr). Prereq: perm.

Phys **504** (s) **Special Topics** (cr arr). Prereq: perm.

Phys **R510 Radiation Shielding and Design Concepts** (3 cr). Prereq: Basic differential and integral calculus, and perm.

Phys **511-512 Techniques of Experimental Physics** (3 cr). Development of experimental techniques and skills in active research fields; foundation for any field of physics. Nine hrs of lab a wk.

Phys **R517 Radiation Dosimetry Instrumentation** (3 cr). Radiation detection methods; stats, instrumentation, and close determination; emphasis on radiation protection.

Phys **R518 Radiation Biology** (3 cr). Mechanisms and patterns of energy disposition by ionizing radiation in biological systems.

Phys **R519 Radiation Physiology** (3 cr). Selected topics from human physiology and methods of internal dosimetry. Prereq: Radiation biology and calculus.

Phys **ID&WS521 Advanced Mechanics** (3 cr). WSU Phys 521. Classical mechanics; Lagrange's and Hamilton's principles, two-body problem, rigid body motion, special relativity, canonical transformation, Hamilton-Jacobi theory, small oscillations, and Lagrangian and Hamiltonian formulations for continuous systems and fields. Prereq: Phys 322.

Phys **525 Relativity** (3 cr). See Phys J425/J525.

Phys **528 Computational Physics** (3 cr). See Phys J428/J528.

Phys **ID&WS533 Thermal and Statistical Physics I** (3 cr). WSU Phys 533. Thermodynamic laws and potentials, kinetic theory, hydrodynamics and transport coefficients, introductions to statistical mechanics, ensembles, partition functions.

Phys **ID&WS534 Thermal and Statistical Physics II** (3 cr). WSU Phys 534. Phase transitions and critical phenomena, Ginzburg-Landau theory, Bose-Einstein condensation, superfluids, Fermi systems, low-temperature expansions. Prereq: Phys 533 or perm.

Phys **ID&WS541-ID&WS542 Electromagnetic Theory** (3 cr). WSU Phys 541-542. Includes Maxwell's equations, electrostatics, magnetostatics, currents and their interactions, general theory of emission, propagation and absorption of electromagnetic waves, boundary value problems, relativistic formulation of electrodynamics. Prereq: Phys 322, 342.

Phys **543 Optics** (3 cr). See Phys J443/J543.

Phys **544 Quantum Optics** (3 cr). See Phys J444/J544.

Phys **ID&WS550, ID&WS551, ID&WS552 Quantum Mechanics** (3 cr). WSU Phys 550, 551, 552. Phys 550-551: physical basis; Schroedinger wave formulation, Heisenberg matrix formulation, transformation theory, approximation methods, radiation theory, theory of scattering; application to atomic systems. Phys 552: relativistic quantum mechanics, second quantization field theory and application. Prereq: Phys 305, Phys 322 for Phys 550-551; Phys 551 for Phys 552.

Phys **ID&WS563 Solid State Physics** (3 cr). Same as MSE 563. WSU Phys 563. Modern theory of metals, semiconductors, and insulators; crystal structure, thermal, electric, and magnetic properties of solids, band theory of solids, crystal imperfections, semiconductors, superconductivity, and photoconductivity. Prereq: Phys 342. Prereq or coreq: Phys 551.

Phys **ID&WS565 Particle and Nuclear Physics** (3 cr). See Phys J465/J565.

Phys **ID&WS571 Mathematical Methods of Physics** (3 cr). WSU Phys 571. Methods and problems. Prereq: Phys 322 or perm.

Phys **ID573 Group Theory and Its Applications in Physics** (3 cr). WSU Phys 573. Intro to group theory with application to atoms, molecules, solids, elementary particles and nuclei. Prereq: Phys 551 or perm.

Phys **584 Astrophysics** (3 cr). See Phys J484/J584.

Phys **R585-R586 Fundamental Reactor Kinetics** (3 cr). Complex plane transformations, transfer functions for various systems, derivation of reactor kinetics equations; analysis of nuclear feedback systems; statistical control theory applied to nuclear systems. Prereq: perm.

Phys **R587 Reactor Physics for Engineers** (3 cr). Review of nuclear physics, nuclear fission, chain reaction, and reactor theory. Prereq: Math 310 or equivalent.

Phys **600 Doctoral Research and Dissertation** (cr arr).

Plant Science

Jeffrey C. Stark, Division Chair, Horticultural Science (242 Iddings Wing, Ag. Sc. Bldg 83844-2339; phone 208/529-8376; jstark@uidaho.edu).

Donn C. Thill, Division Chair, Crop and Weed Science (242 Iddings Wing, Ag. Sc. Bldg 83844-2339: phone 208/885-6214; dthill@uidaho.edu).

PlSc **102 The Science of Plants in Agriculture** (3 cr). Principles of structure, biology, and management of agronomic and horticultural crops; interaction of crop plants and cropping systems with environment; current issues related to plant science. Two lec and one 2-hr lab a wk.

PlSc **106 Introductory Arboricultural Tree Climbing Techniques** (1 cr). Same as Rec 106. Introduction to the techniques and skills required for arboricultural and recreational tree climbing. Course fee of $40.00 for equipment.

PlSc **201 Principles of Horticulture** (3 cr). An introduction to the production and management of edible and ornamental horticultural crops and the maintenance of plants and turf in urban landscapes. Two lec and two hours of lab a wk; two field trips. Prereq: PlSc 102.

PlSc **205 General Botany** (4 cr). Growth, development and ecology of plants, fungi, and protists in relation to their environments. Recommended Preparation: Chem 101 and PlSc 102. Prereq: Biol 115. (Spring only)

PlSc **210 Plant Diseases** (1-3 cr, max 3). May not be used for major credit by majors in plant science. Introduction to plant diseases and plant pathology for general audiences on and off campus; emphasis on the cause, development, diagnosis, and control of common diseases of field crop, garden, and woodlot plants.

PlSc **212 Master Gardener** (1-3 cr, max 3). Basic horticultural skills required for home gardeners and landscapers, including soil, water, and fertility management, composting, pest and disease identification and management, vegetable and fruit culture, ornamentals, plant propagation, and lawn care. Graded P/F. Field trips.

PlSc **300 Plant Propagation** (3 cr). Sexual and asexual propagation techniques of herbaceous and woody ornamental plants; propagation methods covered including seed, cuttings, layering, grafting, and cloning/tissue culture. Two lec and one 3-hr lab a wk. Prereq: PlSc 102, 201, or Biol 115. (Alt/yrs)

PlSc **WS301 Turfgrass Culture** (3 cr). WSU CropS 301.

PlSc **302 Golf and Sports Turf Management** (3 cr). Turfgrass science, cultivation and management for a wide variety of commercial applications. Recommended Preparation: Majoring in Horticultural Sciences or Crop Sciences, or Professional Golf Management. Prereq: Jr. standing.

PlSc **WS310 Pomology** (3 cr). WSU Hort 310. Relationships between physiological processes in fruit trees and management decisions necessary for successful commercial production. One 2-day field trip. (Alt/yrs)

PlSc **WS311 Pomology Laboratory** (1 cr). WSU Hort 311. Cultural practices and management of deciduous treefruit production.

PlSc **WS313 Viticulture and Small Fruits** (3 cr). WSU Hort 313.

PlSc **WS320 Olericulture--Commercial Vegetable Crops** (3 cr). WSU Hort 320.

PlSc **WS321 Olericulture Lab--Commercial Vegetable Crops** (1 cr). WSU Hort 321.

PlSc **WS334 Controlled Environments for Horticultural Production** (3 cr). WSU Hort 334.

PlSc **338 Weed Control** (3 cr). Nature and scope of weed problems, identification and biology of weeds, principles, theory, and practice of mechanical, chemical, and biological control of weeds; legal considerations; integration of methods into functional management systems. Two lec and one 2-hr lab a wk. Recommended Preparation: PlSc 102 or equivalent.

PlSc **ID340 Nursery Management** (3 cr). WSU Hort 340. Management of commercial nurseries from plant propagation through sale of the plants. (Alt/yrs)

PlSc **ID341 Nursery Management Laboratory** (1 cr). WSU Hort 341. Lab study relevant to PlSc 340. Experiments on and demonstrations of different practices used in nurseries. One 2-hr lab a wk; one 1-day field trip. Coreq: PlSc 340.

PlSc **WS360 World Agricultural Systems** (3 cr). WSU CropS and SoilS 360. Study of agro-environmental characteristics of world agriculture; historical and contemporary features of world food production. Prereq: 2 semesters physical or biological sciences.

PlSc **398 Internship** (1-6 cr, max 6). Graded P/F. Prereq: perm of dept.

PlSc **399** (s) **Directed Study** (1-2 cr, max 2). Prereq: perm.

PlSc **400** (s) **Seminar** (1 cr). Prereq: perm.

PlSc **401 Plant Growth and Development** (3 cr). Application of physiological principles to the management of plants in agronomic, horticultural and forest systems. Prereq: PlSc 205. (Spring only)

PlSc **404** (s) **Special Topics** (cr arr). Prereq: perm.

PlSc **407 Field Crop Production** (3 cr). *May be used as core credit in J-3-d.* Management and use of crops in Idaho and the Northwest.

PlSc **408 Cereal Science** (3 cr). Crop history and biology of major cereal crops, emphasizing cool season cereals. Recommended Preparation: Biol 115.

PlSc **409 Scientific Photography and Data Presentation** (1 cr). Principles and techniques for photographic documentation and presentation of data; seven technique areas: field photography, aquarium photography, museum photography, photocopy, microphotography, insect photography, and computer graphics. Recommended Preparation: Own or have access to a 35mm SLR camera. (Alt/yrs)

PlSc **ID-J410/ID-J510 Biology of Weeds** (3 cr). WSU CropS 413/513. Biology, ecology, and physiology of weeds with emphasis on crop and weed interactions. Requirements for grad cr include comprehensive term paper and class presentation on weed-crop interaction. Two lec and one 3-hr lab a wk. Recommended Preparation: Biol 311. (Alt/yrs)

PlSc **WS-J412/WS-J512 Advanced Cropping Systems** (3 cr). WSU CropS and Pl P 403/503. Modern cropping systems: concepts of crop health management within a cropping systems context; diagnosis and management of biotic and abiotic constraints to crop production; interactions of these constraints; concepts of biological control; integration of biological, physical, and chemical approaches to pests and disease control: role of technological innovations; impact of national and international statutes; agreements and treaties on sustainable growth of crop production. Additional projects/assignments reqd for grad cr.

PlSc **415 Plant Pathology** (3 cr). Same as For 414. Biology of diseases and disorders of crop, forest, and ornamental plants, with emphasis on plant-microbe interactions and on disease cause, development, diagnosis, and control. Three 1-hr lectures. Prereq: PlSc 102 , and MMBB 154, 155 or MMBB 250 (or perm). (Fall only)

PlSc **416 Plant Pathology Laboratory** (1 cr). Development of skill and techniques used for the diagnosis, isolation, identification, and characterization of plant pathogenic microorganisms. Recommended Preparation: Familiarity with plant physiology, biological structure of plants and animals, and general agriculture. Prereq or coreq: PlSc 415 or perm of instructor.

PlSc **WS-J418/WS-J518 Post-Harvest Biology and Technology** (3 cr). WSU Hort 418/518.

PlSc **WS-J421/WS-J521 General Mycology** (4 cr). WSU Pl P 421/521. (Alt/yrs)

PlSc **ID-J433/ID&WS-J533 Plant Tissue Culture Techniques** (3 cr). WSU Hort/CropS 533. Laboratory-oriented course involving tissue culture techniques with an emphasis on regenerating herbaceous and woody plant species from organs or tissues. Requirements for grad cr include completion of a special project and report. One lec and 5 hrs of lab a wk. Recommended Preparation: Biol 311 and PlSc 300. (Alt/yrs)

PlSc **438 Pesticides in the Environment** (3 cr). See Soil 438.

PlSc **WS-J439/WS-J531 Ornamental Plant Production** (4 cr). WSU Hort 439/539. Production requirements for spring greenhouse and nursery crop; garden center management considerations. Field trip.

PlSc **464 Landscape Maintenance** (3 cr). Use and culture of landscape plants to enhance the environment. Two lec and one 2-hr lab a wk; one 1-day field trip. Recommended Preparation: Soil 205 and LArc 288. Prereq: PlSc 102 or Biol 213 or perm. (Alt/yrs)

PlSc **470 Arboriculture** (3 cr). Arboriculture addresses the science behind tree selection and maintenance practices. Laboratories in each section will provide "hands-on" experiences examining mechanisms of tree growth and survival and the arboricultural tools and practices used to enhance these traits in urban landscapes. Recommended preparation: PlSc 464 and/or For 408.

PlSc **480 Field Trip** (1 cr, max 2). Three-day field trip to production areas. Prereq: perm.

PlSc **ID-J490/ID-J590 Potato Science** (1-3 cr, max 3). WSU Hort 490/590. History, botanical characteristics, seed physiology and production, plant population, physiology of growth, and pest management; factors influencing maturation, harvest, yield, grade, bruise control, storage, and quality maintenance; economics of production and research on a global basis. Requirements for grad cr include comprehensive term paper and class presentation on selected topic.

PlSc **499** (s) **Directed Study** (cr arr). Prereq: perm.

PlSc **500 Master's Research and Thesis** (cr arr).

PlSc **501** (s) **Seminar** (cr arr). Prereq: perm.

PlSc **502** (s) **Directed Study** (cr arr). Prereq: perm.

PlSc **504** (s) **Special Topics** (cr arr). Prereq: perm.

PlSc **WS506 Diseases of Plants** (4 cr). WSU Pl P 551.

PlSc **WS507 Plant Transmission Genetics** (3 cr). WSU CropS 504.

PlSc **ID510 Biology of Weeds** (3 cr). See PlSc J410/J510.

PlSc **WS511 Viruses and Virus Diseases of Plants** (4 cr). WSU Pl P 511. (Alt/yrs)

PlSc **WS512 Advanced Cropping Systems** (3 cr). See PlSc J412/J512.

PlSc **WS514 Phytobacteriology** (4 cr). WSU Pl P 514. (Alt/yrs)

PlSc **WS515 Molecular Approaches for Improving Crop Quality and Adaptation** (3 cr). WSU CropS 505. (Alt/yrs)

PlSc **WS518 Post-Harvest Biology and Technology** (3 cr). See PlSc J418/J518.

PlSc **ID520 Plant Cytogenetic Techniques** (3 cr). WSU CropS 520. Techniques to study plant genes and chromosomes. Two lec and 4 hrs of lab a wk. Prereq: Gene 314 or equivalent. (Alt/yrs)

PlSc **WS521 General Mycology** (4 cr). See PlSc J421/J521.

PlSc **WS526 Advanced Fungal Biology** (4 cr). WSU Pl P 526.

PlSc **WS531 Ornamental Plant Production** (4 cr). See PlSc J439/J531.

PlSc **ID&WS533 Plant Tissue Culture Techniques** (3 cr). See PlSc J433/J533.

PlSc **WS535 Molecular Genetics of Plant and Pathogen Interactions** (2 cr). WSU Pl P 535. (Alt/yrs)

PlSc **ID&WS539 Herbicide Fate and Mode of Action** (4 cr). WSU CropS 539. Fate of herbicides in plants, soil, and water; physiological and biochemical mode of herbicide action; mechanisms of herbicide resistance. Prereq: PlSc 338, Biol 311, and MMBB 300 or 380, or perm. (Alt/yrs)

PlSc **ID546 Plant Breeding** (3 cr). WSU CropS 546. Application of genetic principles to improvement of crop plants. Grad students reqd to complete additional term paper. Prereq: Gene 314 or equiv. (Alt/yrs)

PlSc **ID547 Biometrics for Plant Scientists** (3 cr). WSU CropS 547. Use of biometrical techniques in research with particular emphasis on designing, analyzing, and interpreting agricultural and biological experiments; application of statistical methods to biological experiments and problems that may be encountered when applying these techniques to biological systems. Prereq: PlSc 102 and Stat 401 or equiv. (Alt/yrs)

PlSc **ID590 Potato Science** (3 cr). See PlSc J490/J590.

PlSc **WS592** (s) **Advanced Topics in Cell Biology** (1-3 cr, max 7). WSU MBios 526.

PlSc **597** (s) **Practicum** (cr arr). Prereq: perm.

PlSc **598** (s) **Internship** (cr arr). Prereq: perm.

PlSc **599** (s) **Non-thesis Master's Research** (cr arr). Research not directly related to a thesis or dissertation. Prereq: perm.

PlSc **600 Doctoral Research and Dissertation** (cr arr).