

grammar and/or other intensional frameworks; quantification, anaphora, and logical form; boundaries between syntax, semantics and pragmatics; recent applications of formal semantics. (Also listed as LALS 4507.)

Prerequisite: two of PHIL 2001, LALS/MCOM/PHIL 2504, LALS 2003, LALS 3505.

Lectures three hours a week.

PHIL 4507 [0.5 credit]

### Contemporary Formal Semantics

Topics may include: desiderata for an empirical theory of meaning; philosophical and logical precursors to contemporary truth-conditional semantics; Montague grammar and/or other intensional frameworks; quantification, anaphora, and logical form; boundaries between syntax, semantics and pragmatics; recent applications of formal semantics.

Prerequisite: two of PHIL 2001, LALS/MCOM/PHIL 2504, LALS 2003, LALS 3505.

Lectures three hours a week.

PHIL 4506 [0.5 credit] (formerly 32.456\*)

### Special Topic in Philosophy of Science

Detailed study of a special topic in philosophy of science.

Prerequisite: eligibility for fourth-year standing in Philosophy Honours program or permission of the Department.

Seminar two hours a week.

PHIL 4507 [0.5 credit] (formerly 32.457\*)

### Special Topic in Philosophy of Science

Detailed study of a special topic in philosophy of science.

Prerequisite: eligibility for fourth-year standing in Philosophy Honours program or permission of the Department.

Seminar two hours a week.

PHIL 4606 [0.5 credit] (formerly 32.466\*)

### Special Topic in Continental Philosophy

Prerequisite: eligibility for fourth-year standing in Philosophy Honours program or permission of the Department.

Seminar two hours a week.

PHIL 4607 [0.5 credit] (formerly 32.467\*)

### Special Topic in Continental Philosophy

Prerequisite: eligibility for fourth-year standing in Philosophy Honours program or permission of the Department.

Seminar two hours a week.

PHIL 4900 [1.0 credit] (formerly 32.490)

### Tutorial

Prerequisite: permission of the Department.

PHIL 4901 [0.5 credit] (formerly 32.491\*)

### Tutorial

Prerequisite: permission of the Department. Note: Students who wish to enrol in a tutorial course must consult the Undergraduate Supervisor, before registration.

PHIL 4902 [0.5 credit] (formerly 32.492\*)

### Tutorial

Prerequisite: permission of the Department. Note: Students who wish to enrol in a tutorial course must consult the Undergraduate Supervisor, before registration.

PHIL 4903 [0.5 credit] (formerly 32.493\*)

### Tutorial

Prerequisite: permission of the Department. Note: Students who wish to enrol in a tutorial course must consult the Undergraduate Supervisor, before registration.

PHIL 4904 [0.5 credit] (formerly 32.494\*)

### Tutorial

Prerequisite: permission of the Department. Note: Students who wish to enrol in a tutorial course must consult the Undergraduate Supervisor, before registration.

PHIL 4906 [0.5 credit] (formerly 32.496\*)

### Tutorial

Prerequisite: permission of the Department. Note: Students who wish to enrol in a tutorial course must consult the Undergraduate Supervisor, before registration.

## Physics (PHYS)

Department of Physics

Faculty of Science

*Note:* Please consult with the Physics Department for advice on which first year course to take.

PHYS 1001 [0.5 credit] (formerly 75.101\*)

### Foundations of Physics I

This calculus-based course covers mechanics, gravitation, oscillations, and thermodynamics. The laboratory is an essential and autonomous part of the course. This is a specialist course for students intending to take further courses in Physics.

Precludes additional credit for PHYS 1003, PHYS 1005 and PHYS 1007.

Prerequisite: OAC's in Physics and Calculus (or equivalents). MATH 1004 or MATH 1007 or MATH 1002 (may be taken concurrently); or permission of the Department. Although not a requirement, an OAC in Algebra and Geometry is recommended.

Lectures three hours a week, tutorial one hour a week, laboratory three hours a week.

PHYS 1002 [0.5 credit] (formerly 75.102\*)

### Foundations of Physics II

An introduction to relativity, electricity, magnetism, wave motion and quantum mechanics. The laboratory is an essential and autonomous part of the course. This is a specialist course for students intending to take further courses in physics.

Precludes additional credit for PHYS 1004, PHYS 1005 and PHYS 1008.

Prerequisites: PHYS 1001, or PHYS 1003, or PHYS 1007 with a grade of B-; MATH 1004 or MATH 1007 or MATH 1002 (may be taken concurrently); or permission of the Department.

Lectures three hours a week, tutorial one hour a week, laboratory three hours a week.

PHYS 1003 [0.5 credit] (formerly 75.103\*)

### Introductory Mechanics and Thermodynamics

This calculus-based course covers mechanics, gravitation, oscillations, and thermodynamics. The laboratory is an essential and autonomous part of the course.

Precludes additional credit for PHYS 1001, PHYS 1005 and PHYS 1007.

Prerequisites: OAC's in Physics and Calculus (or equivalents); MATH 1004 or MATH 1007 or MATH 1002 (may be taken concurrently); or permission of the Department. Although not a requirement, an OAC in Algebra and Geometry is recommended.

Lectures three hours a week, tutorial one hour a week, laboratory three hours a week.

PHYS 1004 [0.5 credit] (formerly 75.104\*)

### Introductory Electromagnetism and Wave Motion

This calculus-based course introduces electricity, magnetism, oscillations, waves and optics. The laboratory is an essential and autonomous part of the course.

Precludes additional credit for PHYS 1002, PHYS 1005 and PHYS 1008.

Prerequisites: MATH 1004 or MATH 1007, ECOR 1101 or PHYS 1001 or PHYS 1003 or PHYS 1007 with a grade of B-, or permission of the Department.

Lectures three hours a week, tutorial one hour a week, laboratory three hours a week.

PHYS 1007 [0.5 credit] (formerly 75.107\*)

### Elementary University Physics I

Mechanics, properties of matter, thermodynamics. Applications chosen in part from the life sciences. For students who do not intend to take additional courses in Physics or who lack the prerequisites for PHYS 1001.

Precludes additional credit for PHYS 1001, PHYS 1003 and PHYS 1005.

Prerequisite: MATH 0107 (may be taken concurrently).

Lectures three hours a week, laboratory three hours a week.

PHYS 1008 [0.5 credit] (formerly 75.108\*)

**Elementary University Physics II**

Electricity and magnetism, DC and AC circuits, wave motion and light. Elements of modern physics. Applications chosen in part from the life sciences.

Precludes additional credit for PHYS 1002 and PHYS 1005.

Prerequisite: PHYS 1001 or PHYS 1003 or PHYS 1007.

Lectures three hours a week, laboratory three hours a week.

PHYS 1901 [0.5 credit] (formerly 75.191\*)

**Planetary Astronomy**

Description of the known stellar, galactic and extra-galactic systems together with the instruments used to study them. Modern ideas concerning the structure, origin and evolution of our own planet. Formation of the Moon - Earth system. Study of the planets in our solar system. A 14" telescope is available for student use.

Precludes additional credit for PHYS 2203.

Lectures two and one-half hours a week.

Note: Science students may only take this as a free elective.

PHYS 1902 [0.5 credit] (formerly 75.192\*)

**From our Star to the Cosmos**

Starting with the Sun, the course studies its composition and source of power, then compares our Sun with the other stars in the galaxy and beyond. Modern ideas concerning the structure, origin and evolution of the universe, pulsars and supernovae are examined. A 14-inch telescope is available for student use.

Precludes additional credit for PHYS 2203.

Lectures two and one-half hours a week.

Note: Science students may only take this course as a free elective.

PHYS 2101 [0.5 credit] (formerly 75.211\*)

**Mechanics and Properties of Matter**

Equations of motion for a single particle. Harmonic oscillation. Noninertial reference frames. Orbits in a central force field. Motion of systems of particles and of rigid bodies. Introduction to special relativity. Laboratory experiments in classical mechanics and properties of matter.

Prerequisites: PHYS 1001 and PHYS 1002, or PHYS 1003 and PHYS 1004, alternatively PHYS 1007 and PHYS 1008 with an overall average of B- or better; MATH 1007 and MATH 1107, or MATH 1002 and MATH 1102.

Lectures three hours a week, laboratory three hours a week, tutorials (optional) once a week.

PHYS 2202 [0.5 credit] (formerly 75.222\*)

**Wave Motion and Optics**

Physical optics based on electromagnetic theory, oscillator model for dispersion, absorption, scattering, Huygen's principle, reflection and transmission as coherent scattering. Interference, coherence length, diffraction, polarization, double refraction. Geometrical optics.

Prerequisites: PHYS 2604.

Lectures three hours a week, laboratory three hours a week.

PHYS 2203 [0.5 credit] (formerly 75.223\*)

**Astronomy**

The observational basis of astronomy. The history of astronomy, properties of light, solar system observations and stellar astronomy.

Precludes additional credit for PHYS 1900 and PHYS 2200.

Prerequisites: PHYS 1002 or PHYS 1004 or permission of the department. PHYS 1008 with a grade of B- or better may also be used if MATH 1004 or MATH 1007 or MATH 1002 have been successfully completed.

Lectures three hours a week.

PHYS 2305 [0.5 credit] (formerly 75.235\*)

**Electricity and Magnetism**

Electrostatics, field intensities in various charge configurations, Gauss' law, electrostatic energy. Dielectric materials, dipoles,

molecular polarizability. Steady currents, properties of electrical conductors. Magnetic effects of currents and motion of charges in electric and magnetic fields. Time varying currents, electromagnetic induction. Magnetic materials and magnetic measurements.

Prerequisites: PHYS 1001, PHYS 1002, or PHYS 1003 and PHYS 1004, alternatively PHYS 1007 and PHYS 1008 with an overall grade of B- or better.

Lectures three hours a week, laboratory three hours a week.

PHYS 2306 [0.5 credit] (formerly 75.236\*)

**Physics of Electrical and Electronic Measurements I**

D.C. and A.C. circuit theory. Resonant circuits. Basic measuring devices, the oscilloscope; impedances, bandwidth, noise; vacuum tubes, transistors, useful approximations for circuit design; feedback, amplifiers, oscillators; operational circuits; digital circuits. Lectures emphasize the physical basis of instrument design. Laboratory emphasizes modern digital instrumentation.

Prerequisites: PHYS 1001, PHYS 1002 or PHYS 1003 and PHYS 1004, alternatively PHYS 1007 and PHYS 1008 with an overall grade of B- or better.

Lectures three hours a week, laboratory three hours a week.

PHYS 2604 [0.5 credit] (formerly 75.264\*)

**Modern Physics I**

The course is designed to provide a logical transition from classical to modern physics. Special relativity. Kinetic theory. Thermal radiation. Rutherford scattering, atomic models. Photoelectric effect, Compton scattering. Bohr theory of the hydrogen atom. Atomic energy states, optical spectra, lasers. X-rays. Radioactivity. Quantum Mechanics.

Precludes additional credit for PHYS 2101, PHYS 2305, PHYS 2602.

Prerequisites: PHYS 1001 and PHYS 1002, or PHYS 1003 and PHYS 1004 (PHYS 1007 and PHYS 1008 are also acceptable provided a minimum average grade of B- is presented); plus MATH 1004 and MATH 1104, or MATH 1007 and MATH 1107, or MATH 1002 and MATH 1102.

Lectures three hours a week, laboratory three hours a week.

PHYS 3000[1.0 credit] (formerly 75.300\*)

**Third-Year Laboratory**

Students complete a small number of independent projects in modern optics, holography, optical spectroscopy, nuclear spectroscopy, cosmic radiation, measurements, etc. Development of skills in laboratory techniques in design/construction of research apparatus.

Precludes additional credit for PHYS 3001, PHYS 3002, PHYS 3007 and PHYS 3008.

Prerequisite: PHYS 2202 and PHYS 2305, or permission of the Department.

Laboratory and seminar six hours a week, workshop three hours a week.

PHYS 3007 [0.5 credit] (formerly 75.307\*)

**Third Year Physics Laboratory: Selected Experiments and Seminars**

Students complete a small number of experiments selected from modern optics, holography, atomic physics, nuclear spectroscopy, radiation, etc. An exercise on literature searches and student seminars on experimental and numerical methods are included.

Prerequisites: PHYS 2202 and PHYS 2604, or permission of the Department.

Six hours a week.

PHYS 3008 [0.5 credit] (formerly 75.308\*)

**Third Year Physics Laboratory: Selected Experiments and Workshop**

Students complete a small number of experiments selected from modern optics, holography, atomic physics, nuclear spectroscopy, radiation, etc. Instruction on instrumentation building techniques will be given.

Prerequisites: PHYS 2202 and PHYS 2604, or permission of the department.

Six hours a week.

PHYS 3204 [0.5 credit] (formerly 75.324\*)

### **Astrophysics and Cosmology**

A discussion of stellar models, in particular stellar evolution and the end states of stars such as neutron stars and black holes. Galaxies and quasars; cosmology.

Precludes additional credit for PHYS 1900, PHYS 2200, PHYS 2204.

Prerequisite: PHYS 2203 or permission of the Department. Lectures three hours a week.

PHYS 3207 [0.5 credit] (formerly 75.327\*)

### **Topics in Biophysics**

An introduction is made to biophysics. Topics in biology: animal movement, food irradiation, DNA damage and repair following irradiation, quantum tunneling in enzyme kinetics. Applications of physics in medicine: radiobiology, cancer treatment, and medical imaging.

Prerequisites: BIOL 1003 and BIOL 1004, either PHYS 1001 and PHYS 1002 or PHYS 1003 and PHYS 1004 or PHYS 1007 and PHYS 1008, plus one of BIOL 2200, CHEM 2101, or PHYS 2604; or permission of the Department.

Lectures three hours a week, tutorial or seminar one hour a week.

PHYS 3308 [0.5 credit] (formerly 75.338\*)

### **Electromagnetism**

Electrostatic field and magnetostatics. Examples involving Laplace's and Poisson's equations; vector potential; Faraday's laws of induction; waves in vacuum and dielectric media.

Prerequisites: PHYS 2305 and PHYS 3807, or permission of the Department.

Lectures three hours a week.

PHYS 3402 [0.5 credit] (formerly 75.342\*)

### **Heat and Thermodynamics**

Zerth, First, Second and Third Laws of Thermodynamics; enthalpy, Helmholtz and Gibbs functions and the Maxwell relations; phase transitions; thermodynamics of magnetism; cryogenics cooling by Joule-Thompson effect, adiabatic expansion of a gas, adiabatic demagnetization, helium dilution refrigeration; black body radiation; negative temperatures.

Prerequisites: PHYS 2101 and PHYS 2305, MATH 2007, MATH 2008, MATH 2107 and MATH 2401 or permission of the Department.

Lectures three hours a week.

PHYS 3606 [0.5 credit] (formerly 75.366\*)

### **Modern Physics II**

Elements of condensed matter physics: semiconductors, superconductivity. Modern optics. Elements of nuclear physics, fission and fusion methods for generating energy. Introduction to particle physics. Ionizing radiation: production, interaction with matter, detection. Medical physics: radiation biophysics, cancer therapy, imaging.

Precludes additional credit for PHYS 3604.

Prerequisites: PHYS 2604 and PHYS 3701, or permission of the Department.

Lectures three hours a week, laboratory two hours a week.

PHYS 3701 [0.5 credit] (formerly 75.371\*)

### **Elements of Quantum Mechanics**

Analysis of interference experiments with waves and particles; fundamental concepts of quantum mechanics, Schrödinger equation; angular momentum, atomic beams; hydrogen atom; atomic and molecular spectroscopy; Pauli principle; simple applications in the physics of elementary particles.

Precludes additional credit for PHYS 3602.

Prerequisite: PHYS 2604, and either MATH 2004 or MATH 2454 and MATH 2000 (may be taken concurrently).

Lectures three hours a week.

PHYS 3801 [0.5 credit] (formerly 75.381\*)

### **Classical Mechanics**

Introduction to Lagrangian and Hamiltonian mechanics: Poisson brackets, tensors and dyadics; rigid body rotations; introductory fluid mechanics coupled systems and normal

coordinates; relativistic dynamics.

Prerequisites: PHYS 2101, PHYS 2202, PHYS 2305, MATH 2007, MATH 2008, MATH 2107, MATH 2401 or permission of the Department.

Lectures three hours a week.

PHYS 3802 [0.5 credit] (formerly 75.382\*)

### **Advanced Dynamics**

Equations of motion for a single particle. Oscillatory Motion. Lagrangian and Hamiltonian formulations of mechanics. Central force motion. Motion of systems of particles and of rigid bodies.

Prerequisites: PHYS 2202, MATH 2004 and MATH 3705 or permission of the Department. Students in the Double Honours Maths Physics program may take these prerequisites, or their equivalents concurrently.

Lectures three hours a week.

PHYS 3807 [0.5 credit] (formerly 75.387\*)

### **Mathematical Physics I**

Boundary Value problems involving curvilinear coordinates; spherical harmonics, Bessel functions, Green's functions. Functions of a complex variable: analytic functions, contour integration, residue calculus.

Precludes additional credit for MATH 3007, MATH 3706 and MATH 3007.

Prerequisites: PHYS 2202, MATH 2004, MATH 2008, MATH 2107, MATH 3705 or permission of the Department.

Lectures three hours a week.

PHYS 3808 [0.5 credit] (formerly 75.388\*)

### **Mathematical Physics II**

Solution of second-order total differential equations by Frobenius' method. Sturm-Liouville theory. Special functions: Legendre, Bessel, Hermite, Laguerre and associated functions. Partial differential equations: method of separation of variables, eigenfunctions and eigenvalues and eigenfunction expansions. Green's function techniques for solving inhomogeneous partial differential equations.

Precludes additional credit for MATH 3004, MATH 3705, and PHYS 3806.

Prerequisites: PHYS 3807 or MATH 3007 or permission of the Department.

Lectures three hours a week.

PHYS 3904 [0.5 credit] (formerly 75.394\*)

### **Co-operative Work Term Report 1**

Provides practical experience for students enrolled in the Co-operative option. To receive course credit students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Prerequisites: Registration in the Physics Co-operative option and permission of the Department.

Not transferable for academic credit.

PHYS 3905 [0.5 credit] (formerly 75.395\*)

### **Co-operative Work Term Report 2**

Provides practical experience for students enrolled in the Co-operative option. To receive course credit students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Prerequisites: Registration in the Physics Co-operative option and permission of the Department.

PHYS 3906 [0.5 credit] (formerly 75.396\*)

### **Co-operative Work Term Report 3**

Provides practical experience for students enrolled in the Co-operative option. To receive course credit students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Prerequisites: Registration in the Physics Co-operative option and permission of the Department.

PHYS 4000 [1.0 credit] (formerly 75.400)

### **Fourth-Year Laboratory**

The student is expected to complete detailed projects involving some original planning in both concept and



experimental technique. Projects are similar to PHYS 3000 but are of a more sophisticated nature.

Precludes additional credit for PHYS 4007 and PHYS 4008.

Prerequisite: PHYS 3000 or PHYS 3007 or PHYS 3008.

Laboratory and seminar six hours a week.

PHYS 4007 [0.5 credit] (formerly 75.407\*)

**Fourth-Year Physics Laboratory: Selected Experiments and Seminars**

Students complete a small number of experiments selected from modern optics, holography, atomic physics, nuclear spectroscopy, radiation, etc. An exercise on literature searches and student seminars on experimental and numerical methods are included.

Prerequisites: PHYS 3008, or PHYS 2202 and PHYS 2604 and permission of the department.

Six hours a week.

PHYS 4008 [0.5 credit] (formerly 75.408\*)

**Fourth-Year Physics Laboratory: Selected Experiments and Workshop**

Students complete a small number of experiments selected from modern optics, holography, atomic physics, nuclear spectroscopy, radiation, etc. Instruction on instrumentation building techniques will be given.

Prerequisites: PHYS 3007.

Six hours a week.

PHYS 4201 [0.5 credit] (formerly 75.421\*)

**Topics in Astrophysics and Cosmology**

Stellar evolution, including, in particular, stellar modeling, main sequence stars, red giants and the end states of stars. Introduction to general relativity, black holes and related phenomena, big bang cosmology.

Prerequisites: PHYS 2203, PHYS 3204, PHYS 2604, and PHYS 3606 or permission of the department.

Lectures three hours a week.

PHYS 4203 [0.5 credit] (formerly 75.423\*)

**Physical Applications of Fourier Analysis**

Laplace transform and its application to electrical circuits. Fourier transform, convolution. Sampling theorem. Applications to imaging: descriptors of spatial resolution, filtering. Correlation, noise power. Discrete Fourier transform, FFT. Filtering of noisy signals. Image reconstruction in computed tomography and magnetic resonance. Integral transforms and their application to boundary value problems.

Precludes additional credit for PHYS 4204.

Prerequisites: MATH 3705, or permission of the Department.

Lectures three hours a week.

PHYS 4208 [0.5 credit] (formerly 75.428\*)

**Modern Optics**

Laser theory: stimulated emission, cavity optics, modes; gain and bandwidth; Gaussian beams; atomic and molecular lasers. Mode locking, Q switching. Diffraction theory, coherence, Fourier optics, holography, laser applications. Optical communication systems: nonlinear effects - devices, fiber optics, fiber sensors, integrated optics.

Precludes additional credit for PHYS 4207.

Prerequisites: PHYS 2202, PHYS 3606, PHYS 3701; ELEC 3105, ELEC 3909 or permission of the Department.

Lectures three hours a week.

PHYS 4307 [0.5 credit] (formerly 75.437\*)

**Electromagnetic Radiation**

Electromagnetic wave propagation in a vacuum, dielectrics, conductors, and ionized gases, reflection, refraction, polarization at the plane boundary between two media; waveguide and transmission line propagation; dipole and quadrupole radiation fields; antenna systems. Electromagnetic mass, radiation pressure. Tensor notation, transformation of the electromagnetic fields.

Prerequisites: PHYS 3308, PHYS 3801, PHYS 3807 and PHYS 3808 (except for Mathematics and Physics Double Honours students), or permission of the Department.

Lectures three hours a week.

PHYS 4407 [0.5 credit] (formerly 75.447\*)

**Statistical Physics**

Equilibrium statistical mechanics and its relation to thermodynamics. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics are derived, and applied in appropriate physical situations. Fluctuations. Kinetics and transport processes, including the Boltzmann transport equation and some of its applications.

Prerequisite: PHYS 3402, PHYS 2602 or PHYS 3601, PHYS 3701 or PHYS 3602, PHYS 4707 (may be taken concurrently); or permission of the Department.

Lectures three hours a week.

PHYS 4409 [0.5 credit] (formerly 75.449\*)

**Thermodynamics and Statistical Physics**

The three Laws of Thermodynamics, enthalpy, Helmholtz and Gibbs functions. Equilibrium statistical mechanics and its relation to thermodynamics. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics.

Precludes additional credit for PHYS 3402 and PHYS 4407.

Prerequisites: PHYS 3701; MATH 2004 and MATH 3705; permission of the Department.

PHYS 4508 [0.5 credit] (formerly 75.458\*)

**Solid State Physics**

An introduction to solid state physics. Topics include crystal structure, phonons and lattice vibrations, conductors, semiconductors, insulators and superconductivity.

Prerequisites: PHYS 2604, PHYS 3606, PHYS 3701, or permission of the Department.

Lectures three hours a week.

PHYS 4602 [0.5 credit] (formerly 75.462\*)

**Particle Physics**

Properties of leptons, quarks and hadrons. The fundamental interactions, conservation laws, invariance principles and quantum numbers. Resonances in hadron-hadron interactions. Three body phase space. Dalitz plots. Quark model of hadrons, mass formulae. Weak interactions, parity violation, decay of neutral kaons, CP violation, Cabibbo theory. Also offered at the graduate level, with additional or different requirements, as PHYS 5602, for which additional credit is precluded.

Prerequisite: PHYS 4707 or permission of the Department.

Lectures three hours a week.

PHYS 4608 [0.5 credit] (formerly 75.468\*)

**Nuclear Physics**

Ground state properties of nuclei, nuclear forces, nuclear levels. Qualitative treatment of Fermi gas model, liquid drop model, shell model and collective model. Alpha, beta and gamma radioactivities. Fission. Passage of particles through matter. Particle detectors. Elements of neutron physics and nuclear reactors.

Prerequisites: PHYS 3601 and PHYS 3602 or permission of the Department.

Lectures three hours a week.

PHYS 4707 [0.5 credit] (formerly 75.477\*)

**Introduction to Quantum Mechanics I**

The basic interpretative postulates of quantum mechanics are applied to simple one-dimensional problems, and angular momentum theory.

Prerequisites: PHYS 3606, PHYS 3701, PHYS 3807, or permission of the Department.

Lectures three hours a week.

PHYS 4708 [0.5 credit] (formerly 75.478\*)

**Introduction to Quantum Mechanics II**

Scattering theory and application; bound state problems; approximation methods.

Prerequisite: PHYS 4707 or permission of the Department.

Lectures three hours a week.

PHYS 4807 [0.5 credit] (formerly 75.487\*)

### Computational Physics

Computational methods used in analysis of experimental data. Introduction to probability and random variables. Monte Carlo methods for simulation of random processes. Statistical methods for parameter estimation and hypothesis tests. Confidence intervals. Multivariate data classification. Unfolding methods. Examples primarily from particle and medical physics. Also offered at the graduate level, with different requirements, as PHYS 5002, for which additional credit is precluded.

Prerequisite: An ability to program in FORTRAN, Java, C or C++, and permission of the Department.

Lectures three hours a week

PHYS 4901 [0.5 credit] (formerly 75.491\*)

### Special Topics in Physics

Each year, at the direction of the Department, a course on a special topic may be offered.

Prerequisite: permission of the Department.

PHYS 4905 [0.5 credit] (formerly 75.495\*)

### Cooperative Work Term Report 4

Provides practical experience for students enrolled in the Co-operative option. To receive course credit students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Prerequisites: Registration in the Physics Co-operative education option and permission of the Department.

PHYS 4906 [0.5 credit] (formerly 75.496\*)

### Cooperative Work Term Report 5

Provides practical experience for students enrolled in the Co-operative option. To receive course credit students must receive satisfactory evaluations from their work term employer. Written and oral reports will be required. Graded as Sat or Uns.

Prerequisites: Registration in the Physics Co-operative education option and permission of the Department.

PHYS 4907 [0.5 credit] (formerly 75.497\*)

### Fourth-Year Project

Same as PHYS 4909 except that it extends over the fall term only. (See PHYS 4909 for details.)

Prerequisite: permission of the Department.

A minimum of six hours laboratory or private study a week.

PHYS 4908 [0.5 credit] (formerly 75.498\*)

### Fourth-Year Project

Same as PHYS 4909 except that it extends over the winter term only. (See PHYS 4909 for details.)

Prerequisite: permission of the Department.

A minimum of six hours laboratory or private study a week.

PHYS 4909 [1.0 credit] (formerly 75.499)

### Fourth-Year Project

These are advanced projects of an experimental or theoretical nature with an orientation towards research. A written progress report, by mid-term for PHYS 4907, PHYS 4908, and by mid-year for PHYS 4909, must be submitted to the student's supervisor prior to the last day for withdrawal from the course. A written and an oral report are required at the conclusion of the project.

Prerequisite: permission of the Department.

A minimum of six hours laboratory or private study a week.

## Political Science (PSCI)

Department of Political Science

Faculty of Public Affairs and Management

PSCI 1000 [1.0 credit] (formerly 47.100)

### Introduction to Political Science

Contemporary political issues and problems: political thought, focusing upon the clash of modern ideologies; comparative government, starting from the Canadian system, and including one other western democracy, a post-communist system and a developing country; international politics; methods of inquiry.

Precludes additional credit for PSCI 1001, PSCI 1002 and PSCI 1003.

Lectures three hours a week.

PSCI 1001 [0.5 credit] (formerly 47.101\*)

### Great Political Questions

Introduction to the central ideas and debates shaping the contemporary political world – east, north, west and south. Topics will vary from year to year but may include liberty and equality, state and nation, sovereignty and anarchy, democracy and dictatorship, and political identity and culture. The combination of two of PSCI 1001, PSCI 1002, and PSCI 1003 is an alternative Introduction to Political Science to that offered in PSCI 1000.

Precludes additional credit for PSCI 1000.

Lectures three hours a week.

PSCI 1002 [0.5 credit] (formerly 47.102\*)

### Global Political Issues

Contemporary political issues in Canada and around the world. Topics will vary from year to year but may include war and peace, human rights, wealth and poverty, Canadian unity, aboriginal politics, nationalism, and globalization. The combination of two of PSCI 1001, PSCI 1002, and PSCI 1003 is an alternative Introduction to Political Science to that offered in PSCI 1000.

Precludes additional credit for PSCI 1000.

Lectures three hours a week.

PSCI 1003 [0.5 credit] (formerly 47.112\*)

### North American Politics

Introduction to politics in Canada, the United States, and Mexico. Topics will include political culture and ideologies, constitutions, political institutions and democracy, national sovereignty and continental integration. The combination of two of PSCI 1001, PSCI 1002, and PSCI 1003 is an alternative Introduction to Political Science to that offered in PSCI 1000.

Precludes additional credit for PSCI 1000 and PSCI 1102.

Lectures three hours a week.

### • Second Year

PSCI 2001 [1.0 credit] (formerly 47.201)

### Introduction à la politique canadienne

Une vue générale du processus politique et des institutions politiques au Canada. Travaux peuvent être présentés en français ou en anglais.

Precludes additional credit for PSCI 2000, PSCI 2002 and PSCI 2003.

Prerequisite: second-year standing.

Lectures three hours a week.

PSCI 2002 [0.5 credit] (formerly 47.202\*)

### Canadian Political Environment

An examination of the cultural, social, and economic context of Canadian politics, including interest groups and social movements, regionalism, language, ethnicity, and gender.

Precludes additional credit for PSCI 2000.

Prerequisite: second-year standing.

Lectures three hours a week.

PSCI 2003 [0.5 credit] (formerly 47.203\*)

### Canadian Political Institutions

An examination of Canadian political institutions, including federalism, Parliament, the constitution, political parties and