

SUMMARY OF COURSES IN THE CALENDAR (FACULTY OF SCIENCE) PER DISCIPLINARY AREA

Students interested in enrolling in these courses should contact individual faculty or departments in order to know about terms in which they are offered. The same applies to courses from other Faculties on Campus (which are not included in this list).

ENVIRONMENTAL SCIENCES

ESC 802 COMMUNICATION STRATEGIES (PhD)

This workshop-style course is central to the certification in Environmental Communication Strategies and is built on the training offered through UPEI's Centre for Conflict Resolution. This course promotes the development of communication skills in the context of environmental issues and exposes students to direct interaction with representatives from industry, government, community, and the social sciences. The course will also provide broad theoretical and practical knowledge needed to resolve disputes as well as skills training in techniques of mediation, facilitation, and negotiation. Due to the uniqueness of this course, it is considered a critical component towards the development of experience and involvement on the decision making process. The topics addressed during presentations and discussions will be the starting point for the development of written reports that at a later stage will benefit from the feedback from the coordinating faculty, and the representatives of industry, government and community.

PREREQUISITE: Admission to a graduate program in Science; **HOURS OF CREDIT:** 3

ESC 803 CURRENT ISSUES IN ENVIRONMENTAL IMPACT ASSESSMENT (PhD)

This course is intended to review the theory behind Environmental Impact Assessment (EIA) through the use of case studies that best exemplify project development that prevent or minimize environmental degradation. This course will examine the needs, methods, regulatory frameworks and social implications of EIA with emphasis on recent Canadian case studies. On completion of this course, students will be familiarized with the concept of EIA (its history, principles, key constructs and main steps), the legislative and institutional context of EIA, and will be able to critically examine EIA cases and identify their implications.

PREREQUISITE: Admission to a graduate program in Science; **HOURS OF CREDIT:** 3

ESC 804 PRACTICAL ISSUES SURROUNDING ENVIRONMENTAL MANAGEMENT (PhD)

This course intends to provide hands-on experience to our students by deploying them in NGOs, government agencies, or environmental consulting companies for approximately 75 flexible hours (the equivalent to the number of contact hours typically considered for a course's lectures and laboratory). The primary goal of this course is to expose students of a given environmental discipline into the multiple aspects involved in the actual issues and decision-making process that take place in agencies outside the academic setting. This unique training period (spread from two weeks to an entire semester) will provide human resources to often resource-limited groups/ entities that will be chosen by each supervisory committee according to their relevance for the student research focus. Students are expected to gain unprecedented experience and, to some extent, provide actual input into environmental management. The student will prepare a written report and share their experience by giving a public seminar. The supervisory committee in collaboration with the Faculty of Science Graduate Studies Committee will be responsible for identifying an appropriate placement based on the student's discipline and interests.

PREREQUISITE: Admission to a graduate program in Science; **HOURS OF CREDIT:** 3

ESC 862 ADVANCED FRESHWATER ECOLOGY (MSc/PhD)

This course provides advanced study in the ecology of freshwater habitats, particularly those found on Prince Edward Island. The first part of the course concentrates on the physical, chemical, and biological characteristics of fresh waters, classification of freshwater habitats, and applied limnology. A

laboratory/field component includes an introduction to water analysis techniques and field equipment, field water analysis, the collection and analysis of biological samples, and the physical properties of water. The second part is a field/lab project on a limnological topic tailored to the student's individual program, and consists of an experimental or observational study coupled with a comprehensive literature review, project write-up, and oral presentation.

NOTE: Credit is not given for both Biology 462 (Limnology) and Biology 862 and ESC 862

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 865 ADVANCES IN MARINE ECOLOGY (MSc/PhD)

This course provides an update on relevant areas of ongoing marine research. The first part of the course concentrates on marine ecology topics including benthic-pelagic coupling, dispersal and adult-larval interactions, animal-sediment relationships, biodiversity ecosystem services, encrusting communities and their interactions, and aquatic invasive species. The second part includes participation in regular discussion sessions based on analysis of advanced literature relevant to the discipline and to the student's particular research. Assignments include an essay relevant (but not restricted) to a student's field of research, and a seminar on a topic relating general ecological hypotheses to the topic addressed in the essay.

NOTE: Credit will not be given for both Biology 465 (Marine Community Ecology) and ESC 865.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 871 ADVANCED STUDIES IN ENVIRONMENTAL TOXICOLOGY (MSc/PhD)

This course provides an in depth analysis of environmental impacts of the major classes of contaminants including methodologies for environmental impact assessment and monitoring. Effects of environmental contaminants are examined at the ecosystem, organismal, cellular, biochemical and molecular levels. Additional emphasis is placed on understanding the fate of contaminants of concern in aquatic and terrestrial environments including their environmental chemistry, biogeochemical cycles, and exposure and uptake pathways by organisms. The course consists of lectures, discussions of peer-reviewed literature, case studies, presentations by students and laboratories.

Cross-listed with MMS 824

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 872 ADVANCED STUDIES OF MACROECOLOGY AND BIOGEOGRAPHY (MSc/PhD)

This course examines our current understanding of the patterns of distribution and abundance of organisms from the integrative perspective of macroecology and biogeography. The first discipline is concerned with understanding patterns at large spatial and temporal scales via the use of large quantitative databases and statistical techniques. The second one is concerned with the study of the patterns of distribution of animal species by integrating information on historical events (e.g., plate tectonics), evolutionary processes, as well as ecological and physiological trends.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 873 CONSERVATION GENETICS (MSc/PhD)

Conservation genetics is an emerging and topical field of biology that combines molecular genetic approaches with environmental, evolutionary and ecological research under the umbrella of conservation biology. This course will cover a range of research topics pertaining to the conservation of biodiversity including ecological and landscape genetics, contemporary evolution and human-mediated change, invasion biology, genomics for endangered species, and genetics of captive or isolated populations. The course will introduce students to theoretical and experimental approaches to measuring and managing genetic diversity, as well as cultural and ethical issues in conservation biology through lectures, tutorial and case study discussion. Students will have hands-on experience with DNA and molecular marker analysis techniques, lead in-class discussions, write critical reviews of current research, and develop

research proposals for selected questions in conservation genetics.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 875 QUANTITATIVE METHODS FOR THE ANALYSIS OF ANIMAL MOVEMENT (MSc/PhD)

A better comprehension of animal movement is vital to interpreting key ecological and evolutionary processes, such as the spatial-temporal patterns of resource selection, foraging behaviour, and predator-prey interactions. As human activities continually alter landscapes and influence the behaviour and movement patterns of organisms, a variety of pressing ecological and health issues are emerging, such as the spread of invasive species and infectious diseases. Hence, advances in our understanding of animal movement will have direct implications in several disciplines including landscape ecology, conservation biology, and wildlife management, as well as those dealing with public health. In this course, the student will investigate the various methods currently employed to study animal movement in complex landscapes.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 877 VETERINARY BIOSTATISTICS (MSc/PhD)

This course provides the student with a working knowledge of the basic statistical techniques used in veterinary science. Topics include descriptive statistics, inferential statistics non-parametric statistics, analysis of variance, regression and correlation and experimental design.

Cross-listed with graduate level course VHM 801.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 878 ISLAND BIOGEOGRAPHY AND CONSERVATION OF INSULAR SYSTEMS (MSc/PhD)

This course examines the several fundamental patterns and processes that characterize biotas and environments on islands and other broadly defined insular systems. Topics covered include earth history and historical biogeography, speciation, dispersal, extinction, island biogeography, assembly and evolution of insular communities, island effect, adaptive radiation, environmental determinism, conservation biology, marine and terrestrial protected areas, and vulnerability of island biotas to terrestrial and aquatic invasive species.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 879 ADVANCED TECHNIQUES IN SCANNING ELECTRONIC MICROSCOPY (MSc/PhD)

This course covers the principles of scanning electron microscopy including techniques used for the preparation of biological or other materials for microscopy and the use of specialized software to analyze surface features of samples. Students will learn to operate the instrument over the full spectrum of use and will generate their own images and learn to interpret patterns. A microscopical investigation of material relevant to the student's discipline will form the basis of a course project.

Cross-listed with Molecular and Macromolecular Sciences and Human Biology (cf. MMS 813 and HB 825) PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 880 MOLECULAR BIOTECHNOLOGY (MSc/PhD)

This course examines principles of gene manipulation, and the application of molecular biology in all the fields of biotechnology. Recent developments in medicine, agriculture, industry and basic research are considered. Emphasis is placed on reviewing current literature in the field, particularly on areas more closely related to the natural sciences/ environment.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

ESC 881 DIRECTED STUDIES IN ENVIRONMENTAL SCIENCES (See HB 881)

HUMAN BIOLOGY

HB 811 ADVANCED TOPICS IN CELL AND MOLECULAR BIOLOGY (MSc/PhD)

This course enhances student knowledge of cell and molecular biology from a research perspective. Current advances in cell and molecular biology, including biotechnology and cytogenetics, are emphasized. Topics vary yearly according to the needs of the participating students. A combination of formal lectures, directed readings, and group discussion of journal articles is used. Students are expected to prepare written reports or present seminars.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

HB 825 ADVANCED TECHNIQUES IN SCANNING ELECTRON MICROSCOPY (See ESC-879)

HB 881 DIRECTED STUDIES IN HUMAN DEVELOPMENT AND HEALTH (MSc/PhD)

Under the supervision of a faculty member, a graduate student independently pursues an area of interest in depth. The course includes an extensive literature review of the specific discipline, directed research on the topic, or collection and analysis of data. The student may be required to present a written report and/or present a seminar in the area. Topics must not be a part of the student's thesis research although they may be in a complementary area. Course outlines must be approved by the supervisory committee, the department chair, and the Dean of science.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MOLECULAR AND MACROMOLECULAR SCIENCES

MMS 802 MOLECULES, MACROMOLECULES AND THE BUSINESS OF SCIENCE (PhD)

This capstone course highlights the integration between Molecular and Macromolecular Sciences and Business. In conjunction with the Program Coordinators and the PEI BioAlliance, the student will be paired with a receptive industry or government partner to develop a new research idea, direction, or application of potential interest to industry. The student will consult on scientific business ideas within the context of recent literature, scientific expertise, and the current industrial environment, with a focus on entrepreneurship and the development of new scientific products, processes, or markets. The partner in this course will be chosen so that the project will build toward the student's doctoral thesis with integration across all three components (doctoral-level study, MMS, and the business of science) of the program. This cross-sector collaboration will culminate in the student presenting and defending his/her work on the developed concept to industry and academic experts. This six-credit course will take place over a period of two–three semesters.

PREREQUISITE: Admission to PhD program; HOURS OF CREDIT: 6

MMS 803 DIRECTED STUDIES IN MOLECULAR AND MACROMOLECULAR SCIENCES (PhD)

This course is a thorough study of a selected topic in the Molecular and Macromolecular Sciences constellation. Entry to the course, and the course outline, are subject to the approval of the Supervisory Committee and the Dean of Science. The course may include directed reading, directed research, and discussion with the instructor. The student may be required to prepare a written report and/or present a seminar in the area. Topics must not be directly related to the student's research project, although they may be in the same discipline. Coverage of the topic by the student must include the relevant commercial and business aspects of the field.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 804 FIELD COURSE IN MARINE DRUG DISCOVERY (MSc/PhD)

This course offering will familiarize students in the areas of marine natural products, marine taxonomy, field based biological assays of relevance to drug discovery, marine microbiology, and biotechnology. Lectures will introduce students to the concepts of field research and their applications to drug discovery. Students will participate in field collections of marine invertebrates. The collected organisms will then be subjected to several biological and chemical assays. Students will present field reports identifying the collected species and any chemical or biological activities observed. The second half of the course will focus on supervised research projects. The project topics will be chosen by the students and instructors. In lieu of a textbook, students will be provided with a collection of several publications from the marine natural products literature. These articles will include reviews of marine natural products, reports of recent advances, and founding texts of the field. Course experience in invertebrate zoology at the undergraduate level is strongly recommended.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 805 ADVANCED STUDIES IN NMR SPECTROSCOPY (MSc/PhD)

This course covers the use of Nuclear Magnetic Resonance (NMR) spectrometry used in the determination of structures in Organic and Inorganic Chemistry. Major topics include the theory and use of NMR spectroscopy, in particular the use of 2D experiments and multi-nuclear NMR spectroscopy. Particular emphasis is placed on developing the students' ability to interpret spectra and elucidate the structure of a molecule based on this evidence beyond the undergraduate level, as well as the role NMR has played as a structural tool in the pharmaceutical industry and academia.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 806 ADVANCED TOPICS IN COMPUTATIONAL CHEMISTRY (See MMS 883) (MSc/PhD)**MMS 807 ADVANCED STUDIES IN INORGANIC REACTION MECHANISMS (MSc/PhD)**

This course develops inorganic reaction mechanisms, with an emphasis on catalytic cycles, catalyst development, and the context of these reactions within the polymer, pharmaceutical and consumer product industries. Students will learn how to support reaction mechanisms through appropriate experimentation and spectroscopic characterization of catalysts, reactions and products. Students will examine how new catalysts are developed, patented and brought into commercial use. Major projects include a patent application on an imaginary catalytic system, and a report assessing the commercial relevance of a recent literature discovery.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 808 GREEN CHEMISTRY(MSc/PhD)

This course will develop the fundamentals of greener chemical processes and syntheses. The course will present the principles of green chemistry in the context of case studies within Canadian academia and industry. Coursework and projects will aim to develop synthetic skills, providing students with the tools to propose green synthetic plans for small molecules and polymers while introducing students to wider political and environmental issues which impact on chemical industry.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 809 BIOMATERIALS(MSc/PhD)

This course covers the fundamentals of the synthesis, properties, and biocompatibility of metallic, ceramic, polymeric, and biological materials that come in contact with tissue and biological fluids. Emphasis is placed on using biomaterials for both hard and soft tissue replacement, organ replacement, coatings and adhesives, dental implants, and drug delivery systems. New trends in biomaterials, such as electrically conductive polymers, piezoelectric biomaterials, and solgel processing are discussed, and the

recent merging of cell biology and biochemistry with materials is examined.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 810 SOFT CONDENSED MATTER PHYSICS (MSc/PhD)

This course utilizes a variety of tools developed within the general framework of statistical and solid-state physics to study the structural and dynamic properties of a number of important soft-condensed matter systems, including: polymers, liquid crystals, and membranes. Some key topics include: (1) Liquid crystals: elasticity, deformations, surface effects, fluctuations and scattering; (2) Polymers: chain conformations, mixtures and phase behaviour, motion in melts and glasses (viscoelasticity, relaxation, reptation); (3) Membranes: two and three-dimensional networks, self-assembly of amphiphiles, thermal fluctuations in membrane shape, bilayer bending and surface curvature. One of the goals of the course is to introduce students to a variety of important analytical methods, including: mean-field theory, density functional theory, Landau-Ginzberg theory, and renormalization-group theory. In addition, a number of key computational methods are employed to explore the properties of some simple polymeric systems, including: Monte Carlo, Molecular Dynamics and Discontinuous Molecular Dynamics.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 811 ADVANCED TOPICS IN MATERIALS CHARACTERIZATION (MSc/PhD)

This course introduces students to instrumentation that is routinely used in materials chemistry. The techniques to be covered include powder X-ray diffraction, thermogravimetric analysis, differential scanning calorimetry, electron microscopy, AC impedance and Raman spectroscopy. The theory behind these techniques will be thoroughly discussed in class, with an emphasis of data interpretation. Students will also gain hands-on experience with these instrumental techniques through laboratory work.

PREREQUISITE: Admission to a graduate program in Science; HOURS OF CREDIT: 3

MMS 813 ADVANCED TECHNIQUES IN SCANNING ELECTRONIC MICROSCOPY (See HB 825) (MSc/PhD)

MMS 882 MMS 882 ADVANCED TOPICS IN MOLECULAR AND MACROMOLECULAR SCIENCES (MSc/PhD)

This course covers current advances and advanced topics in a discipline of Molecular and Macromolecular Sciences and is a thorough study of specific topics. It is offered to graduate students at the discretion of the Department, and covers areas of specialization not covered in other graduate courses. The course discusses recent advances in an area of interest to the students but which are not part of the students' thesis research directly.

PREREQUISITE: Admission to the graduate program and permission of the instructor. HOURS OF CREDIT: 3

MMS 883 ADVANCED TOPICS IN COMPUTATIONAL CHEMISTRY (MSc/PhD)

This course exercises the application of computational chemistry to structural and reactivity questions in organic and inorganic chemistry. Computational methods discussed include molecular mechanics, ab initio and semi empirical calculations, and density functional theory. The objective is to gain an understanding of the application of these methods to chemical problems. The current literature is explored to illustrate the use of computational chemistry in research.

PREREQUISITE: Admission to MSc Program. HOURS OF CREDIT: 3

MMS 884 ADVANCED SPECTROSCOPIC STRUCTURE ELUCIDATION (MSc/PhD)

This course covers various forms of spectrometry used in the determination of structures in Organic and Inorganic Chemistry. Major topics include the theory and use of nuclear magnetic resonance (NMR) spectroscopy, in particular the use of 2D experiments; mass spectrometry and infrared spectroscopy. Particular emphasis is placed on developing the students' ability to interpret spectra and elucidate the

structure of a molecule based on this evidence. Spectroscopic techniques for the study of transient species are also discussed, including: laser flash photolysis (LFP); laser induced fluorescence (LIF); and stopped flow and relaxation methods for fast reaction studies.

PREREQUISITE: Admission to the graduate program. HOURS OF CREDIT: 3

MMS 890 SEMINAR IN MOLECULAR AND MACROMOLECULAR SCIENCES

In this course students attend regular departmental seminars. Students are also required to present a seminar on a topic within their discipline, but unrelated to their research project. Students must register for this course each semester, and receive a grade of "In Progress" until completion of their MSc programs.

PREREQUISITE: Admission to MSc Program in Science. HOURS OF CREDIT: 3
