

Undergraduate and Graduate Course Inventory

The following course inventory was conducted by Facilities Management in May 2014 in order to identify sustainability courses and courses that include sustainability as offered by Western University according to the most recently available academic calendar. **The course inventory is based on course offerings from the 2013-2014 and 2014-2015 academic year.** **Sustainability-focused courses** concentrate on the concept of sustainability, including its social, economic, and environmental dimensions, or examine an issue or topic using sustainability as a lens. **Sustainability-related courses** incorporate sustainability as a distinct course component or module or concentrate on a single sustainability principle or issue.

The course inventory includes undergraduate and graduate courses that include sustainability themes. Please seek academic counselling with the appropriate faculty for more information about registration in these courses.

Faculty of Arts and Humanities		
Classical Studies		
CS 2906A/B	Greek and Roman Medicine	This course will explore the major concepts of health and disease found in Greek and Latin texts (800 BC to 600 AD). Topics discussed will include ancient views on the structure and function of the body; health and its preservation; symptoms, causes and treatments of physical and mental diseases; the medical profession; divine healing; the patient as individual and type; and environmental influences on health.
English		
English 2091F	Green Literature	Ecological sustainability is a major concern today and it influences how we view nature as both precariously fragile and extremely powerful. But how did this view develop, and are their other ways of viewing the relation of nature to culture? Should we assume there is an irrevocable gap between the natural world and the world of artificial human construction, or is there a continuum as Donna Haraway suggests with her term “natureculture”? Furthermore, is “green” a normative political movement or a rejection of politics as usual? How has nature been represented in literary form in modern literature (focusing mostly on America) – from the pastoral to the wilderness, from nature as that which can be preserved, to the idea that nature is chaotic or sublime, beyond human conception? In this course, we will take a broad look at narratives of ecology, a word not invented until the late nineteenth century. We will also look at literary criticism of what is called ecocriticism, a movement launched in the 1980s, but which has its roots in 1960s radicalism and stretching back to the critiques of modern nationalism.

Philosophy		
Philosophy 1305F	Questions of the Day	This course develops students' ability to approach disputed questions by seeing them from both sides, so that they reach their own view only after respecting a broad range of argument. Six questions will be considered, including human (over) population, the public funding of art, and the limits of religious freedom.
Philosophy 2033A/B	Intro. to Environmental Philosophy	An examination of several key issues arising out of the present environmental crisis. Sample topics include: to what extent the environmental crisis is a scientific, religious, or ethical problem; the Gaia hypothesis; deep and shallow ecology; the land ethic; ecofeminism; the environment and economics; and sustainable development.
Philosophy 2035F	Nature, Ecology, and the Future	Our changing relationship to the natural world, and ability to affect Earth's future, bring urgent philosophical questions with real-world implications. This course draws on ideas from ethics, political philosophy, biology, psychology, economics and philosophy of science to explore the moral and epistemological dimensions of climate change, species extinction, and biotechnology.
Philosophy 2355F/G	Sustainability: A Philosophical Perspective	Sustainability is now widely advocated, but what exactly does it mean? Is sustainability a trendy ideology, an ethical ideal, or a scientifically based endeavour to protect people and the environment? This course addresses these questions and fosters reflections on what ought to be sustained, and what is required to make that possible.
Philosophy 2810F	Global Justice and Human Rights	What are our obligations to other countries and their citizens? Do those obligations issue from universal human rights? This course will address these questions through the consideration of a number of topics that raise issues of global justice, for example economic globalization, genocide and military intervention.
Richard Ivey School of Business		
Business		
BUS 2299	Business Organization for Engineers	The course is designed to introduce students to engineering economics and managerial decision-making. The case method is used to present selected problems in accounting and finance, marketing, organizational behavior and general management.
Bus 4414A/B	Managing for Sustainable Development	To enable managers to come to grips with the complex, demanding and potentially conflicting issues of sustainable development. This course focuses on the inter-relationships between and integration of financial, social and environmental performance.
4438Q/R/S/T	Business Ethics	Focus is on enhancing sensitivity to ethical issues. Topics covered include: developing an appreciation of the importance of ethical decision-making in business and learning how to deal with ethical issues in an organized way.

Bus 4518A/B	Project Management	This course is designed to provide students with a holistic, integrative view of project management. Both the technical elements (e.g., scope, schedules, budgets and status reports, etc.) and the sociocultural elements (e.g., leadership, teamwork, politics, etc.) of project management will be examined. Students taking this course will advance their understanding of project management and should develop a better appreciation for the common sense and science behind effective project management.
4519A/B	Co-creating Value in Developing Markets	Designed to equip students with knowledge and nuanced understanding of societal and individual consumer needs in developing markets, and to enable them to design product and market development sector-collaboration strategies to satisfy those needs. The course will explore these through a value co-creation paradigm.
Bus 4521	Social Innovation	Organizations are becoming increasingly interconnected and integrated through globalization, financial markets, information and communication technologies, and demographic changes. This course places in sharp focus the intimate connection among individuals, corporations, and society. You will learn about the complexity of decision-making, particularly when trying to align societal, organizational, and personal objectives.
Bus 4522	Managing the Triple Bottom Line	This course enables managers to come to grips with the complex, demanding and potentially conflicting issues of sustainable development. In a nutshell, sustainable development focuses on the interrelationships between and integration of financial, social and environmental performance. By the end of this course you should have gained tools, skills and intuition that will enable you to characterize the drivers of current social and environmental issues; integrate financial, social and environmental performance within a general business model; review and critique the strategies adopted by firms on sustainable development based on decision-oriented frameworks; and formulate effective approaches to managing the triple bottom line.
Bus 4523A/B	Business, Government and the Environment	This course examines the rationale for government regulation in various industries and the public policy procedures through which regulations are determined. The course will also develop an understanding of how firms can strategically manage their policy environment through their interactions with various stakeholders and government. Special emphasis will be placed on current policy and management issues in the energy sector.
4529Q/R/S/T	Social Enterprise	This course provides a comprehensive introduction to social enterprise in developed and developing countries. The course focuses on the unique entrepreneurial processes associated with the creation or discovery of positive social change. It explores the different mechanisms of value creation in organizations that combine doing good and doing well.

4538A/B	Women in Leadership	For students who want to promote the movement of women into leadership positions in Canadian business organizations. Through case studies, debates, and conversations with senior women leaders, investigate the factors enhancing women's career opportunities and identify the skills that it takes for women to build successful careers.
Bus 4539A/B	Business Strategy and Sustainability	This course is for students interested in understanding the interface between business and sustainability. Sustainability is defined as the maintenance of ecological, social and economic systems. This course will introduce students to the relationship between sustainability and business strategy, focusing on the fundamental strategic motivations of business can represent both a force for and against the integrity of these systems.
Bus 4550A/B	Sustainability in Action	This course provides a comprehensive foundation to the practical challenges to and opportunities of doing sustainability work. It is designed as an action-oriented course for future leaders of for-profit, non-profit and governmental organizations interested in championing and implementing positive social change.
Bus 4557A/B	Business Government and Globalization	This course explores the tensions that can arise between corporate behavior and societal interests. There are two modules to the course: the first, examines these issues in the context of the natural and the social environment. The second examines the relationship between business strategy and an ever globalizing world.
Bus 4570A/B	Design Thinking for Sustainable Innovation	This course is intended for business and engineering students who are interested in leading multi-disciplinary teams in a holistic approach to creating sustainable innovations.
Business (PhD, EMBA, MBA) ELECTIVES - course code not included		
	Embedding Sustainability in Business (0.75)	This course examines how environmental and social factors are reshaping the competitive landscape of business. It will teach you to a) apply conceptual frameworks to evaluate environmental and social performance; b) assess how markets respond to....
	Managing Operations (1.0)	In MO you will learn how tactical decisions such as process design, planning and control, and project management are the basis for broader quality and supply chain management systems.. You will also learn to identify and understand how effectively managing
	China Study Trip (0.75)	During your time in China you'll visit local businesses, make connections with business leaders, join in 'cultural plunge' team activities and learn how businesses operate successfully in these economic climates.
	Competing with Analytics (0.75)	The course will build on material covered in the MBA core class "Decision Making with Analytics". It will provide you with an understanding of the field of business analytics with a focus on examining the ways that globally competitive corporations are using
	Global Supply Management (0.75)	The course is composed of three parts: purchasing and supply management; logistics activities in the supply chain; and supply chain strategy.

	Health Sector 1 (0.75)	The purpose of the course is to provide a foundation for students who wish to pursue careers or who have an interest in the health sector. The course begins with a discussion of the Canadian context - policy, population health issues, globalization and health -
	Health Sector 2 (0.75)	The purpose of the course is to provide a foundation for students who wish to pursue careers or who have an interest in the health sector. The course begins with a discussion of the Canadian context - policy, population health issues, globalization and health -
	Health Sector 3 (0.75)	The purpose of the course is to provide a foundation for students who wish to pursue careers or who have an interest in the health sector. The course begins with a discussion of the Canadian context - policy, population health issues, globalization and health -
	India Study Trip (0.75)	During your time in India you'll visit local businesses, make connections with business leaders, join in 'cultural plunge' team activities and learn how businesses operate successfully in these economic climates.
	New Media Marketing (0.75)	This course merges theoretical concepts with strategic and practical solutions, and lays the foundation for the type of insight necessary to intelligently and strategically engage the environment while avoiding its many pitfalls.
	South America Study Trip (0.75)	During your time in Latin America you'll visit local businesses, make connections with business leaders, join in 'cultural plunge' team activities and learn how businesses operate successfully in these economic climates.
Business Management (MSc) ELECTIVES - course code not included		
	Sustainability (0.75)	Sustainable businesses create value by encouraging healthy ecosystems and strong communities. In this course, we discuss some of the significant social and environmental issues confronting our society and the business practices and tools that can help to resolve these issues.
	Customer Insights (0.75)	Intimate knowledge of consumer psychology is imperative to sustainable value creation. This course focuses extensively on the consumer as a key driver of marketing strategy. Successful performance in international markets requires an especially heightened sensitivity to unique consumer behaviours and needs. A variety of research techniques will be introduced and applied with the major goal of increasing your ability to translate consumer insights into winning marketing strategy.
	Decision Making With Analytics (0.75)	The objectives of this course are to introduce you to analytical frameworks and techniques for solving managerial problems in order to make better decisions. The course is organized around the use of data and mathematical models to analyze and support the decision making process. More specifically we will discuss Spreadsheet Modeling, Optimization (linear, non-linear, and dynamic), Stochastic Decision Making, Simulation, Data Analysis and Regression (linear and logistic). Models will be developed in Excel. and the statistical programming environment.

	Global Supply Chain Management (0.75)	The course is composed of three parts. The first part of the course covers the broad perspective of purchasing and supply management; topics covered include supplier selection, supplier management and strategic sourcing. The second part of the course addresses logistics activities in the supply chain, including transportation, distribution, planning and forecasting and customer service strategies. The balance of the course focuses on supply chain strategy and deals with opportunities to develop and implement initiatives to create competitive advantage. Every effort is made to make the methodology as interesting and exciting as possible. This course uses a variety of approaches, including a classroom simulation exercise.
	Technology Trends (0.75)	Students will first investigate how personal computers, telephony, and enterprise systems have changed the face of organizations over the last 40 years. The purpose of this section will be to understand modern technology infrastructure and to develop a familiarity with methods used to analyze these technologies. Students will then move to study technologies that are currently going through rapid change and integration in to practice including social media, mobile communication, big data, 3D printing, wearable computing and the Internet of things. In the final section of the course, students will look at how these technologies are being brought to bear on some of the big problems of the world – food distribution, income disparity, housing and health care. At the end of this course, a student will be familiar with current “hot” technologies and methodologies to assess the relevance of new technologies to their industries.

Faculty of Engineering

ES 1050	Introductory Engineering Design and Innovation Studio	Introduction to the principles and practices of professional engineering. The design studio fosters innovative thinking, improves problem solving, and provides context - includes elements of need recognition, conceptualization, prototyping, and engineering design to satisfy commercial specializations. Emphasis on creativity, teamwork, communication and engineering skills necessary to practice in any engineering discipline.
ES 4498 F/G	Engineering Ethics, Sustainable Development and the Law	This course will cover professionalism, ethical theory, the code of ethics and enforcement; the environment; and contracts and risk.

Chemical and Biochemical Engineering

CBE 2220A/B	Chemical Process Calculations	The objective of this course is to introduce second year students to the field of chemical engineering. The basic concepts employed in chemical engineering will be covered. Examples of chemical, biochemical, environmental industries will be presented. New directions in chemical and biochemical engineering will be introduced.
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CBE 2290A/B	Fundamentals of Biochemical & Environmental Engineering	The overall objective of the course is to apply the principles of microbiology, biochemistry to understand and solve environmental problems. This course covers the fundamental concepts of biological processes that are important in natural and engineered environmental systems. Students will gain basic skills of biochemistry and microbiology in laboratory section.
CBE 2291A/B	Computational Methods for Engineers	This course is designed to introduce the student to technical computing for Engineers and Scientists using the high level, interactive, computational tools provided by the Matlab-Simulink Environment. Students will learn both the object oriented programming and command line modes of Matlab and apply them to the solution of a variety of problems involving optimization and dynamic simulation of Engineering processes.
CBE 3301A/B	Biochemical Reaction Engineering	This course is designed to introduce the student to technical computing for Engineers and Scientists using the high level, interactive, computational tools provided by the Matlab-Simulink Environment. Students will learn both the object oriented programming and command line modes of Matlab and apply them to the solution of a variety of problems involving optimization and dynamic simulation of Engineering processes.
CBE 3310A/B	Process Dynamics and Control	This course is designed to introduce the student to technical computing for Engineers and Scientists using the high level, interactive, computational tools provided by the Matlab-Simulink Environment. Students will learn both the object oriented programming and command line modes of Matlab and apply them to the solution of a variety of problems involving optimization and dynamic simulation of Engineering processes.
CBE 3315A/B	Reaction Engineering	This course is designed to introduce the student to technical computing for Engineers and Scientists using the high level, interactive, computational tools provided by the Matlab-Simulink Environment. Students will learn both the object oriented programming and command line modes of Matlab and apply them to the solution of a variety of problems involving optimization and dynamic simulation of Engineering processes.
CBE 3319A/B	Introduction to Plant Design & Safety	This course introduces students to chemical processes, analysis and design considering safety, environment and economics. Students will be exposed to fundamental aspects of chemical process design and integration of safety from theoretical and practical perspective. Students will be also provided with detailed review and analysis of major accidents in chemical industry and preventive measures.
CBE 3320A/B	Bioprocess Engineering	Transport phenomena in biochemical engineering systems, design and analysis of bioreactors, mixing, aeration, sterilization, instrumentation and control in bioprocesses. The laboratory deals with complete fermentations, medium preparation and product recovery for selected processes/products.
CBE 3322A/B	Heat Transfer Operations	Introduce chemical engineering students to the basics of heat transfer, including conduction, convection, radiation and phase change. This knowledge will be used for the design of various types of equipment such as heat exchangers with and without phase change agitated reactors, evaporators, condensers.

CBE 3323A/B	Staged Operations	This course will focus on the staged unit operations in chemical engineering. It is designed to familiarize the students with the nature and theory of chemical engineering unit operations, analysis and physical separation processes based on the ideal stage concept.
CBE 3324A/B	Mass Transfer Operations	This course reviews the fundamentals of interphase mass transfer and transfer units and then reviews the design of differential mass transfer equipment, with special emphasis on absorption, stripping, humidification and drying.
CBE 4403A/B	Biochemical Separation Processes	The main objective of this course is to introduce the student to the basic fundamentals of downstream separation and purification processes such as membrane separation processes, protein separation and purification and other separation processes of economic importance to fermentation industry.
CBE 4407A/B	Solid Waste Treatment	Principles of solid waste treatment using chemical and biological methods, with emphasis on waste volume reduction at the source and recycling. Classification of solid wastes, incineration, fluidized chemical reactors and bioreactors for solid waste treatment, chemical and biological oxidation of solids, chemical and biological treatment of hazardous compounds in soil.
CBE 4409A/B	Wastewater Treatment	This course introduces a basic understanding of municipal wastewater treatment processes. The course reviews pertinent environmental regulations, and general wastewater quality parameters. Processes and unit operations in wastewater treatment are introduced with particular emphasis on process design. Considerations in integrating unit processes and operations into a treatment system are presented.
CBE 4413A/B	Selected Topics in Chemical Engineering – Nanobiotechnology	Nanobiotechnology is an emerging frontier in nanotechnology. It integrates materials science, chemical engineering, physics and life science toward the biological and biochemical applications. Through introducing the vital information on application of nanotechnology, this course presents how to design and develop nano-devices for the applications of pharmaceuticals and healthcare. Typical applications include nano-biosensor, target delivery, and tissue engineering.
CBE 4415	Chemical Engineering Project	Selection and investigation of an engineering problem. Analytical and/or experimental work is carried out by individual students or project groups under the supervision of a faculty member. Progress reports and a final engineering report are prepared; each student must deliver a public lecture.
CBE 4418A/B	Industrial Multiphase Reactor Design	This course covers various aspects of certain multiphase reactors including hydrodynamics, heat and mass transfer, residence time distributions and contacting models for large reactors. Design methods and calculations for industrial fixed-bed, fluidized –bed, and three phase reactors are covered.

CBE 4424A/B	Biosensor Principles and Applications	The fundamentals of biosensors and their applications in biotechnology, environmental and biochemical engineering will be discussed. Fundamentals of intelligent biosensor design are introduced. Basic concepts of micro- and nano-biosensors are discussed.
CBE 4432A/B	Oil Refining and Processing	An introduction to petroleum refining processes, operations, feedstocks and products. Configurations of refinery processes and their evolution will be discussed in view of environmental efficiency and economic considerations. Current trends and future of the industry will be addressed.
CBE 4463A/B	Water Pollution Design	Design problems on specific pollution topics are undertaken and completed. Topics selected are activated sludge, trickling filters, oxidation ponds, anaerobic digestion, composting, solvent extraction, flotation, settlers and clarifiers, incineration, chemical treatment, e.g. flocculation, coagulation, ozonation or chlorination.
CBE 4467A/B	Green Energy and Chemical Processes	This course explains how green processes can provide a sustainable supply of energy and advanced separations, while maintaining a minimal environmental impact. New and emerging technologies will be explored for biomass gasification, pyrolysis, solar energy and the replacement of organic solvents with supercritical carbon dioxide and ionic liquids.
CBE 4485A/B	Energy and Society	Energy is the greatest challenge facing humanity in the 21st century. This course will cover the historical aspects of energy conversion and use by humans, the types of energy available (including both renewable and non-renewable), their conversion to useful forms of energy, conversion efficiency, and cost of conversion. A very important aspect of the course is the environmental effect of energy conversion. The atmospheric pollution by greenhouse gases as well as conventional pollutants during energy conversion will be discussed. The main methods of pollution reduction by power industries will be presented.
CBE 4493A/B	Polymer Engineering	The basics of polymer science and engineering are covered. The theory of macromolecules, macromolecular chemistry and fundamentals of polymerization are discussed. Specific manufacturing processes and polymer types are considered.
CBE 4497	Chemical Process & Plant Design	A design is prepared for a full-scale chemical process. This involves the detailed design of all major pieces of equipment, an estimate of the requirements for new materials and energy, and a calculation of total costs. Problem formulation, alternative design solutions and professional decision making are emphasized.
CBE 4499	Chemical Engineering Design for Medical Students	Selected chemical, biochemical or pharmaceutical processes or processes for pollution abatement will be designed. Alternatively, the design of specific biomedical devices may be carried out. Chemical engineering principles will be employed. The design will include problem formulation, detailed design of equipment, environmental, economic and legal issues, and safety consideration.

CBE 9260	Advanced Bioengineering and Biotechnology	This course will introduce graduate students to advanced topics in biochemical engineering. Students will be provided with an understanding of the underlying molecular biology of industrially relevant processes and will be introduced to modern techniques and practices in biotechnology and bioengineering. The course will further cover bioreactor design for aerobic and anaerobic processes and bridge new molecular advances and classical reactor engineering. The course is of interdisciplinary nature and intended for graduate students conducting biotechnological research.
CBE 9265	Microalgae: Biotechnology and Applications	Microalgae are being considered with renewed interest as a source of cheap feedstock for a myriad of applications including next generation biofuels, nutraceuticals, production of clean water and for the capture of carbon dioxide. In this course, the fundamentals of microalgal systems are discussed. The basics of the biochemistry, microbiology and classes of microalgae are covered. Applications and design of microalgal systems, energy analysis and introductory economics are also covered.
CBE 9350	Physical Principles of Environmental Engineering	To learn the fundamentals and applications of mass, momentum, and heat transport in environmental engineering; concepts of advection, diffusion, dispersion, settling, surface transfer, kinetics and equilibrium processes in air, water and soil; quantitative applications in natural environment and treatment systems.
CBE 9361	Biological Wastewater Treatment	This course introduces the students to the principles of wastewater treatment and pollution control, with particular emphasis on municipal wastewater treatment. At the end of the course, students should have a thorough understanding of both liquid wastewater treatment processes as well as biosolids handling, treatment and disposal. That Understanding should enable students to undertake process design activities as well as pursue and explore further research areas in the field.
Civil and Environmental Engineering		
CEE 2217A/B	Introduction to Environmental Engineering	A course introducing the application of chemistry and engineering principles to an understanding of environmental issues associated with human activity. Topics include mass and energy transfer, environmental chemistry, water and air pollution, pollutant transport modeling, pollution management, and risk assessment.
CEE 2219A/B	Computational Tools for Civil Engineers	A first course in numerical methods for civil and environmental engineers, emphasizing problem formulation, solution algorithm design and programming application. Methods for solving nonlinear algebraic equations, ordinary differential equations, and differential-algebraic systems. Introduction to the systems approach, and system analysis terminology, for application to engineering planning, design and operations.
CEE 3321A/B	Soil Mechanics & Hydrogeologic Engineering	Soil classification, clay mineralogy, effective stress principle, site investigation practice, soil compaction, and one and two dimensional steady state flow in natural and engineered systems.

CEE 3322A/B	Introduction to Geotechnical Engineering	One dimensional settlement and consolidation theories for clayey soils, shear strength models, and assessment of slope stability.
CEE 3327A/B	International Development for Engineers	The course will assist students to achieve a broad understanding of international development to enable the effective use of engineering in developing countries. The course covers what works and does not work in international development, the results targeted in development work, and effective approaches and methodologies to achieve those ends.
CEE 3328A/B	Appropriate Technologies for International Development	The course will introduce the concept of appropriate technology in the context of international development to students. It will examine the application of technologies to critical human needs in development, such as housing, transportation, provision of safe water and sanitation, waste management, and as energy.
CEE 3348A/B	Project Management & Engineering Cases	Students develop decision making skills for case histories including those involving project management, natural and environmental hazards (earthquake, floods, etc.) and sustainable development.
CEE 3355A/B	Municipal Engineering Design	Application of hydraulics and hydrology in design of water-related municipal systems. Topics include municipal water requirements and waste volumes; surface and ground water supplies; water treatment, transportation and distribution; sewerage, drainage and flood control.
CEE 3361A/B	Water Resources Management	Introduction to water resources management for engineers. Water resources management principles and tools; regulatory issues; economic analysis; water supply; water demand; sustainable development; climate change; extremes (floods and droughts); water management in the Upper Thames River basin. Exposure to and use of computer-based tools in solving water resources management problems.
CEE 3362A/B	Drinking Water Quality and Treatment	In the course students will be taught the basic principles of water quality and treatment with particular focus on developing communities. Specific topics will include drinking water quality guidelines and legislation, identifying drinking water sources with adequate quality and quantity, drinking water treatment technologies and water distribution systems in developing communities.
CEE 3386A/B	Numerical Modeling for Environmental Engineers	Principles of model development and solution for environmental systems including river and lake water quality, groundwater flow and contamination, and atmospheric pollution. Application of these principles using a range of numerical techniques, including current commercial software packages, through all stages of the modeling process from conceptualization to calibration and validation.
CEE 4404A/B	Advanced Topics in International Development for Engineers	This course will help students to achieve a deeper and broader understanding of the role of engineering in international development. This course makes extensive use of the case method and the decision makers in some of the cases will attend. A range of advanced topics will be covered.

CCE 4405A/B	Air Pollution	The nature and effects of air pollution including the structure and physical behavior of the atmosphere, types and origins of air pollutants, chemical reactions in the atmosphere, atmospheric dispersion, techniques of pollutant evaluation and surveys and effects of air pollution on health and other aspects of urban and natural environments.
CEE 4418A/B	Systems Approach for Civil & Environmental Engineering	Use of systems approach in civil and environmental engineering planning, design and management. Course topics include: systems thinking; simulation; optimization; and multi-objective analysis. Exposure to and use of computer-based simulation and optimization tools in solving civil and environmental engineering problems.
CEE 4427 A/B	Special Topics in International Development	The course deals with topics of current interest in Civil Engineering applications to International Development. Topics and course outline will be available at the time of registration.
CEE 4440	Civil Engineering Thesis	Selection and investigation of an engineering problem. Analytical and/or experimental work is carried out by individual students, supervised by a faculty member. Progress reports and a final engineering report are prepared; each student must deliver a public lecture. Students considering future graduate studies are strongly encouraged to take this course.
CEE 4441	Civil Engineering Design Project	Students undertake a comprehensive engineering design project which involves the creative, interactive process of designing a structure/system to meet a specific need subject to economic, health, safety, and environmental constraints. Each group of students is required to write an engineering report and deliver a public lecture.
CEE 4458A/B	Risk Analysis & Decision-Making in Engineering	Engineering systems are analyzed using probability theory and statistics to evaluate system performance under uncertainty. Risk based methods are used to make decisions under uncertainty.
CEE 4465A/B	Environmental Design for Waste Disposal	Consideration of properties of solid waste, landfill covers, landfill gas, leachate, techniques for disposal, regulations, liner technology, contaminant transport, and impact assessment are examined in the context of the design of solid waste disposal facilities.
CEE 4476A/B	Environmental Hydraulics Design	The application of hydraulic engineering principles in the analysis of environmental flows. Topics include: open channel transitions, flow measuring devices, stabilization of a natural river, flood control channels, spillways and stilling basins, culverts, and sediment transport in alluvial channels.
CEE 4477A/B	Environmental Applications of Nanotechnology	This course describes the technology, challenges, and applications of nanoscale devices for environmental technology and engineering. The first part of the course will explore the underlying science behind nanotechnology and the tools used to create and characterize nanostructures; the second part will deal with the current and potential applications of such devices in environmental science and engineering. Material will be presented on a level intended for upper-level engineering students.

CEE 4478A/B	Case Studies in Civil Engineering	Students will examine a number of "cases" in which some critical engineering decisions must be made. These decisions may be influenced by technical, social, economic, political, legal, ethical, health and safety or regulatory considerations.
CEE 4479A/B	Subsurface Contamination by Hazardous Industrial Chemicals	This course deals with soil and groundwater contamination by organic industrial liquids. Multiphase flow through porous media will be covered, linking key physics and chemistry to contaminant behavior in the field. Relevant analytical and numerical models are employed. Practical aspects covered include site investigation techniques and innovative clean-up technologies.
CEE 4480A/B	Wind Engineering; Modelling Assessment and Mitigation	An introduction to wind effects on structures. Topics covered include wind climate, the atmospheric boundary layer and its description, bluff body aerodynamics and aeroelastic effects, quasi-static and dynamic approaches to wind loads on structures, internal pressures, and code approaches to wind loads on structures.
CEE 9531	Wind Energy and Sustainability	This course will provide an introduction to wind energy and, to a lesser extent, wind sustainability. Some specific areas that will be discussed include the wind resources, wind turbine aerodynamics, wind turbine blade aerodynamics, wind turbine dynamics, and an overview of wind sustainability concepts. The coverage is very broad based on the interdisciplinary nature of wind energy, and each of these areas could be a course in themselves. As a result, the course content will be more applied in nature.
CEE 9532	Building Sustainability	In this course, students are introduced to environmental issues associated with buildings, passive cooling and heating building systems, as well as concepts of building performance indicators. Students are exposed to modeling methods to evaluate environmental loads and energy demand, to the use of building simulations in life cycle analysis for the selection of energy-efficient building components and systems, and to applicable regulatory and sustainability frameworks. Buildings can produce less greenhouse gas emissions and consume less energy while being comfortable, healthy, and economical through the proper application of sustainable design.
CEE 9598A/B	Durability, Monitoring and Rehabilitation of Concrete Structures	This course is intended to provide graduate students with practical experience in identifying mechanisms of degradation of concrete structures, understanding the potential causes of such degradation, and developing repair strategies that can efficiently and economically extend the service life of deteriorated structures
CEE 9642	Aquatic Chemistry	Application of thermodynamics and kinetics to understand chemical speciation, transformation and partitioning in natural aquatic systems. Broad applicability in areas including ground and surface water quality and contamination as well as water and wastewater treatment.

CEE 9692	Drinking Water Quality and Treatment	The course develops graduate level concepts for the examination of drinking water quality and discussion of state of the art technologies for treating drinking water. The motivation for the course is the recent recognition that infrastructure and facilities for delivering safe, clean, and adequate supplies of drinking water to citizens are either inadequate or susceptible to failure. This course will incorporate significant experimentation with the pilot plant at the Walkerton Clean Water Centre.
CEE 9704	Assessment and Remediation of Contaminated Sites	This course reviews physical and chemical properties of commonly occurring contaminants and their impacts to subsurface environment, study the interactions of soil-water systems with inorganic and organic contaminants. The practical issues discussed include site assessment - delineation of the scope and extent of contamination in subsurface and compliance with regulatory guidelines; and site remediation techniques.
CEE 9870	Groundwater Flow and Contaminant Transport	This course is an advanced course in groundwater flow and subsurface contamination and includes a contaminated site remediation design. The objectives of the course are for the students: To develop an understanding of groundwater and its importance in the hydrologic cycle. To recognize the wide range of technical and non-technical considerations associated with contaminated site remediation and to understand the impact of the engineering solution in a global and societal context. To develop an understanding of the sources and characteristics of groundwater pollutants. To understand the professional and ethical responsibility of an engineer with respect to contaminated site remediation including consideration of social, economic, environmental, worker health and safety, and legislative and other regulatory issues. To use state-of-the-art computer techniques to determine the extent of groundwater contamination and assess remediation options. To apply mathematical, scientific and engineering knowledge for contaminated site remediation design to meet specified needs and legislative requirements. To improve communications skills by discussing current contaminated site remediation issues, and expressing and defending opinions before your peers. To obtain experience working as a member of a design team and hence prepare for the engineering workplace. To appreciate the rapidly changing nature of knowledge and technology in this field and the need for life-long learning.
Electrical and Computer Engineering		
ECE 4439A/B	Conventional, Renewable and Nuclear Energy	Global energy resources, distribution and consumption. Sustainability. Principles of operation and control of thermal, nuclear, thermal and hydroelectric, photovoltaic solar and wind power plants. Distributed Generation (DG) and renewable energy technologies. Grid integration of distributed generation.

Green Process Engineering		
GPE 2213A/B	Green Chemistry I	This course introduces green chemistry concentrating on a fundamental understanding, design and implementation of processes and products that minimize or eliminate the use and generation of hazardous chemicals. An introduction to the properties of organic molecules and the general laws that govern organic chemical process is presented together with the main reactions of the organic functional groups with special highlights on green chemical reactions
GPE 2214A/B	Green Chemistry II	This course expands the concepts of green chemistry and application to the manufacture and use of chemical compounds. The concepts are developed concentrating on a fundamental understanding and application of the 12 principles of green chemistry. The course relies on knowledge of organic chemistry and its application for the development of green industrial processes
GPE 2218A/B	Physical Chemistry and Reaction Equilibria	This course presents the basic concepts of physical chemistry and chemical equilibria. The general objectives are for the student to understand the basic concepts of physical chemistry and chemical equilibria that will be used by subsequent courses in the green program and be able to perform calculations associated with the prediction of chemical equilibria.
GPE 3315A/B	Reaction Engineering with Green Engineering Applications	Reaction kinetics as applied to the large-scale manufacture of chemicals. An introduction to the factors which affect the design and size of chemical reactors as well as the conditions under which they are to be operated for maximum efficiency with special highlights on green processes.
GPE 3324A/B	Mass Transfer Operations with Green Engineering Applications	This course reviews the fundamentals of interphase mass transfer and transfer units and then reviews the design of differential mass transfer equipment, with special emphasis on absorption, stripping, humidification and drying. The laboratory component of the course focuses on the operation of mass transfer process with green applications.
GPE 3382A/B	Fundamentals of Green Engineering and Safety	This course reviews the fundamental concepts of Green Process Engineering and Safety. The general objectives are for the student to be aware of the environmental and safety issues associated with industrial processes, environmental laws and regulations and to be able to evaluate and control the environmental footprint of industrial chemical processes with considerations of safety.
GPE 3383A/B	Solar and Fuel Cells	The basics of fuel cell operation, including electrode kinetics, membrane processes, mass transfer and hydrodynamics. The main types of fuel cells and solar cells will be taught, advantages, disadvantages and current status of development will be discussed. Applications of fuel cells for stationary, portable and transportation electricity generation.

GPE 3385A/B	Green Power	This course will introduce students to various electric power generation technologies and issues associated with their design, performance, environmental and social impact. Power consumption patterns of family households, small businesses and their modeling are studied. Solar, wind, nuclear, tidal, geothermal, hydrogen and biomass based electric power generation are reviewed. Aspects of their incorporation into the existing electric power grid and fuel cycle will be reviewed.
GPE 3386A/B	Sustainable Engineering Life Cycle Analysis and case Studies	This course will provide an introduction to sustainable engineering. Topics include challenges in sustainability, risk and life-cycle frameworks, environmental laws and regulations, green and sustainable environmental footprints of industrial chemical processes. Several case studies will be examined including life-cycle analysis of biofuels for transportation, photovoltaic cell construction and LED lighting.
GPE 3395Y	Green Process Engineering Laboratory Course	This course focuses on a laboratory, green engineering project. It applies and integrates the concepts reviewed in heat and mass transfer operations, process dynamics and control, and particulate operations.
GPE 4415	Green Process Engineering Project	Selection and investigation of a green engineering problem. Analytical and/or experimental work is carried out by individual students or project groups under the supervision of a faculty member. Progress reports and a final engineering report are prepared; each student must deliver a public lecture.
GPE 4484 A/B	Green Fuels & Chemicals	This course describes what are green fuels and chemicals and the main current or potential processes used to produce green fuels and chemicals. The student should be aware of the issues associated with the production of fuels and chemicals from fossil resources, be aware of the current processes that are used on a commercial scale to produce green fuels and chemicals, their advantages and drawbacks.
GPE 4497	Green Process Design	A design is prepared for a device or a full-scale industrial process. This involves the detailed design of all major components, an estimate of the environmental footprint, and an economic analysis. Problem formulation, innovative solutions and professional decision making are emphasized.
Mechanical Engineering		
MME 2259A/B	Product Design and Development	Introduction to the engineering design and structured design methods. Topics include: mechanical design process; concept generation and evaluation; embodiment design; design for manufacture and assembly; design for product safety; principles of life-cycle engineering.

MME 4423A/B	Internal Combustion Engines	This course elaborates on the fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements and environmental impact, study of fluid flow, thermodynamics, combustion, heat transfer and friction phenomena, and fuel properties, relevant to engine power, efficiency and emissions, examination of design features and operating characteristics of different types of internal combustion engines: spark-ignition, diesel, stratified-charge, and mixed-cycle engines.
MME 4429A/B	Nuclear Engineering	To present an overview of nuclear engineering beginning with the fundamentals of nuclear physics and extending to the operation of nuclear reactors with special emphasis on the CANDU nuclear reactor.
MME 4443A/B	Energy Conversion	The basic technical and economic criteria for the design of efficient energy conversion systems are introduced. The principal traditional (steam, hydro and wind) as well as alternative (solar, Ballard) power systems are modeled. Strategies for increased energy efficient and environmentally friendly operation are developed. Design alternatives and selection criteria are studied based on long-term economic viability and overall energy management strategies.
MME 4491A/B	Wind Engineering	Basic meteorology, the atmospheric boundary layer, wind statistics, flow patterns around basic structural shapes, Quasi-static design of wind loads on structures (using relevant codes of practice), dynamic excitation and response of structures to wind loading, environmental effects of flow around buildings, wind tunnel testing using structural models.
MME 4492A/B	Production Management for Engineers	This course examines lean production principles and practices adopted by world-class manufacturers. Topics include: continuous improvement; total quality management; statistical process control; setup reduction; total productive maintenance; just-in-time and pull production; group technology; cellular manufacturing; standard operations; level production scheduling; process balancing; supply chain management; activity based costing; agile manufacturing.
MME 9617A/B	Energy Conversion	To introduce the basic technical and economic criteria for an understanding of energy conversion systems, including traditional as well as alternative power systems. To discuss strategies for increased energy efficiency and more environmentally sound operation. To assess design alternatives and selection criteria based on long-term economic viability and overall energy management strategies.
MMEE 9722A/B	Fuel Cell Science and Energy	This course focuses on a clean energy device, known as fuel cells. This course aims at developing students' knowledge and understanding of various fuel cell systems. Strong emphasis will be put on fuel cell fundamentals including thermodynamics, electrode kinetics, transport issues, and fuel cell performance. These issues will be discussed in the context of operation of following systems Polymer Electrolyte Membrane, Direct Methanol, Alkaline, Solid Oxide, and Molten Carbonate. Overview of the current fuel cell industry will be given.

Faculty of Health Sciences

Health Sciences

HS 1002A/B	Social Determinants of Health	This course introduces key social determinants of health, and orients students to viewing health in relation to social factors, equity, and social justice. Students will be introduced to basic terms, concepts, and measurements related to health, public health, population health, and health inequalities.
HS 2000A/B	Highway to Health	This introduction to the multidisciplinary field of health sciences will engage students in learning about health from multiple perspectives. Each week, an expert will lecture on contemporary issues in health such as: aging and health; occupational health; ethical issues in health care; health and popular culture; global health issues; sexuality and health.
HS 2610	Introduction to Ethics in Health	An introduction to basic moral theory and development of an understanding of moral reasoning. The course will also teach students to apply basic principles of sound moral decision-making to important ethical issues in health including: concepts of health, wellness, and illness, allocation of scarce resources, the notion of "consent". The methods of explaining/justifying moral decisions in health will be explored by surveying major philosophical approaches to ethics.
HS 2711A/B	Health Issues in Aging	This course will examine, from an interdisciplinary perspective, fundamental issues associated with growing older and the complex interaction of physical, psychosocial, and environmental issues that influence the health and well-being of older adults.
HS 3010F/G	Introduction to Rural Communities	An introduction to rural communities and how they differ from urban communities. Rural vs. urban comparisons will be introduced from sociological, infrastructure, political, and health services perspectives.
HS 3011F/G	Creative Service Delivery in Rural Communities	This course will help prepare students for rural community employment. Content includes analyses of community development strategies, political decision making models, community fundraising, and effective human resources management strategies. (Note: In preparation for Health Sciences 409, students will develop their own practica with a faculty member and rural community representative).
HS 3050A/B	Health Related Quality of Life	The course provides information on the construct, measurement, and definition of health related quality of life in health and disease and is directed toward understanding the multidimensional nature of quality of life as a theoretical construct and its application to health and wellness, illness, and disease.
HS 3071A/B	Determinants of Health and Disease	Many factors such as individual characteristics and behaviour, social status, physical and social environments and personal relationships affect the health of individuals and communities. This course will provide an in-depth investigation of the key determinants of health and disease, with special attention to modifiable and non-modifiable factors.

HS 3250A/B	Global Health Promotion	Political, economic, social, cultural, environmental, behavioural and biological factors determine health status. Designed for an interdisciplinary student mix, this course will explore issues identified as significant determinants of health (poverty, disease, illiteracy, environmental degradation) and strategies (activism, community development) to promote health within a global context.
HS 3251F/G	Global Health Promotion Practicum	Based on a service-learning philosophy, students will have an opportunity to provide an important community service and to benefit from 'learning-in-context' about health promotion within a global perspective. This field placement will enable students to practice the skills (e.g., community development, activism) learned within Health Sciences 3250F/G.
HS 4092	Health Issues Among Marginalized Populations	This is an advanced undergraduate course in health sciences that examines from critical perspectives, namely medical anthropology, feminism, and political-economy theory, a series of health issues that are experienced by a diverse array of marginalized populations. One of the primary objectives of this class is for students to develop an understanding of how macro (i.e., gender, political-economy, race, poverty) and micro (i.e., individual factors within the context of people's daily lives) forces intersect to produce both marginality and particular health issues/experiences for people who are relegated to, or find themselves on, the margins of society. The course is structured topically, with different populations and issues explored weekly, including: the social geography of mental health; everyday suffering among drug users; youth 'at risk'; motherhood and surveillance among poor women; the unfortunate legacy of the "elephant man"; the violence of "starlight tours" for Aboriginal people in Saskatoon, Saskatchewan; immigrant and working class women's ideology regarding cancer; a social portrait of a British neurosurgeon who devotes his time to working in impoverished hospitals in the Ukraine; violence and barriers to existence among lesbian women; and the cultural logic and social forces behind constructions of sexually-transmitted diseases. The focus is primarily on the North American context, however, the concepts and ideas employed in the class can also be applied in socio-economic, political, and gendered settings globally.
HS 4410A/B	Future of Health Care	Canada's health care system is facing significant challenges and structural reforms. Students will learn how Canada's system is performing relative to other countries. Based on these international experiences and other forces of change, students will investigate what needs to change in order to create a sustainable system for the future.
Nursing		
Nursing 1101W	Introduction to health and Illness	This course provides an introduction to the nursing profession, health, illness and health promotion. These concepts are considered from the perspectives of individuals, families and communities. Students will have opportunity to learn about the nursing process, basic assessment skills, and ways in which nursing practice can support those with long-term health challenges.

Nursing 3310A/B	Health in a Global Context	This course will address people's health and contextual factors influencing health in countries or regions with limited resources. Through a focus on particular situations, students will consider context-relevant health promotion and analyze issues of social justice in health and health care.
Nursing 3311A/B	Professional Practice in Global Context	A supervised practicum in which students will provide culturally-appropriate care. Health promotion, caring, mutual goal-setting, social justice, and advocacy will be addressed in situations of limited resources. Preparatory and follow-up activities are required.
Nursing 3323W/X	Promoting the Health of Communities	This course provides an introduction to community health promotion and the influence of socio-environmental determinants of health on populations. The concepts of community as client, health promotion, determinants of health, and empowering nursing practice are considered. Students will examine a number of theoretical foundations for designing appropriate and effective health care and health promotion strategies.
Nursing 3380F/G	Rural Health Nursing	Theory, practice, research and issues related to nursing in rural and remote settings will be examined. The health status of various rural populations, related public policy and the factors influencing health of rural residents will be explored.
Nursing 4440A/B	Future Directions for Nursing and Health Care	This course focuses on contemporary issues in nursing, health care and health policy. Students will explore the role of nursing in shaping and influencing future directions incorporating program concepts such as social justice, empowerment, and change and transformative theory.
Nursing 9604	Violence and Health	In this course, the three major categories of violence as defined by the World Health Organization (WHO, 2002) will be explored, with an emphasis on an ecological approach to help understand the multifaceted nature of violence. Through a critical analysis of theoretical and empirical literature, students will gain an appreciation of the root causes, cross-cutting risk factors and the health, social and economic consequences of violence. Nursing's contribution to violence prevention and the promotion of health and healing from violence through research, education, policy development and clinical practice will be explored.
Nursing 9607	Advanced Community Health Promotion/Population Health	This course examines and integrates concepts, philosophies, models and theories relevant to advanced community health/population-focused nursing practice. Principles of public health, community health, primary health care, and population health as well as health promotion trends and issues pertaining to community health locally, nationally and globally will be emphasized.
Nursing 9619	The Context of Health Care	Economic, political and social factors at provincial, national and international levels influence health care systems and health professions within it. This interdisciplinary course explores the critical leadership challenges thereby created and cultivates skills for meeting these challenges through seminar and group work.

Nursing 9639	Health in Rural and Remote Settings in Canada	Using a determinant of health perspective, this course examines health and health care challenges, strengths, and solutions in rural and remote Canada, and implications for rural and remote health care theory, practice, education, and research. Course content emphasizes geographical, gender, historical, sociocultural, economic, and political variables that affect health and health care for various groups and populations in rural and remote Canada. Multidisciplinary and international content, and research and nursing practice experience in rural and remote settings by the course professor will enrich course content.
Nursing 9685	Canadian Health Policy	This course focuses on understanding policy development and analysis within the context of Canadian health policy. Emphasis is on understanding the policy process and exploring philosophical, historical, political and social foundations of Canadian health policy including legislation, healthcare financing and contemporary debates in health policy. Topics may include primary health care reform, aboriginal health, mental health, homecare, globalization, and equity and social justice in health policy.

Faculty of Information and Media Studies (FIMS)

Media, Information and Technoculture (MIT)

MIT 2152F/G	Media and Social Movements	This course examines the relationships between media, social movements, and social change. By exploring struggles over issues such as democracy, the environment, human rights, gender equality, class relations, and race and ethnic relations, we will map the ways that participants use media, and the obstacles they confront.
MIT 2411F/G	Crash Landscape	Our reliance on private transport has produced a landscape dominated by the automobile: an environment to which we are culturally blind. This course is not a strict history of the car. It is a sustained examination of how a particular technology can become intertwined with a society's political and economic processes.
MIT 2500A/B	The Meaning of Technology: Exploring the Relationship Between Technology & Society	Exploration of a number of technologies that lie behind and fuel the technocultural imagination. Introduces contemporary technologies from both a technical and cultural/historical point of view. Topics include: technological systems, issues of technical visualization, representation and interactivity, natural vs. artificial languages, artificial intelligence, robotics, natural and virtual environments, technology as social imperative and cultural metaphor.

Master's of Health and Information Studies (MHIS)

HIS 9241/LIS9841	Interdisciplinary Issues in Health Information Science	This course will provide an overview of issues in the creation, provision and retrieval of information in the health care system. A focus will be on describing the 'actors' in the health area, their information behaviour, and consideration of how services provided by information professionals and other information sources meet these needs. We will also consider, taking a critical approach, emerging issues in health care generally and health information specifically, and how these influence broader ethical, social, political, legal and economic considerations.
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Faculty of Law

Law, Law Studies (L.L.M., Ph.D., M.S.L)

Law 5304	Environmental Law	<p>This course will provide an introduction to Canadian environmental law, with a focus on federal and Ontario law. The course will first cover foundational topics including: definitions and theories of environmental law; common law environmental causes of action; the relationship between international environmental law and domestic Canadian environmental law; federalism and constitutional issues relating to jurisdiction over the environment; public interest standing; and judicial review of environmental decision-making. Second, the course will provide an overview of environmental regulatory models for both the prevention and remediation of environmental harm. Topics will include environmental impact assessment (including social dimensions such as public participation and First Nations consultation), environmental standard setting (including the role of precaution, uncertainty and voluntary measures), and compliance and enforcement (including criminal, regulatory and citizen enforcement). Throughout the course a number of substantive environmental law topics will be discussed, such as parks and protected areas, species protection, discharges to air and water, hazardous spills, toxic substances, environmental justice, and climate change.</p>
Law 5325A	Aboriginal Law	<p>This course focuses on the legal aspects of the relationship between Aboriginal peoples and Crown governments in Canada. Through course readings, guest lectures and analysis of case law, students will engage in a critical review of the manner in which the Canadian courts, legislatures and executive have addressed the challenge of accommodating the reality that Aboriginal societies pre-dated European arrival in North America. Topics covered will include the following key aspects of that challenge: the interpretation and enforcement of the rights created by treaties between the Crown and First Nations; the evolving case law on aboriginal interests in land arising from prior occupation by Aboriginal societies, and the implications of those interests for corporations and municipalities seeking to develop lands traditionally occupied by Aboriginal peoples; the meaning and implications of the fiduciary relationship between the Crown and Aboriginal peoples; the content of Aboriginal rights under section 35 of the Constitution and the circumstances in which legislatures may infringe those rights; an examination of the basis of indigenous peoples' claims to a right to govern themselves and the place of Aboriginal peoples in relation to the Canadian Constitution; and the adequacy of non-judicial processes currently available to resolve outstanding issues related to land and governance rights.</p>

Selected Topics (ST) Courses		
Law 5812C	Comparative Mining and Energy Law (ST)	This course will examine the law and policy governing mineral and energy resource exploration, financing and development in a comparative context. The materials will focus primarily on Canada and New Zealand, although other jurisdictions will be discussed when considering regulatory regimes for energy activity and recent developments in renewable energy law and policy. International agreements and influences, state jurisdiction over resources, property rights, regulation governing allocation and access to mining and energy resources, the concept of sustainable development, the role of governments, indigenous peoples' claims, and the use of economic mechanisms to encourage renewable energy will be addressed.
Law 5832A	Corporate Social Responsibility (ST)	This course will provide an introduction to the law relating to corporate social responsibility (CSR) in both Canadian and international contexts. CSR is often understood as socially or environmentally enlightened voluntary action by a business that goes beyond the mandatory requirements of the domestic legal system. Yet the line between voluntary and mandatory is far from clear. Voluntary corporate and industry association codes of conduct inform the legal standards to which companies are held accountable under domestic laws. Project finance requirements imposed by private sector banks and export credit agencies incorporate socially and environmentally responsible criteria that serve as de facto mandatory standards for corporate conduct in developing countries. According to the United Nations Human Rights Council, all businesses have a responsibility to respect all human rights, and are expected to conduct human rights due diligence throughout their supply chain. Yet businesses engaged in foreign direct investment also have the right to be compensated for regulatory expropriation, a right which can undermine a state's obligation to regulate environmental matters in the public interest. And while laws impose criminal sanction for bribery of foreign officials, access to justice for victims of even the most egregious human rights violations associated with corporate complicity is unavailable in home state courts. This course will examine these and related developments with a view to informing future business lawyers of their responsibilities to their clients in relation to CSR, future social justice advocates of potential mechanisms for business accountability for CSR, and future government lawyers of the relationship between CSR and legal regulatory tools.
Law 5862A	Mining Law (ST)	This course will provide an introduction to the many areas of law (mining, real property, contract, aboriginal, environmental, securities regulation) that relate to mineral resource exploration and development and provide the basis for sustainable economic development, growth and prosperity in the Canadian mineral resource sector and internationally. It will be both academic and practical of nature and students will be introduced to several forms of industry agreements and prospective.

Law 5871D	Indigenous Legal Traditions (ST)	This course was developed after more than 30 years of working with and listening to the expressions of Indigenous academics, scholars and Elders. Additionally, it is spawned from personal knowledge of the professor and experiences as a Canadian “Status Indian” (Anishinabeg) who has worked with Aboriginal people in the Canadian Justice circle for 37 years. The primary goal of the course is to identify the merits and value of learning about Indigenous legal traditions and applying them within the Indigenous community for the purpose of positively contributing to the challenges of Indigenous people contextually within the Canadian justice system, while at the same time improving their social, economic and cultural conditions.
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Faculty of Science

Biology

Biol 1201A/B	General Biology I	This course provides an understanding of fundamental biological concepts with emphasis on function in and relevance to humans. Topics include inheritance, evolution, ecology, behaviour, ecosystem health.
Biol 1202A/B	General Biology II	This course provides an understanding of fundamental biological concepts with emphasis on function in and relevance to humans. Topics include molecular genetics, physiology, bioenergetics.
Biol 2404A/B –	Changing Plant Communities of Ontario	A study of the natural flora of Ontario, with emphasis on southwest Ontario. The course will deal with plants and their distribution pattern as affected by past and modern climates and technological change. Some field work included.
Biol 2217A/B	Plants as a Human Resource	An introduction to economically important plants and their products, especially as sources of food, fuel, drugs and industrial raw materials. National and international programs relating to food and other plant resources.
Biol 2483A/B	Ecology	An introduction to ecology, the scientific study of the interactions that determine the distribution and abundance of plants, animals, and microorganisms. Ecological concepts at the organism, population and ecosystem levels will be considered, including tolerance limits, life history evolution, competition, predation, population growth and control, and ecosystem dynamics.
Biol 2485A/B	Environmental Biology	Basic principles of environmental biology, human ecology, ecosystem structure and function. Human population growth and its impact on soil, water, energy, agriculture and natural populations of plants and animals. Environmental problems created by resource exploitation and possible solutions.

Biol 3218	Biology of Fungi	The world can be divided up into producers (e.g., plants), consumers (e.g., animals) and decomposers (e.g., fungi). While this is very much an oversimplification it does convey a sense of the importance of fungi. Fungi are extremely important in many ways - think of food (bread, wine, cheese), magnificent forests (trees and many other plants need fungi to survive), of drugs such as penicillin or cyclosporine, of diseases of plants such as blights, mildews, rusts and smuts or diseases of animals such as ringworm, athlete's foot, thrush, and deadly systemic mycoses. Then remember all those hidden species so busily decomposing dead material. In this course we will be emphasizing not just the different types of fungi but exploring their impact on humans and the ecology of the world we live in.
Biol 3220Z	Field Studies in Biology	Specialized field courses given by biologists from Ontario universities at various times during the year. Students should be prepared to meet travel and living expenses.
Biol 3222F/G	Selected Topics in Restoration Ecology	The course will look at restoration ecology in theory and in practice. Topics covered include ecosystem functioning, ecological relationships at various spatial scales as they apply to restoration, invasive species management, reclamation of contaminated sites, restoration of various types of ecosystems (e.g. forest, tallgrass prairie, wetland), value of ecosystem services, financial and practical considerations in ecological restoration projects. We will use case studies as examples, with a focus on local restoration projects. Local experts will be featured as guest lecturers.
Biol 3440A/B	Ecology of Populations	Knowing how many individuals of a given species there are and identifying the factors that cause population numbers to change is fundamental for conservation, fisheries, forestry, and managing everything from pest insects to pandas. This course combines the central tenets of population ecology with hands-on techniques for its practical application.
Biol 3442F/G	Conservation Biology	This course introduces fundamental concepts and issues in conservation biology. We explore the three prongs of conservation including: (1) the science involved in conserving biodiversity; (2) the political systems that directly affect conservation; (3) how to access the political system to maximize the probability of implementing conservation programs.
Biol 3446A/B	Wildlife Ecology and Management	The application of ecological principles to the management of wildlife species. Topics include techniques, harvest, predation, habitat loss and management, stocking and reintroductions, and economics of wildlife. Identification and biology of game, pest and furbearing species in laboratories; films are used frequently.
Biol 3445F/G	Community Ecology	An integrative approach to ecology, stressing the structure and function of communities. Theoretical explanations for diversity, stability and productivity across a variety of community types are evaluated in light of empirical evidence.

Biol 3475A/B	Chemical Ecology	This course will examine how plants and animals use chemical cues to find essential resources, defend against natural enemies, locate suitable mates, and maintain social systems. How chemical ecology may be used to elucidate basic ecological problems and to provide more environmentally friendly pest management practices will also be discussed.
Bio 3483A/B	Patterns in the Diversity of Life	This course considers the large-scale patterns in the Earth's biota: patterns in life's diversification and extinction, changing the biota through time; patterns in the form and functioning of organisms, reflected in biological classification; patterns in the global distribution of life's lineages, and in their major responses to Earth's diverse climate.
Biol 3603A/B	Ecophysiology of Plants	The aim of this course is to introduce students to the physiological mechanisms governing the success and distribution of plants in different environments. Specific topics covered will include energy balance, photosynthesis, water transport and mineral nutrition. This course will provide background information for further courses in plant ecology or plant physiology.
Biol 3660A/B	Advanced Plant Physiology	Physiology and biochemistry of plants with emphasis on primary plant metabolism, including: photosynthesis, respiration, photorespiration, and nutrient assimilation. Other topics include plant-soil relationships, herbicides, phytoremediation, photomorphogenesis, medicinal plants, plant products and alternative fuels.
Biol 4230A/B	Ecosystem Health	A characterization of ecosystems, contaminants, and the human health concerns. Course material will cover the production, transport, transformation and fate of environmental contaminants, with an emphasis on their anthropogenic impacts. Emphasis will include the assessment of human health exposure and biomarkers of environmentally associated disease.
Biol 4218A	Microorganisms in Plant Disease	This course deals with the principles of plant pathology and the causes of disease. Concepts and models of diagnosis, infection, development of symptoms, disease spread, plant defenses and disease control are discussed in lectures and further illustrated in a weekly 3-hour laboratory period.
Biol 4243G	Political Biology	The biological consequences of human activities for the biotic world and particularly human beings and their institutions. Direct physical and chemical effects upon metabolism, development, adaptation, genes, and population structure. Indirect effects through climatic change, population density, social conditions and changed patterns of survival. Predictions and mechanisms for influencing the future.
Biol 4257Z	Field Studies in Biology	Specialized field courses given by biologists from Ontario universities at various times during the year. Students should be prepared to meet travel and living expenses.
Biol 4258Z	Field Studies in Biology	Specialized field courses given by biologists from Ontario universities at various times during the year. Students should be prepared to meet travel and living expenses.

Biol 4405F/G	Ecosystem Ecology	This course traces the flow of water, energy, and nutrients from their abiotic origins, to their cycles through microbes, plants, and animals. This course will synthesize current advances in ecology with established theory to offer a comprehensive survey of ecosystem pattern and process.
Biol 4608F/G	Environmental Plant Physiology	The impact of environment on plant function and adaptation. Topics include the radiation environment, use of radiation to sense environmental change, carbon metabolism and productivity, inorganic nutrients and the rhizosphere, responses to environmental stress (water, temperature, radiation and aerial pollution).
Biol 9215A	Domestication	Not available
Biol 9419 (0.5)	Global Change Biology	
Biol 9438B	Topics in Landscape Genetics	This seminar in Landscape Genetics provides a unique opportunity for interdisciplinary training and international collaboration. The course caters to students of both evolutionary biology, particularly population/evolutionary genetics, and ecology, particularly landscape ecology, spatial ecology and conservation. This course represents the local implementation of a Distributed Graduate Seminar in Landscape Genetics that will be held concurrently at several universities in North America and Europe. A key objective of landscape genetics is to study how landscape modification and habitat fragmentation affect dispersal and gene flow of organisms across the landscape. Landscape genetics is highly interdisciplinary and makes use of spatial analysis tools such as remote sensing, GIS software and spatial statistics that have not historically been a component of training programs for population geneticists. This distributed graduate seminar unites some of the most active landscape genetics groups in North America and Europe, drawing on the experience of experts in both population genetics and landscape ecology to provide an integrated overview of approaches for testing the effect of landscape pattern on dispersal, gene flow, and genetic diversity.
Biol 9439 A/B	Algal Blooms	This course will examine the ecological significance and impact of algal blooms in the Great Lakes region.
Biol 9440A	Topics in Ecology and Evolution: Entomology	Insects are the most abundant macro-invertebrates and are found in all ecosystems, with the exception of the marine environment (although this is debatable). This course will examine the basic external and internal anatomy, as well as the basic physiology, of insects. Subsequently, we will examine how adaptations in these different traits have allowed this group of organisms to exploit such a wide range of habitats at the global scale. In the tutorial we will examine the characteristics that distinguish each major orders of insects (e.g. what to all beetle species have in common) and look at the characteristics that separate the different major families within the order (what makes a lady beetle different from a bark beetle). This section of the course will be in combination with the undergraduate course (Bio 4200). In addition to the Bio 4200 requirements, the graduates will have to write a 10 page essay on a subject related to entomology.

Biol 9440A	Topics in Ecology and Evolution: Plant and Animal Communication	In this course we will examine different media for communication (e.g., visual, auditory, chemical) used by plants and animals. Each student will be assigned a topic (far from her/his own area of research) and will have to research the subject in detail, using the primary literature. Each student will give a 20- 25 minute long presentation to the class and provide a written report (in the form of an annotated Powerpoint) on the subject. Prior to their presentation each student must provide the other individuals in the class the pertinent papers they have used, so that there will be "animated" discussion. The final grade will be based on the oral and written reports, as well as the level of participation in the discussions following each oral presentation.
Biol 9440G	Topics in Ecology & Evolution: Movement, Behaviour and Analysis	This graduate level course focuses on theoretical and statistical aspects of animal movement. We consider major concepts in movement ecology both at the individual level (orientation, navigation, movement models) and population level (dispersal, migration). Using R, we cover the analysis of circular data, analysis of movement trajectories, and Bayesian inference of movement models (using WinBUGS or JAGS).
Biol 9440B	Topics in Ecology & Evolution: Biodiversity and Ecosystem Function	This class will focus on fundamental questions in ecology as they pertain to biodiversity and ecosystem function research outlined by Sutherland et al. (2013). This is a seminar and essay course based on primary literature, where students are encouraged to think about how their research can be placed within broader theoretical perspectives in ecology. We will address such theoretical questions as (but not limited to): What is the relative importance of stochastic vs. deterministic processes in controlling diversity and composition of communities? What is the relative contribution of biodiversity at different levels of organization (genes, species richness, species identity, functional identity, functional diversity) to ecosystem functioning? What are the ecosystem impacts of world-wide top predator declines? Students will become familiar with current literature, discuss trends in biodiversity-ecosystem function research, and present in both written and oral forms how to address the challenges of these unanswered fundamental questions. This is a one term course with one two-hour class session per week.
Biol 9510 A/B	Plant Molecular Biology	This Biology Graduate Course will specifically focus on molecular biology of plant responses to biotic stress. As a group, we will discuss papers publishing original data on this topic. Individual students will present these papers, but discussion will be based on the participation of the whole group. Students will also prepare a written proposal (4 pages) to address a current topic in molecular biology of plant responses to biotic stress, and will subsequently defend this proposal to the class with a short oral presentation.
Biol 9610 A	Plant Stress Biology	Not Available

Chemistry		
Chem 1027A/B	Chemistry in the News	This course provides the background knowledge required to make informed decisions about how chemistry is presented to the public through various media. Topics will include environmental concerns, forensic chemistry, sources of energy, the chemistry of drugs. No chemistry background required; intended primarily for students from Faculties other than Science
Chem 2210A/B	Chemistry of the Environment	The environmental chemistry of air, water, and soil.
Chem 2211A/B	Inorganic Elements in Life	A discussion of the diverse roles of inorganic elements in the chemistry of life processes, with an emphasis on the chemistry of hydrogen, oxygen, and the cations of Groups 1 and 2. Bioenergetic processes, biomineralization and photosynthesis. The uptake, transport and storage of iron.
Chem 2214A/B	Physical Chemistry for Life Sciences	Basic thermodynamic concepts and relations and illustration of their relevance and applications to biological systems. In addition, some aspects of electrochemistry, and spectroscopic techniques will be introduced, again with emphasis on the role of these techniques in understanding the structure and nature of important biological molecules.
Chem 2271A/B	Structure and Bonding in Inorganic Chemistry	An overview of the Periodic Table, stressing trends in properties of the elements and their compounds; principles of ionic and covalent bonding; molecular orbital theory of simple molecules; solution and solid state chemistry of Group 1 and 2 compounds, with examples relevant to biology and everyday life.
Chem 3320A/B	Polymer Chemistry	A comprehensive treatment of the preparation and uses of polymers, and their chemical and physical properties in the solid state and in solution.
Chem 3330F/G	Industrial Chemistry	Industrial applications of chemistry including a survey of the chemical industry and its principal products; mass and energy balances as applied to chemical processes and the comparative economics of chemical processes will be discussed.
Chem 3373F/G	Organic Chemistry III: Reactions and Strategies for Synthesis	An intermediate level course in organic chemistry designed to complete the core requirements in organic chemistry. The major topics include: concepts of organic synthesis, radical chemistry, the chemistry of beta-dicarbonyls, amines, heterocycles, cycloadditions and pericyclic reactions.
Chem 4471A/B	Transition Metals and Catalysis	This course covers the fundamental basis of homogeneous catalysis using transition metal complex catalysts, illustrated by important industrial processes. It also treats heterogeneous and hybrid catalysts.
Chem 9521	Catalysis	Not Available
Chem 9531A	Molecular Energy Conservation	Wide-spread use of renewable energy sources – particularly in areas such as transportation and on demand applications – requires efficient methods for the inter conversion of chemical and electrical energy. This course will discuss recent advances in the design of molecular electrocatalysts that activates small molecules for the purposes of energy storage or use. Transformations of interest will include oxidation/production of H ₂ , H ₂ O oxidation, O ₂ reduction and CO ₂ reduction. The scope of the course will focus primarily on well-defined homogeneous catalysts that are made of earth-abundant metals.

Chem 9555R	Photochemistry	This course is intended as an introduction to the study of the chemistry of photochemically generated excited states of molecules, with a concentration on organic molecules. It will introduce the basic concepts of the physical aspects of the formation and deactivation of the excited states and some of the chemical and mechanistic aspects of their photoreactions.
Chem 9591	Asymmetric Homogeneous Catalysis	This course is intended as an introduction to the study of the chemistry of photochemically generated excited states of molecules, with a concentration on organic molecules. It will introduce the basic concepts of the physical aspects of the formation and deactivation of the excited states and some of the chemical and mechanistic aspects of their photoreactions.
Chem 9594	Materials Corrosion Processes	Corrosion thermodynamics; corrosion/mineral reactions; corrosion kinetics; metallurgy of corrosion processes; oxide films and semiconductors; corrosion films; pitting; crevice corrosion; galvanic corrosion; stress corrosion cracking; hydrogen effects; dealloying; erosion/corrosion; categories of materials; corrosion protection; modeling corrosion processes.
Chem 9604	Radiation Induced Chemistry	Radiation Induced Chemistry is the study of the chemical effects produced in a system by the absorption of ionizing radiation, alpha-, and beta-particles and gamma- and x-rays.
Chem 9621R	Metal Ions in Biology	This 1/4 course describes techniques and methods commonly used in bioinorganic chemistry. Covered are: atomic absorption spectrometry for metals, GC, HPLC and SEC for molecular species. UV absorption and emission spectroscopies as probe methods. Theoretical techniques including molecular mechanics, molecular dynamics, INDO and DFT.
Chem 9704 A	Solar Energy Conversion	The course provides an overview of the photovoltaic and photoelectrochemical methods of solar energy conversion. Structure and properties of various types of semiconductor materials used for solar energy conversion will be outlined. The mechanism of photoprocesses in various types of solar cells and the cell architectures will be discussed.
Earth Science		
ES 1022 A/B	Earth Rocks!	We will study what the Earth is made of (minerals and rocks), how it works (plate tectonics), and how it affects us. Focus is on surface processes, landforms, resources of our planet – natural features and actions that we can see including natural disasters such as earthquakes, volcanoes, landslides, tsunami, and floods.
ES 1022 A/B	Introduction to the Geology and Resources of Earth	This course is an introduction to geology and covers rock forming minerals and rock forming processes: emphasis is placed on how mineral and hydrocarbon resources develop. Deposit types presented include layered mafic intrusions, diamonds, placer, oil, gas, coal, salt and aggregate; metamorphic and hydrothermal deposits such as VMS, vein, stratabound and hydrothermal overprinting relating to ore textures. Investigations will include the development of these deposits in terms of plate tectonics including brittle and ductile crust scale processes; the occurrence of these deposits through geologic time; absolute and relative age dating; relationships observable in the field and mapping techniques; mining terminology and techniques.

ES 1081A/B	Resources, Environment, and Sustainability	This course introduces students to the relationship between humans and their geological environment. Emphasis is placed on the evidence for perturbations of Earth's natural environments by humans that impact on our planet's future. Specific topics include utilization of natural resources, waste management, water quality, geological hazards, and global change.
ES 1083F/G	Life on Planet Earth	Aims of the Course: This course is designed for (but not exclusive to) students with a non-science background. The fundamental aims of this course are to provide such students a basic understanding of: a) The history of life on Earth in the context of geological time and Earth processes b) Principles of biological evolution c) Evolutionary trends in major animal groups
ES 1088F/G	A Foundation for Medical and Forensic Geology	Practical applications of the Earth Sciences to human welfare. Aspects of origin, natural concentration, and biological intake of earth materials are considered and the significance of these substances to human health is discussed. Use of earth materials in surgery, treatment of disease and of Earth Science techniques to solve criminal cases are covered.
ES 2222A/B	Data Analysis and Signal Processing in the Sciences	An introduction to data analysis techniques, including data types and analysis tools, statistical methods to characterize univariate, bivariate and multi-variate data, time series and signal processing. A variety of applications from various fields will be used to illustrate these techniques, with emphasis on applications in the earth sciences.
ES 2240F/G	Catastrophic Events in Earth History	Earth Sciences 2240F considers those events so dramatic and catastrophic that they leave evidence in the geologic record and can threaten life on Earth. Included will be violent volcanic eruptions, mega-earthquakes and the tsunami arising from them, rapid climatic changes and associated storms, and impacts from asteroids and comets. As much as possible, we will use the examples of recent events and processes to help interpret what we read in the rock record. The content of the course incorporates definitions of basic geologic terminology and concepts required to proceed irrespective of background knowledge.
ES 2241A/B	Hazardous Earth	Earth processes leading to disasters; the amplification of earth processes by human activity; individual, national and global policies mitigating natural disasters. Volcanoes and earthquakes in the context of plate tectonic processes. Mass wasting, large storms, floods, and fires; global climate change.
ES 2261A/B	Biospheric Interactions Through Time	This course explores the significance of life on Earth, past and present. Topics include ecological revolutions, mass extinctions, roles of life in the mediation of physical and chemical processes in the lithosphere, hydrosphere and atmosphere, controls on global biodiversity patterns, and case histories of selected invertebrate and vertebrate groups.

ES 2265A/B	Paleobiology and Paleocology	A survey of the fossil record from bacteria, protista, calcareous algae, to invertebrate animals. Topics on each group of fossils include functional morphology, evolutionary trend, ancient living environments, contribution to sediment accumulation and reef-building, utility for dating and correlating rocks and for understanding long-term biodiversity change.
ES 2266F/G	Dinosaur and other Vertebrate Evolution	Introduction to the fossil record that documents the major steps in vertebrate evolution, such as the origin, radiation, and mass extinction of fishes, basal tetrapods (amphibians), basal amniotes (reptiles, mammal-like reptiles, and dinosaurs), birds, and mammals.
ES 2281A/B	Geology for Engineers	Introduction to physical geology with emphasis on the engineering oriented aspects of the Earth Sciences. Topics include: minerals and rocks; mass movements; interpretation of aerial photographs, topographic and geologic maps; surficial processes and their manifestations; surface and ground water; structural geology and subsurface processes; and earth resources.
ES 3001A/B	Astrobiology	The study of life in the universe, including the origin of life on Earth, the possibility of life elsewhere in the solar system/universe, and the future of human life off-Earth. This course will include topics that draw from biology, physics, astronomy, geology, chemistry, and other areas.
ES 3312A/B	Genesis of Meteorites and Planetary Materials	The origin of meteorites and planetary materials (igneous, metamorphic and sedimentary rocks) will be deduced from textural evidence obtained from microscopic studies and geochemical evidence. These deductions then will be used to constrain hypotheses concerning genesis and evolution of Earth, other planets and the Solar System.
ES 3320A/B	Environmental and Exploration Geophysics II	An advanced course covering the geophysical techniques used for subsurface sensing, with applications to environmental studies and resource exploration. Data analysis includes seismology, gravity, electromagnetic and radiometric applications.
ES 3323A/B	Introduction to Geodesy and Remote Sensing	An introduction to the basic concepts of geodesy and geodetic surveying, to include geometrical and physical geodesy. Material covered will include datums and coordinate systems, space and surface geodetic techniques, gravity and precise leveling, uncertainty estimation, and error propagation. Specific applications will include GPS data collection and analysis.
ES 3340A/B	Watershed Hydrology	Occurrence, movement, and behavior of water in the hydrologic cycle. The development of quantitative representations of hydrologic processes (e.g., precipitation, evapotranspiration, runoff, infiltration and unsaturated flow, saturated flow, surface flow). Analysis of stream response hydrographs. Statistical models of predicting flood responses and water resource management.
ES 3341A/B	Waters and Geochemical Cycles	Acquisition of solutes by rain, surface and subsurface waters and their transportation and deposition in natural environments (e.g., formation of ore deposits). Natural sources of potential pollutants (e.g., heavy metals). Geochemical cycles of solutes and waters.

ES 3372 A/B	Introduction to Petroleum Systems	The study of the fundamental geological components of petroleum systems responsible for oil and natural gas accumulations in sedimentary basins. The fate of organic matter is traced along a path from source rocks, maturation, migration, to reservoir, trap and seal. Labs incorporate use of industry software.
ES 4431A/B	Isotope Geochemistry in Earth and Environmental Science	Stable isotopes (O,H,C,S,N), atmosphere, hydrosphere, sedimentary and diagenetic systems, hydrothermal systems, fluid migration, ore-forming fluids, igneous and metamorphic rocks. Environmental applications: groundwater, oceans, wetlands, acid rain; acid mine drainage, climate fluctuation; global cycle modification. Radiogenic isotopes: dating techniques; crust and mantle evolution, environmental tracing.
ES 4440A/B	Fundamentals of Ground Water Flow and Contaminant Transport	Occurrence, distribution, movement, chemistry and composition of ground water as a function of the geological environment; water quality and ground water contamination; collection and evaluation of hydrogeologic data; modelling ground-water flow and advective transport; case histories.
ES 4444A/B	Hazardous Mine Wastes	Introduction to uranium, Cu-Pb-Zn sulphide and lode-gold deposits. Quantitative modelling is introduced, and focuses on reactions occurring in mine wastes. Common geochemical remediation practices are discussed. Students will propose and test chemical remedial actions for waste sites using geochemical modelling. Laboratories include the analysis and leaching of ores.
ES 4452Z	International Geoscience Field Experience	A research-level field course to globally significant international or Canadian geological type localities. Students will gain practical field experience through the collection, analysis, and presentation of primary geological and geophysical field data. Lectures/ seminars/ practical exercises will emphasize the interaction between the physical, chemical, and biological aspects of the Earth system. Combined with GL 9600Y
ES 4461A/B	Advanced Paleontology	Advanced topics on applications of paleontological data to reconstructions of evolutionary history, ancient environments, geochronology, and paleobiogeography.
ES 4462A/B	Glacial and Quaternary Geology	The last 2 million years of Earth history. Glacial-interglacial cycles, global sea level and climate changes, and their causes. Extent and dynamics of North American Pliocene ice sheets. Dating methods, Quaternary resources, waste disposal, air photo interpretation and surficial mapping. Laboratory exercises, field project, field trip.
ES 4472 A/B	Applied Petroleum Assessment	Advanced-level study of characterization and quantitative assessment of petroleum plays and prospects, with an emphasis on the integration of Geoscience, introductory reservoir engineering and basic economic indicators on the valuation of oil and gas properties. Labs will analyze case studies using industry software.
ES 4490E	Senior Thesis	A presentation of research on a chosen problem. Original data must be generated from field or laboratory studies and analyzed using appropriate methodologies. The results must be integrated into the existing literature on the topic. Independence in the conduct and reporting of research

		must be demonstrated.
Environmental Science		
EnvrSci 1021G	Environmental Issues	The science underlying environmental issues including climate change, waste management, endangered species and spaces, air and water quality, and ecosystem health, is presented and discussed from a variety of perspectives.
EnvrSci 3300F/G	Natural Science of Environmental Problems	Topics will include: water pollution from toxic chemicals and biological sources; waste disposal and recycling of materials; other current pollution problems. Instruction and practice in library research and essay writing involving aspects of these topics.
EnvrSci 3350F/G	Research Techniques in Environmental Science	A multi-module course where a case study approach will be used to acquaint students with the research tools of environmental science, and the analysis, interpretation and presentation of environmental data.
EnvrSci 4949F/G	Special Topics in Environmental Science	A detailed study of selected issues in environmental science with an emphasis on integration of perspectives and expertise from a broad range of disciplines as represented by the particular faculty and guest speakers involved in a given year. Understanding and communication of the concepts and controversies discussed will be the focus of the course.
EnvrSci 4970F/G	Independent Study in Environmental Science	A research project course in a particular field under the direction of a faculty member who is a member of the Centre for Environment and Sustainability.
EnvrSci 4999E	Honors Research Thesis	A major laboratory or field project that emphasizes experimental design, instrumentation, collection and analysis of data, and communication of experimental results by oral and written presentations.
Environment and Sustainability		
EnvrSust 9011A/Geography 9334A/Political Science 9720	Foundations of Sustainability and Environmental Policy	A graduate course on Foundations of Sustainability and Environmental Policy is given in the fall, as a lecture course. The course description is: Environmental and sustainability issues, especially climate and environmental change as dealt with through science, controversy and assessment; the role of the media and science-to-policy considerations; impacts on humans and ecosystems; international and national policy considerations; environmental hazards and environmental organizations.

EnvrSust 9012	Planning and Management	<p>This course considers the concept and practice of sustainability in the context of environment and resource management. After an introduction to resources, resource management and the legal framework in Canada, the course pays particular attention to different forms of planning and techniques used in environment and resource management, such as benefit-cost analysis and impact assessment. Some time of the course will be devoted to the role of bargaining in resource and environmental management. Particular approaches as to how we address the change, uncertainty, complexity and conflict (associated with many types of environmental issues) are explored. Student projects on a variety of case studies will provide further insight into the practice of planning and management. Course objectives:-to introduce students to the change, complexity, uncertainty and conflict associated with a variety of resources and environmental issues; -to encourage critical thinking about the nature and solutions to current problems; -to consider how planning can contribute to solving problems; and -to understand the theory and practice of selected approaches to resource and environmental management.</p>
EnvrSust 9013	Sustainable Business Practices	<p>This course builds on the foundations of sustainability concepts to consider the combination of environmental, social, and economic issues from a management perspective. As these are difficult challenges, students will not be presented with either easy questions or simple answers. Exploring these issues tends to generate active and heated scientific, social, and economic debate. This course is designed to foster in-depth discussion and equip students with the concepts and tools to develop an interesting, insightful project that explores sustainable development into practice. The course will examine one firm in detail during each weekly session, supplemented with other readings or activities. There will be group presentations in mid-December. By the end of this course, you should have gained tools, skills, and intuition that will enable you to: - characterize the drivers of current social and environmental issues in business; -integrate financial, social and environmental performance within a general business model; and -formulate effective approaches to make progress toward improving the triple bottom line.</p>
EnvrSust 9014	Ecosystem Health	<p>In “Ecosystem Health” we will explore the theory and practice of measuring and implementing projects that deal with the interrelationships between humans and all aspects of their environment, including disease, health and well being. In this context, the health of all parts and individual species of the ecosystem is important, particularly where illness is due to exposures to pollutant chemicals or biological agents in the environment. By the end of this course you should be able to: -review and critique modern determinants of health, with an emphasis on problems that lead to human illness or community health issues; -create an assessment of the wellness and sustainability of specific environmental projects; -actuate the concept of community research partnerships into research projects on the environment and sustainability; and -implement a multi-disciplinary or trans-disciplinary approach to the study of complex environmental problems associated with community or human health issues.</p>

EnvrSust 9015	Engineering Solutions	<p>This course aims to provide students with an understanding of the basic fundamentals of environmental science and engineering and their synergistic role for the maintenance of a healthy and sustainable environment. Several case studies will be studied and analyzed, including carbon dioxide emissions, global warming, air and water pollution control, solid waste management and treatment, renewable energy resources, world population and environmental sustainability issues. By the end of this course you will have an understanding of: population growth kinetics and environmental sustainability; problem solving with respect to calculations of energy and mass balances; problem solving with respect to waste-water treatment and applications; problem solving with respect to pollution emissions and reduction strategies and technologies; opportunities to use biological wastes as raw materials in biochemical processes to produce value-added commercial products; and opportunities to use biological processes and economic analysis for the production of renewable energy and biofuels.</p>
EnvrSust 9103	Legislation and Certification Systems (Workshop)	<p>This workshop provides students with an introduction and understanding of environmental compliance as a social responsibility principle and required element of management systems, and the tools in place to go beyond compliance. This course has been designed to involve all of the following to accommodate all learning styles and enhance student experience: 1. In-class lecture style discussion, 2. Hands-on group exercises, 3. Guest speaker presentations, 4. Tour of an ISO 14001 certified facility. Exercises will be completed based on material presented in-class and reference material read prior to some of the classes. These exercises will build upon concepts discussed in class and will also serve to guide class discussion, improve analytical skills and equip the student with the concepts and tools to conduct insightful analyses and make recommendations for improvement. The course will outline: the environmental legislative framework (i.e. federal, provincial and municipal), key pieces of legislation, and where to find legislation; the link between compliance and management systems in the areas of environment, health & safety, social responsibility, etc.; objectives of environmental legislation (i.e. trends in pollution reduction); management system standards and certification; the 'Plan-Do-Check-Act' approach found in ISO 14001 and real-world implementation opportunities using the Sustainability Toolkit; and auditing practices (i.e. roles and responsibilities, principles of auditing, managing an audit program, audit activities and competence and evaluation of auditors) with a special focus on the environment.</p>
EnvrSust 9104	Measuring Change in the Environment and Sustainability (Workshop)	<p>EnvSus 9104 complements EnvSus 9015 and both are core courses required for the graduate program Master's of Environment and Sustainability (MES). The objectives of this workshop course are to provide some basic fundamentals used to solve environmental sustainability problems. Several problems will be worked out during the workshop to develop problem solving skills. Summarized course notes will be provided and problems assigned prior to each class. Full participation of each student is required to pass the course.</p>

EnvrSust 9106	The Natural Step Approach (Workshop)	
EnvrSust 9107	Life Cycle Assessment (Workshop)	
Envrsust 9108	Fundamental Concepts LEED (Workshop)	
EnvrSust 9200	Consulting Project	<p>The purpose of this course is to give students an opportunity to work with the Client in a non-academic, applied setting. Members of each Consulting Group will jointly undertake environmental research. Upon completion of the course, each Consulting Group will make a formal presentation of their research findings and recommendations and will provide their Client with a professional quality report. Success in this course requires each student to undertake both secondary and primary research. Secondary research is defined here as a review of data, including documents, that has been published in some form, such as scholarly books and articles, industry or government reports, and newspaper articles. Primary research means the collection and analysis of quantitative and/or qualitative data, including verbal or written statements from people, or from governmental or other documents. The course Instructor will present the projects and students will compete for the projects. By the end of the course, you should have gained experience to: work with a Client in a non-academic setting; work as a member of a research team that collectively plans and carries out research and writing tasks; plan and organize use of your time in co-ordination with others; define/negotiate a research question, hypothesis and/or terms of reference with the Client and course Instructor; conduct detailed and comprehensive research of the secondary literature on a given topic; develop a methodology for primary research that will augment the secondary literature; conduct primary research; plan and write a report that presents secondary and primary research findings, analysis and recommendations present a verbal report to the Client; and carry a major written document through all the stages of organization, drafting, revisions, editing, copy-editing, formatting and printing.</p>
EnvrSust 9300	Cooperative Education Experience (Co-op)	<p>Cooperative education (co-op) is a program through which students gain professional work experience related to their Masters of Environment & Sustainability graduate program and career objectives. The MES co-op is a mandatory component of the MES Program, and carries a 2.5 credit weight. The MES co-op provides students with skills and experience needed to compete for an entry-level position as an environmental professional in industry, a non-governmental organization, or a government department. In this course, students will: develop cover letter and resume writing skills; learn about different interview styles and how to prepare for them; improve technical writing and presentation skills; and apply environmental science knowledge to an employment setting.</p>

EnvrSust 9410Y/9420Y	Interdisciplinary Research Seminar (MSc)	In this seminar, Master's (9410Y) and Ph.D. (9420Y) students will develop skills in communicating their research to an interdisciplinary audience in Environment and Sustainability. Students will have the option of presenting and leading a discussion on 1) their proposed research, 2) their completed research (e.g., a chapter of their thesis), 3) an emerging issue in Environment and Sustainability, or 4) a novel communication tool. Students are expected to present at least once per academic year. The schedule of presenters will be made during the first class.
EnvrSust 9517B/Bus 9808	Multi-disciplinary Perspectives of Sustainability	Sustainability has become the buzz word of the 21st century. It seems to apply to everything, including art, architecture, to agriculture. It has become a movement. But, the boundaries are so stretched, it is hard to know what sustainability really means. The one thing on which we all agree is that sustainability addresses some of the most significant issues confronting our society and planet; issues like poverty, armed conflict, climate change, biodiversity loss. Without attending to these issues, there will be misery and human suffering. This course aims to generate cross-disciplinary dialogue, in an effort to bring new insights to home disciplines. These bridges are important steps to finding insights that are truly inter-disciplinary – insights that transcend boundaries, rather than merely bridging them. Such dialogue could be the fountain of solutions to some of the world's most intractable problems and spawn true innovation. The specific objectives of this course are to: 1. To see sustainability through different disciplinary lenses. 2. To identify the key issues and questions raised within different disciplines. 3. To build a community of interdisciplinary researchers in which to discuss sustainability issues.
Geology		
GL 9519 (0.5)	Applied Ground Water Modelling	Principles of analytical and numerical techniques in modelling groundwater flow in porous media. Emphasis will be placed on the formulation of conceptual models of a flow system, the translation of conceptual models into a numerical modelling framework, and the application of models to ground water flow problems.
GL 9523	Physical Volcanology	This course examines the eruption mechanisms, depositional processes, textures and structures of effusive and explosive volcanic deposits. Case studies from various locations on Earth will be studied in detail. Associations between ore deposit formation and volcanic rocks will be covered, in addition to volcanic hazards, and volcanism on other planets. Methods for studying volcanic activity, facies analysis and composition will be introduced.
GL 9532	Ancient Ecosystems	A wide range of topics concerning the evolution of ecosystems from Archean to Phanerozoic, including changing global cycles (e.g. C, O, N, S) and their relationships to biotic evolution, and environmental control on the origin, diversification, and extinction of biotas in various ecosystems. 2 lecture hours per week + research project.

GL 9550	Mineral Deposits and Evolution of Crustal Environments	Changes in mineral deposits throughout geological time. Problems of metal source, transport and deposition within the context of Archean, Proterozoic and Phanerozoic geotectonic frameworks. Key deposit-types reflecting changes in global lithospheric, hydrospheric, and atmospheric conditions. Environmental hazards from mining; acid generation and heavy metal dispersion by surface runoff. Concurrent and antirequisite of Earth Sciences 4470a.
GL 9551	Regional Metallogeny	Critical relationships of mineral deposits to tectonic settings. The spectrum of deposit-types and their appearance over an idealised Wilson Cycle. The nature of Wilson Cycles is considered from the vantage of supercontinent dispersal and reassembly.
GL 9552	Advanced Mineral Deposit Geochemistry	The principals of metal concentration and deposition in magmatic and hydrothermal environments are examined. Natural and experimental data, including fluid inclusion, stable isotope, metal solubility, mineral stability and metal partition behavior are used to develop genetic models for ore deposits, which form the basis of mineral exploration strategies. Combined with ES 4432 A/B.
GL 9556	Advanced Stable Isotope Science, Low Temp Systems	Examination of paleo-ecosystem reconstruction methods based on the stable isotope behaviour of elements within the atmosphere, biosphere, hydrosphere and sedimentary systems. Topics include: atmospheric gases, fresh and marine water, soil and sedimentary systems, biomineralization, food webs, stable isotope proxies of climate, environments, diet and migration, with emphasis on current research trends and data interpretation.
GL 9559	Isotopic Dating of Planetary and Resource Evolution	An introduction to isotopic dating methods focused mainly on U-Th-Pb geochronology, the benchmark method for calibrating the geologic timescale. Students will have the opportunity to learn how to apply and assess U-Th-Pb geochronologic tools, explore diverse techniques within the field, and explore its key role in determining the formation age and thermochronology of planetary materials and resources preserved in microminerals. Complimentary radiogenic isotope, stable isotope, trace element and microstructural measurements now being paired with accessory phase ages, will also be evaluated to illustrate the growing potential of U-Pb geochronology in helping unravel the evolution of planetary materials and exploration of resource targets.
GL 9567	Regional Petroleum Systems Seminar	This is a weekly graduate seminar course intended as a forum for the discussion and critical examination of current petroleum geology literature pertaining to basin analysis and petroleum systems. Graduate students will meet weekly to discuss peer-reviewed papers and select government reports in an informal round-table discussion. During student seminar discussions, one student will lead discussion of the paper through an initial summary oral presentation of the paper (or group of papers) under consideration, and the other students will be expected to participate. Depending on the number of students enrolled in this class, it is expected that students will lead one or two seminar sessions. The goal of the discussions is to relate current understanding of petroleum systems to real-world play and prospect evaluation problems.

GP 9508	Engineering Seismology	Seismotectonics, earthquake recurrence statistics, seismic hazard analysis, seismic sources, wave propagation and waveform modeling, site effects and ground motion relations, simulation of ground motions, time histories for design.
GP 9509	Geophysics Field School	This course provides an introduction to a range of geophysical techniques used for environment studies and resource exploration, as well as in-depth training in one method of the student's choice. Working independently, students will plan, acquire, process and interpret a geophysical field survey. NOTE: The course will include a one week field trip during the term given, and partial cost of the field course must be borne by the student, with the sum payable to the department in advance of the trip. Students not enrolled in a Geophysics graduate program should check with the Department concerning possible additional costs.
GP 9531	Computer Modeling of Natural Processes	An introduction into computer modeling of various physical processes using both Monte-Carlo simulations of stochastic processes and cellular automata and numerical solutions of ordinary and partial differential equations is given. Notions of chaos, fractals, and complexity, analysis of discrete and continuous dynamical systems, importance of phase transitions and self-organized criticality are discussed. Specifically, the fundamental processes relevant to the physics of the Earth are analyzed such as diffusion, convection, fluid flow, propagation of waves, etc. Cellular automata, dynamical systems, and stochastic simulations are used to model earthquakes, forest-fires, percolation, branching and point processes, fracture and flow of materials. Matlab is employed as a programming and visualization environment.

Physics and Astronomy

Physics 2070A/B	Understanding Earth's Atmosphere	This course is designed for non-science students and examines the atmosphere in which we live, how it affects our everyday life, and how we in turn, as the technologically dominant earth-borne species, affect it. Atmospheric phenomena such as wind, temperature, composition, precipitation and electricity are used to illustrate basic physical principles.
Planetary Science 9601	Impact CrateringL Process and Products	Impact cratering is one of the most fundamental, yet poorly understood, geological processes in the Solar System. On many planets, impact craters are the dominant geological landform. On Earth, erosion, plate tectonics and volcanic resurfacing continually destroy the impact cratering record, but even here, the geological, biological, and environmental effects of impact cratering are apparent. Impact events are destructive and have been linked to at least one of the "big five" mass extinctions over the past 540 Ma. In recent years, it has also become apparent that impact craters can also have beneficial effects: many impact craters are associated with economic metalliferous ore deposits and hydrocarbon reservoirs. Impact events can also create new biological niches, which can provide favourable conditions for the survival and evolution of life and potentially on other planets such as Mars. This course will introduce students to the processes and products of impact cratering on Earth and throughout the Solar System. Particular emphasis will be placed on what meteorite impact craters can tell us about other planetary bodies.

Planetary Science 9604	Impact Cratering Short Course and Field School	Impact cratering is one of the most fundamental, yet poorly understood, geological processes in the Solar System. On many planets, impact craters are the dominant geological landform. On Earth, erosion, plate tectonics and volcanic resurfacing continually destroy the impact cratering record, but even here, the geological, biological, and environmental effects of impact cratering are apparent. Impact events are destructive and have been linked to at least one of the "big five" mass extinctions over the past 540 Ma. In recent years, it has also become apparent that impact craters can also have beneficial effects: many impact craters are associated with economic metalliferous ore deposits and hydrocarbon reservoirs. Impact events can also create new biological niches, which can provide favourable conditions for the survival and evolution of life and potentially on other planets such as Mars. This is an intensive 5-day short course and field training program on impact cratering. This course will introduce students to the processes and products of impact cratering on Earth and throughout the Solar System. This course will be based in Sudbury, Ontario, the site of an ~200 km diameter impact structure formed 1.85 billion years ago. Each day will feature 3 hours of lecture material in the morning, followed by field excursions and/or hands on laboratory sessions in the afternoons. The Sudbury structure offers an exceptional opportunity to study impact melt rocks, various types of impact breccias, shatter cones, impact-induced hydrothermal alteration, and much more.
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Social Sciences

Anthropology

Anthro 1026F/G	Introduction to Biological Anthropology and Archaeology	An introduction to aspects of biological anthropology and archaeology which help us to understand the place of humankind in nature. Topics to be covered include heredity, human evolution and variability, archaeological method, the development of culture, the domestication of plants and animals, and the rise of civilization and the state.
Anthro 2201F/G	Urban Thinking: Cultural Explorations of Towns and Cities	An ethnographic and social-ecological approach to towns and cities examining small and large urban and peri-urban sites as complex cultural and political systems. Topics such as urban cultures, space and power, sustainability, and governance, among others, will be explored from a critical cross-cultural and historical perspective.
Anthro 2203F/G	Indigenous Peoples, Globalization, and the Environment	An examination of natural resource development emphasizing the interplay between indigenous people, the state and transnational developers. Topics include: environmentalism and livelihood; land rights; corporate power and state policies; common property and community-based resource management; NGOs in environmental politics; sustainability and the greening of development.
Anthro 2217F/G	First Nations Traditional Cultures of Canada	Cultural and linguistic areas of Canada, subsistence patterns, social and political organization, religion, ethnohistory of the fur trade and Metis, treaties, accessing First Nations viewpoints.

Anthro 2218F/G	Contemporary First Nations Issues in Canada	Education, land claims, sovereignty, social justice, hunting and fishing rights, co-management of resources, spirituality, pow-wows, oral history, language maintenance; media representation, cross-cultural mis-communication, Royal Commission on Aboriginal Peoples.
Anthro 2260F/G	'Nature' in the City	This course examines how changing notions of social control, sanitation, property value, class, security, and individual well-being have shaped the social production of green spaces in urban environments. We will also explore how green spaces are experienced by urban inhabitants and influence their imagination of the city.
Anthro 2262F/G	The Production and Consumption of Global Commodities	This course focuses on communities of commodity producers and consumers in an integrated global political economy. Weekly lectures centre on particular commodities (rubber, gold, sapphires, oil, water, etc.) and on how anthropologists have attempted to study the roots and effects of their production and consumption.
Anthro 2264F/G	Issues in Primate Conservation	A consideration of conservation issues confronting primatologists, including: conservation assessment, variables for understanding the conservation biology of nonhuman primate populations, biogeographic patterns contributing to declining primate populations, strategies in primate conservation, and how ethnoprimateology – the study of interactions between humans and nonhuman primate populations – can be useful in primate conservation.
Anthro 2269F/G	Special Topics in Environment Culture	Special topics in the anthropological study of environment and culture.
Anthro 2272F/G	The Anthropology of Tourism	This course examines various aspects of tourism from an anthropological point of view. Topics will include the cultural effects of tourism on both hosts and guests, on the political and economic issues involved in tourism, on the connection between tourism and environmental concerns, and on conflict over local resources.
Anthro 2281F/G	Anthropology of Development	Third World responses to development from an anthropological perspective, with emphasis on the impact of market institutions on indigenous societies. Topics include the impact of aid, wage labor and urbanization on peasant communities; local versus national priorities in development; and risk aversion and technological innovation among small farmers.
Anthro 3322	Field Course in Environmental Anthropology	This course offers students the opportunity to study current issues in environmental anthropology through participation in extended fieldtrips and collaborative research projects during Intersession or summer terms. Students should be prepared to cover necessary travel and living expenses. Applications required and available in department.
Anthro 4402F/G	Indigenous Cultures and Globalization	Indigenous cultures around the world are sharing their traditional knowledge and supporting one another's claims to political and cultural autonomy as well as human rights. First Nations in Canada increasingly act on a global scale, in ways still dependent on their traditional values and forms of social organization.

Anthro 3309F/G	Hunting and Gathering Societies	An overview of issues concerning hunter-gatherers from both an archaeological and ethnographic perspective. Topics include: the usefulness of the "hunter-gatherer" category, debates about the original state of human nature, and the causes of subsistence and societal variability including the shift to agriculture and the development of non-egalitarian societies.
Anthro 9210	Assessing Development	This course will focus on the connection between development and patterns of migration, both internal, especially rural-urban migration, and international. Specific issues that will be covered are: livelihoods and mobility; remittances; the trend toward urbanization; inner city poverty and shanty towns; migration and the informal sector; development induced migration.
Anthro 9221	Political Ecology and Naturecultures	Political ecology has over the last decades emerged as an interdisciplinary field of inquiry that has effectively applied both materialist and symbolic perspectives to the analysis of environmental struggles, broadly defined. Drawing on recent ethnographic works, as well as theoretical writings by anthropologists, geographers, sociologists, political scientists, biologists and historians of science, this seminar reviews the evolution of political ecology since the 1970s and considers how recent post-humanist perspectives that focus on human-nonhuman entanglements might be re-configuring the field.
Economics		
Econ 2124A/B	Economic Development I	A review of the economic problems of the third world and the nature of the process of economic development. Topics may include: structure of developing countries' economies; theories of economic growth and development; development and human welfare; planning and markets; human resources in development.
Econ 2125A/B	Economic Development II	Topics will include savings and the financing of capital formation in the development process; the role of international trade and capital flows; natural resources and agriculture in economic development.
Econ 2172A/B	Natural Resource and Environmental Economics	Economic issues pertaining to the exploitation and conservation of renewable and nonrenewable natural resources such as fisheries, forests and energy. The course also explores the tension between economic growth and environmental quality and evaluates alternative approaches to environmental problems.
Econ 3374A/B	Natural Resource and Environmental Economics	The aim of this course is to develop the economist's approach to environmental problems and natural resource use and to evaluate the effectiveness of various policies that governments have used to solve environmental problems and improve natural resource use.
First Nations Studies		
FNS 2203F/G	Indigenous Peoples, Globalization, and the Environment	An examination of natural resource development emphasizing the interplay between indigenous people, the state and transnational developers. Topics include: environmentalism and livelihood; land rights; corporate power and state policies; common property and community-based resource management; NGOs in environmental politics; sustainability and the greening of development.

FNS 2218F/G	Contemporary First Nations Issues in Canada	Education, land claims, sovereignty, social justice, hunting and fishing rights, co-management of resources, spirituality, pow-wows, oral history, language maintenance; media representation, cross-cultural mis-communication, Royal Commission on Aboriginal Peoples.
FNS 2531F/G	Women in First Nations Cultures	First Nations women have exercised considerable power and authority, both domestic and political, in their traditional cultures. Aboriginal women live within a value system that sees them as having a different but equally valid role in society. These values will be contrasted to those of mainstream Canadian society.
FNS 2532F/G	Indigenous Women and Globalization	An overview of the social, cultural and economic consequences of globalization on Indigenous women. Students will use contemporary sources to examine how the globalization of culture, communication, consumption, and production have effected Indigenous women as well as their responses to these pressures.
FNS 2601F/G	Indigenous Environments	The consequences of physical environmental change for Indigenous communities around the globe will be examined in relation to the processes of colonialism & environmental dispossession. Topics include: identity, culture, local economies, social functioning, food security and health.
FNS 4402F/G	Indigenous Cultures and Globalization	Indigenous cultures around the world are sharing their traditional knowledge and supporting one another's claims to political and cultural autonomy as well as human rights. First Nations in Canada increasingly act on a global scale, in ways still dependent on their traditional values and forms of social organization.

Geography

Geo 1100	Fundamentals of Geography	A systematic descriptive introduction to the diverse elements of landscape including geomorphic, climatic, and biotic elements, human settlement and land-use patterns; cartographic approaches to the analysis of selected processes of landscape change; an introduction to the synthesis of elements and processes in spatial systems models.
Geo 1300A/B	Physical Geography	Physical Geography examines the phenomena and processes of the Earth-atmosphere system that underlie human environment interactions and environmental change. Topics include: the atmosphere and fundamentals of weather and climate, water in the environment, Earth surface processes and biogeography.
Geo 1400F/G	How Humans Interact with The World	This course introduces students to the central problems, concepts, methods and applications of human geography. It pays particular attention to the ways humans interact with the world; for example, population growth, use of natural resources, culturally-based activities, urbanization and settlements, agricultural activities, and industrialization.
Geo 1500 A/B	Environment and Development Challenge	Examines environmental change over long periods of earth history, considering both physical processes and human impacts. An integrative approach provides a basis for understanding some of the world's most pressing environment and development challenges, such as biodiversity loss, desertification, climate change, energy consumption, and persistent hunger and malnourishment.

Geo 2010A/B	Geography of Canada	An overview of the regional geography of Canada. Topics considered may include demographics, culture, the economy, resources and environmental issues.
Geo 2011A/B	Ontario and the Great Lakes	A detailed examination of the province as part of the Great Lakes region, with special reference to its historical development, natural resources and patterns of human and economic activity.
Geo 2012A/B	Geography of Arctic Canada	An introduction to the landscapes of the Canadian Arctic: interrelationships amongst climate, vegetation, landforms, soils and resources; human responses over time.
Geo 2020A/B	Latin America and the Caribbean: Landscapes of Inequality	This course provides an introduction to the geography of Latin America and the Caribbean by examining how struggles for land, resources and labour have driven political, economic, social and environmental change in the region, from the European Conquest to the present.
Geo 2030A/B	Africa South of the Sahara	This course provides an introduction to the geography of Africa south of the Sahara. The course will take a systematic approach. Economic, political, social and environmental issues will be examined with a focus on contemporary patterns of change within the context of the global economy.
Geo 2040A/B	Geography of East and Southeast Asia	An introduction to the region. Issues examined include ethnic relationships, social structure, population distribution, environmental awareness and resource utilization.
Geo 2041F/G	Geography of China	This course adopts a geographic approach to understanding contemporary China. It examines how transformations of China's land, people, economy, and society are recasting internal regional divisions and repositioning China in a rapidly changing world.
Geo 2045 A/B	Russia and the Former Soviet Union	An introduction to the geography of Russia and its neighbours with an emphasis on the Soviet legacy. Topics covered will include resource and environmental issues, culture and nationalism, the economy and demographics.
Geo 2050A/B	Western Europe	Investigation of geographical factors in the political, economic and social patterns of Western Europe; selected themes and case studies.
Geo 2060A/B	World Cities	A global perspective on urbanism. In each session a selected city is used to emphasize a particular urban problem, urban spatial structure or world region.
Geo 2071F/G	World Rivers	This course introduces students to the interactions between rivers, their physiographic environments, and human activities.
Geo 2130Y	Field Geography and Geology of Southwestern Ontario	A field-trip based course exploring the history and patterns of the geology, physical landscapes and resources of southwestern Ontario. Usually offered in the first half of the Fall semester; four mandatory, full day field excursions (transportation fee required) supported by a weekly lecture.
Geo 2131A/B	The Natural Environment	An examination of the characteristics, origins and history of selected natural environments with particular reference to North America.

Geo 2132A/B	Digital Earth	This course uses online digital imagery and topography to access, analyze and interpret Earth surface landscapes and landscape change. Students are introduced to the use of digital landscapes, images and visualization software to explore and analyze the origin and development of selected landscapes in response to natural and human forces.
Geo 2133A/B	Climate Change	This course examines the processes that underlie natural and human-induced climate change at global and regional scales and describes the resultant climates that have existed, those projected to occur in the future, and what impacts climate change has and will have on the physical and human environment.
Geo 2142A/B	Geopolitics	An exploration of the geographical setting in which political decisions are taken. The history of the rise and fall of centres of power, the rise of supranational entities, ethnic wars, and the impermanence of international boundaries will be discussed.
Geo 2144F/G	Geography of Tourism	Examination of tourism as a global, national and local phenomenon, with economic, social, and environmental impacts; emphasis on tourism in developing countries; hosts, guests, and tourism operators; tourism trends; mass versus alternative tourism; relationship between 'ecotourism' and nature protection.
Geo 2152F/G	Geography of Hazards	A survey of the methods and models used to understand human responses to hazards. The course reviews the rich tradition of hazards research in geography, particularly through the lens of social science. The course will include discussions of both so-called "natural hazards" (e.g., floods, fires, earthquakes) and "technological hazards" (e.g., nuclear technology, genetically modified organisms, terrorism, war) as examples.
Geo 2153A/B	Environment, Economy, and Society	The human uses of and impacts on environment and resources; the concept of sustainability; current resource issues.
Geo 2162A/B	Introduction to Urban and Regional Planning	Principles and processes of land use planning for urban and regional development; current issues and case studies.
Geo 2310A/B	Weather and Climate	Fundamentals of the physical processes underlying weather and climate; radiant energy, energy balances, clouds, atmospheric dynamics and thermodynamics; principles of the "Greenhouse Effect", mid-latitude cyclones and aspects of weather forecasting, severe weather phenomenon and atmospheric optics.
Geo 2320A/B	Introductory Biogeography	Spatial distributions of plants and animals; evolutionary and environmental controls on distributions; impacts of human settlement.
Geo 2330A/B	Geomorphology and Hydrology	Water and sediment cycles at the earth's surface and explanation of the resultant landforms; examples of response to environmental change; selected applications to environmental management.

Geo 2410B	Social Geography	A geographical investigation of the links between spatial change and social processes. Selected topics will focus on the ways social relations, identities and inequalities are created and practiced over space, with examples from Canadian and international contexts.
Geo 2411F/G	Indigenous Environments	The consequences of physical environmental change for Indigenous communities around the globe will be examined in relation to the processes of colonialism and environmental dispossession. Topics include: identity, culture, local economies, social functioning, food security and health.
Geo 2430A	Public Health and Environment	This course introduces students to current issues in public health and the environment. Theory, method and case study discussions focus on the important role of geography in understanding and explaining patterns of diseases, health and health care in communities, regions and nations.
Geo 2450F	Introduction to Resource and Environmental Management	A geographical introduction to natural resources and their management; juxtaposition of global and Canadian resources and environmental conditions and the human management response.
Geo 2460G	Introduction to Urban Development	Growth, structure and morphology in industrial and post-industrial cities; theories of, and empirical research on, urban form and structure; land development decision making; development feasibility modelling; urban land-use policy.
Geo 3260A/B	Environmental Modeling with Geographic Information Systems and Remote Sensing	Examination of spatially and temporally distributed environmental models that use Geographic Information Systems and remote sensing techniques. Modelling of watershed systems, focusing on the energy, water, and biogeochemical cycles. Prediction of environmental and/or ecological change on watershed systems.
Geo 3311A/B	Micrometeorology	Principles of weather and climate at micro-, local, and meso-scales; processes associated with transfer of heat, mass, and momentum and resulting climates near the surface; local winds, fog, urban climates and air pollution.
Geo 3333A/B	Drainage Basin Geomorphology	Analysis of drainage basin form and process, including fluvial processes on hillslopes, channel networks, the drainage basin sediment cascade, response of drainage basins to environmental change and selected applications to drainage basin management.
Geo 3334A/B	Geomorphology of River Channels	The geomorphology of rivers, including fluvial hydraulics, fluvial erosion and sediment transport, river channel morphology and dynamics, channel and floodplain sedimentation, the response of rivers to human activities and environmental change, and applications to river channel management.
Geo 3341A/B	Hydrology	The relationship between rainfall and runoff, including the influence of vegetation and soil-water systems; runoff from snow and ice; the hydrological role of lakes and rivers.

Geo 3343A/B	River Ecosystems	This course introduces students to riverine ecosystems. General principles of the physical, chemical and biological patterns and processes of river systems are presented in a landscape context. The course emphasizes human driven landscape changes in the health and sustainability of river systems and teaches techniques for river monitoring and assessment.
Geo 3350A/B	Environmental Change	The evidence, causes, and chronology of environmental change, with emphasis on the Holocene in North America.
Geo 3431A/B	Land Use and Development Issues	Critical examination of current land use and development projects; students are required actively to participate in the discussions.
Geo 3432A/B	Environmental Hazards and Human Health	This is a survey course regarding the links between human health and environmental hazard exposure. Issues will include the health impacts of water pollution, air pollution, solid and hazardous waste, toxic substances, pesticides and radiation. The limitations of models and methods are discussed.
Geo 3441F/G	Conservation and Development	Examines struggles between conservation and economic development in a North-South context, setting the transformation of natural ecosystems and impoverishment of biodiversity in a political economic context that includes disparities in wealth, consumption, and 'ecological footprints'.
Geo. 3442F/G	Geographies of Development	A thematic course on the geography of development. Common explanations for poverty and underdevelopment are critically assessed. Covers a range of scales (local, national, international, global) to demonstrate how processes operating at various scales interact to produce uneven geographical outcomes.
Geo 3462F/G	Land Use Planning	Basic techniques for preparing, implementing, and applying land use plans and zoning controls.
Geo 3463G	Housing	This course explores the geography of housing in North American cities from an historical perspective, with a detailed investigation of the effects of land development, construction, financing, planning, public policy, demographics and lifestyle changes on the production and consumption of residential landscapes.
Geo 4430A/B	Community-based Research on Environment and Health	A critical review of Canadian research on environment and health, focusing upon dilemmas and responsibilities of conducting research in communities under stress. An opportunity for students to compare findings and re-consider methods for the particular contexts of research amongst vulnerable populations.
Geo 9104	Environmental Change	The physical, chemical and ecological aspects of environmental change, both natural and anthropogenic. An overview of the techniques used to determine environmental change, recent environmental history and a deeper understanding of the contributions of this research to identifying the mechanisms and impacts of global change.

Geo 9105	Environmental Modelling	This course concerns the practicalities, possibilities and limitations of numerical simulation of environmental processes. The course provides a basic understanding of numerical algorithms for environmental processes and their implementation in spatial and temporal dimensions. While directed at physical environmental processes, the course may be applicable to those working in other areas.
Geo 9106	Developmental Geography	In this course we will wrestle with the historical context, key political economic processes and institutions, and conflicting theories that fall under the rubric of development and its modern sister, globalization. In addition, we will see that 'thinking geographically' about development involves understanding how the meaning of places and regions are socially constructed, and how theoretical and conceptual frameworks about development have been debated. We aim to be sensitive to regional differences based on historical experiences and geographical particularities, but give attention to overarching themes and dominant political economic processes.
Geo 9107F	Environment and Health	The conceptual frameworks for environmental health research and policy analysis. Appraisal of methods of deriving and substantiating evidence in environment and health research. Approaches to environmental health policy formulation and the uses of evidence in the environmental health policy arena.
Geo 9108W	Qualitative Methods	This course introduces students to epistemological issues that distinguish qualitative from quantitative methods and provides an overview of several of the main types of qualitative research methods. It also considers ethical issues and data analysis and management challenges that are associated with qualitative research. Students will use the knowledge that they gain in this course to write a research paper.
Geo 9109W	Geography of Migration	Trends, patterns and processes of migration, drawing from diverse theoretical perspectives to examine migration flows in a number of international contexts. Particular attention is paid to the development impacts of migration as well as to emerging transnational migrant practices.
Geo 9110	Introduction to GIS	Introduction to fundamental concepts, techniques and applications of Geographic Information Systems (GIS). This is an entry level course for students who wish to apply GIS to their own research. Students gain hands-on experience using the ArcGIS software and develop problem solving skills.
Geo 9114W	Urban Studies	An examination of social and physical characteristics of the form, function and evolution of cities at multiple scales and perspectives. A critical examination of everyday urban issues, theories, conceptual frameworks and research methods in urban geography, and cognate disciplines.
Geo 9116F	Indigenous Health	In this seminar-based course, we will critically examine key determinants of Indigenous health, including basic concepts, theories, methods and ethical issues outlined in the contemporary Indigenous health literature.

Geo 9117	Urban Geography of the Developing World	An examination of physical, economic, and social characteristics of cities in the developing world in global and historical context. A critical examination of planning ideologies, principles, and recent global processes that have shaped and continues to shape the character of cities in developing countries as well as their outcomes.
Geo 9118F	Policy Formation and Futures: Critical and Analytical Approaches	This course is an advanced seminar on policy formation and policy futures. There is long-standing interest in policy development beginning with agents and influencers, adoption and development, implementation and outcomes and to some extent policy evaluation. This course takes a critical and analytical approach to understanding and analysing policy formation and futures focused in particular on public policy.
Geo 9119	Monitoring of Riverine Systems	Contemporary riverine principles are explored in the context of the development and execution of riverine monitoring. Methods of monitoring the physical, chemical and ecological status of rivers will be discussed with labs providing opportunities for practical experience in popular monitoring techniques. A presentation and formal written report detailing the findings of a review of an ongoing riverine monitoring program of the student's choice is expected.
Geo 9130	Environmental Monitoring	Approaches to characterising the environment are explored through principles of monitoring strategies and practicalities of instrumentation. Practical experience in design, development, testing and deployment of environmental sensors. A practical report on environmental monitoring is expected, usually directly related to planned thesis research.
Geo 9300	Advanced Studies in Physical Geography: Paleolimnology	Paleolimnology is the analyses of the physical, chemical and biological properties of lake sediments in order to determine environmental change. This course includes an overview of limnological processes, paleolimnological techniques, and an understanding of the contributions of paleolimnological research to global change issues.
Geo 9300	Advanced Studies in Physical Geography: Urban Climatology	This course examines the field of urban climatology through sample papers that represent observational, modelling, conceptual and applied studies in urban climate. The course will allow students to situate their own research within the broader discipline of urban climatology. It is assumed that students will have previous background in boundary layer climatology/micrometeorology
Geo 9300	Advanced Studies in Physical Geography: Determinants of Health of Populations	An examination of the methods used to define, measure, and investigate health outcomes and health determinants at a population level. The applications of this approach to public health policy and planning. Both local and international contexts will be explored in population and public health.

Geo 9300	Advanced Studies in Physical Geography: Global Technologies and Local Knowledge	A course examining the frictions of going global: 1) how technologies embed the resource endowments, labour and managerial practices, culture and politics of their time and place of origin, 2) when exported where the local knowledge and best practice amongst users, policy makers and entrepreneurs differ, 3) and what environmental, political and economic implications attend such encounters. We proceed through theory and case studies, concluding with a series of workshop presentations. This course has been of interest to geographers, historians and those following courses in environment and sustainability.
Geo 9300	Advanced Studies in Physical Geography: Environment and Resource Management	A review of institutional, legislative and community perspectives on resource management. This course is targeted at resource managers, but is also relevant to those interested in environmental policy and society.
Geo 9300	Advanced Studies in Physical Geography: Agriculture and Rural Development	This course provides theoretical and substantive foundations in the history of agriculture and food in the Global South, and examines contemporary agricultural, food and nutritional issues and controversies.
Geo 9300	Advanced Studies in Physical Geography: Environment and Ideology	An examination of ideological premises and their ramifications for effective governance of resources and the implementation of sustainability.
Geo 9300	Advanced Studies in Physical Geography: Civil Society and Development	A critical examination of how civil society is constructed as an actor and a context for international development interventions. The focus is on how development rhetoric orders and utilizes the space, and on the negotiation of diverse agendas that meet in this space.
Geo 9300	Advanced Studies in Physical Geography: Advanced Cultural Geography	This course examines the production and interpretation of cultures, the major cultural markers of identity, and the politics of space, place and landscape. Final lists of seminar topics and readings for discussion will be developed in consultation with students.
Geo 9332	Environmental Hazards	Scientific and social perspectives on the human impact of weather, storms, temperature extremes, floods and droughts. Environmental change response strategies such as warnings, adaptation, mitigation and recovery.
History		
History 1805E	Science Technology and Global History	A survey of global history with a focus on mathematics, science, technology, medicine and environment.

History 3407F/G	Themes in European Environmental History: From Antiquity to the Nineteenth Century	This course explores the history of European attitudes toward the natural world. We will reach back to Antiquity, but the Middle Ages, the Renaissance, and, above all, the early-modern period will draw most of our attention. The multi-disciplinary nature of environmental history will suggest a broad range of topics.
History 3408F/G	Europe, Nature and History: Opportunities and Crises	Was Ancient Greece ruthlessly deforested? Was medieval expansion born of a climatic Optimum - and ruined by over-exploitation or the Little Ice Age? This course will examine the ways in which natural forces and social imperatives interacted to shape European attitudes to nature - and their impact across the world.
History 9833A	Environmental History	Environmental history explores the history of human beings and the natural environment: how people have thought about, and interacted with, nature. While introducing the main concepts and debates of the international field, this seminar course will trace an environmental history of Canada, particularly through the past two centuries.
Management and Organizational Studies		
MOS 4405F/G	Airport Planning and Management	A study of airport planning and successful airport operation. Topics include the duties and responsibilities of the airport manager, regulations governing the operation of commercial and public airports in Canada and internationally, fiscal management of airports, forecasting methods, environmental issues and requirements, terminal building concepts, current and emerging public airport issues.
Political Science		
PS 2104	The United Nations in the New Millennium	The course examines the United Nations' contributions to the resolution of diverse global problems. The course will assist the student to understand how the United Nations operates and to evaluate current United Nations policies and activities on a wide range of contemporary issues, including peace and security, economic development, human rights, and environmental protection.
PS 2140A/B	Globalization: Competition and Cooperation	This course critically discusses the history and development of globalization and the cultural, social, religious and political impacts of an interconnected world. Topics include: global financial crisis and governance; global production and trade; rising fundamentalism and religious backlash; cultural homogeneity and westernization; global social movements and protest; global environmental issues.
PS 2137	Politics of the Environment	An examination of human impacts on the earth's ecosystems, and the political responses to these impacts, with particular attention to the effects of industrial technologies and economic patterns, and the underlying values that support these. This course will draw upon concepts from economics, geography, and biology, as well as political science.

PS 3314E	Global Environmental Governance	This course explores the theory and practice of global environmental governance. It offers a comprehensive overview of existing international policy on various ecological issues such as climate change. Through classroom simulations of global negotiations, students will analyze the political, economic, and social factors that shape outcomes in environmental politics.
PS 3326E	Canadian-American Relations	This course examines the Canadian-American relationship by looking back to how it developed and ahead to what it might become, especially after NAFTA. Topics include communications, culture, trade and investment, immigration, security, the environment and extra-continental relations. Approaches include economic history, political economy, political integration and public choice.
PS 3364F/G	Issues in Urban Governance	A thematic analysis of current policy problems and responses in large North American and West European cities. Issues include globalization and economic development, suburban sprawl, the challenge of social diversity and local environmental problems.
PS 4408F/G	International Security	This course overviews current threats to international security such as nuclear weapons proliferation, terrorism, environmental degradation, and ethnic conflict. It also considers various approaches to alleviating these problems including UN peace support operations, regional alliances, espionage, arms control, and disarmament.
PS 4902A/B	The Policy Process in Local Government	After an introduction to policy analysis, there is an examination of the factors which help determine local government decisions about policies, development expenditures, and taxes. The scope for local government to frame its own economic policies and address social, economic and environmental problems is analyzed.
Psychology		
Psych 3721F/G	The Psychology of Persuasion	An examination of social psychological theories and research relating to attitude formation and change. Both persuasion of others and self-persuasion will be considered. Specific topics to be covered include the effects of fear appeals, race relations and prejudice, mass media, communications, advertising, and sex role stereotypes.
Psych 3723F/G	Attitudes and Attitude Change	This course will describe research and theory in social psychology relating to attitudes. Topics to be covered include dissonance, factors associated with effective persuasion, resistance to persuasion, advertising, religious attitudes, environmental attitudes, prejudice, and propaganda.
Sociology		
Socio 2134A/B	Civil Society and Social Movements	This course examines civil society, participation, and activism in modern democracies. We focus on the importance of social movements seeking to initiate changes in civil society. Movements to promote women's rights, gay and lesbian rights, and the environment are studied along with the counter-movements that work to resist them.

Socio 2179A/B	Promotion of Community Health	The course examines health from a community perspective. The main focus will be on understanding the influence of the community on health, with particular attention to the relationship between social inequality and health. The course will also consider the implications of a sociological perspective for health promotion policies.
Socio 2212A/B	Women and Third World Development	This course is an introduction to theories and debates that merge feminist theory with the study of global economic development. In particular, the course will examine changes in the lives of Third World women wrought by development and by their incorporation into global economic and political systems.
Socio 2239	Social Inequality	A study of the causes and consequences of the unequal distribution of prestige, power and wealth and of the ideologies used to defend and criticize inequality. Different societies are examined but emphasis is on the development and contemporary structure of the Canadian class system.
Socio 2246A/B	Sociology of Health and Illness	This course examines how health and illness are related to social processes and social structure. We will investigate how the social organization of Canadian society influences and is influenced by the types and distribution of disease and illness. Patterns of health and illness in Canada will be studied in relation to the variables of age, gender, class and race. In addition the impact of stress, work and the environment on the health of Canadians will be addressed. This will be followed by an examination of the social experience of illness.
Socio 2285A/B	Social Inequality over the Life Course	This course examines social factors that affect social inequality in later life from a life course perspective. It introduces key concepts and examples from life course analysis concerning the interdependence of age, gender, class, and racial/ethnic relations as they relate to inequality in health, wealth, and income over the life span.
Sociology 9147	Social Inequality	The purpose of this course is to advance our understanding of a number of theoretical approaches to inequality. Rather than examining separately different forms of inequality, such as racial or gender inequality, this course examines theoretical approaches that are used to explain these and other forms of inequality in more general terms.
Women's Studies		
WS 1022F/G	Gender, Justice, Change	The 21st century is a period of accelerating change focused around issues of gender, justice and activism. This course will introduce students to the ways in which movements for justice and change are informed by and take up gender issues in matters of education, health, poverty, globalization, the environment, etc

WS 3357F	Feminism, Ecology and Women's Writing	<p>This course will study Indigenous women storytellers and how their stories reveal important knowledge about the meaning of ecology, of relations between and among people, animals and the earth. Students will read literary works by Indigenous women from Canada, the United States, Australia and New Zealand which illustrate that the ecology or health of a community not only depends on the life of certain species or the preservation of the environment but how our connections to animals, plants, land, and sea bind us together. Students will gain an understanding of the philosophical and ethical issues that concern Indigenous people today and how their knowledge is relevant to environmental concerns, globally and locally.</p>
WS 9592	Gender and Development: Engaging with Theory, Practice and Advocacy	<p>This course seeks to provide an introduction to gender and development as a domain of theory, practice, advocacy and interaction. The course is informed by the needs and interests of future practitioners, i.e. students who hope to engage in research, project design and implementation, policy analysis, advocacy and/or networking in the gender and development field or a closely related domain. To best serve the needs of such students, a few lectures of the course are devoted to providing students with a historical perspective on the evolution of the theory and practice of gender and development discourse, and rest of the course focuses almost exclusively on key contemporary and emerging gender issues and debates. Students who do not intend to work as gender and development practitioners, but who want to acquire an up-to-date understanding of the field are welcome in the course, which is open to all graduate students with an interest in the contemporary theory and practice of gender and development.</p>