Environment and Geography

Faculty

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Program Overview

The Department of Environment and Geography offers a wide variety of courses focusing on the intersection of humans and the natural environment. In order for a complete understanding of the human-environment interactions, students need to understand the science of the natural world, and the impacts humans are having on their environment, whether they be at a local, regional or global scale. We must understand how and why the environment is changing. Climate change, acid precipitation, ozone depletion, waste management, food systems, and water conservation are issues which require thorough examination in or that proper decision-making processes can be implemented by leaders in government, industry and non-governmental organizations. We carefully and systematically examine all aspects of the environment so that our graduates can play an important role in the future of our environment.

Bishop's location in the midst of an area of great economic, cultural and physical diversity provides many opportunities for students to take part in practical fieldwork and applied projects. Such studies are integral parts of several courses, especially those relating to elements of physical geography and human impact on the environment. Students enrolling in ESG and AGR courses should be prepared to devote time to fieldwork outside of normal class time. Details of field studies will be discussed within individual courses.

Environment and Geography Programs

Environmental Studies
B.A. Honours in Environmental Studies, 60 credits
B.A. Major in Environmental Studies, 48 credits
Minor in Environmental Studies, 24 credits

B.Sc. Environmental Science
B.Sc. Honours in Environmental Science, 81 credits
B.Sc. Major in Environmental Science, 75 credits
Minor in Environmental Science, 24 credits

B.A. Geography
B.A. Honours in Geography, 60 credits
B.A. Major in Geography, 45 credits
Minor in Geography, 24 credits

Sustainable Agriculture and Food Systems
B.A. Major Sustainable Agriculture and Food Systems*
B.A. Honours Sustainable Agriculture and Food Systems*
B.Sc. Major Sustainable Agriculture and Food Systems*
B.Sc. Honours Sustainable Agriculture and Food Systems*
Minor in sustainable Agriculture and Food Systems, 24 credits

**At the time of printing, the B.A. and B.Sc. Majors and Honours programs in Sustainable Agriculture and Food Systems (SAFS) were under external review. Currently, only the SAFS Minor and Certificate programs are offered.*

Certificate Programs

Certificate in Environmental Studies and Geography, 30 credits

Certificate in Sustainable Agriculture and Food Systems, 30 credits

Graduate-level Micro-Program in Climate Change, 9 credits
(see graduate programs section of the Academic Calendar)

NOTES:

1. All AGR coded courses may count as ESG electives for the EST, GEO or ENV majors, honours and minors.
2. You cannot major in either EST, GEO or ENV and minor in any of EST, GEO or ENV at the same time, due to the abundant overlap in courses. However, you can major in either EST, GEO or ENV and minor in AGR.
3. For B.A. programs, you must take a 3-credit course from the Division of Natural Sciences to fulfil your divisional requirement.

B.A. Environmental Studies

Environmental Studies Major (48 credits) MAJEST

Core (8 courses or 24 credits)

ENG 116 **Effective Writing** *(or any University-level English literature 3-credit course)*
ESG 100 **Intro to Env Studies**
ESG 126 **Intro Human Geography**
ESG 127 **Intro Physical Geography**
ESG 260 **Research Methods**
ESG 261 **Quant. Methods** *(or one of the following:* BMA 140, PMA 260, or PHY 101)
ESG 262 **Intro to GIS**
ESG 300 **Environmental Studies Seminar**

Additional required: Any 8 courses (24 credits) from the ESG department

Environmental Studies Honours (60 credits) HONEST

Same as Environmental Studies Major, plus:

Core (2 courses or 6 credits)

ESG 461 **Honours Proposal**
ESG 462 **Honours Thesis**

Additional required: Any 2 courses (6 credits) from the ESG department

Environmental Studies Minor (24 credits) MINEST

Core (3 courses or 9 credits)

ESG 100 **Intro to Env Studies**
ESG 126 **Intro Human Geography**
ESG 127 **Intro Physical Geography**

*Additional required***:** *Any 5 courses (15 credits) from the ESG department*

B.A. Geography

Geography Major (45 credits) MAJGEO

Core (5 courses or 15 credits)

ESG 126 **Intro Human Geography**
ESG 127 **Intro Physical Geography**
ESG 260 **Research Methods**
ESG 261 **Quant. Methods** *(or one of the following:* **BMA140, PMA260, or PHY101)**
ESG 262 **Intro to GIS**

Additional required: Any 10 courses (30 credits) from the ESG department

Geography Honours (60 credits) HONGEO

Same as Geography Major, plus:

Core (2 courses or 6 credits)

ESG 461 **Honours Proposal**
ESG 462 **Honours Thesis**

Additional required: Any 3 courses (9 credits) from the ESG department

Geography Minor (24 credits) MINGEO

Core (2 courses or 6 credits)

ESG 126 **Intro Human Geography**
ESG 127 **Intro Physical Geography**

Additional required: Any 6 courses (18 credits) from the ESG department

Certificate in Environmental Studies and Geography (30 credits) CONESG

ESG 100 **Intro to Env Studies**
ESG 126 **Intro Human Geography**
ESG 127 **Intro Physical Geography**

*Additional required***:** *Any 7 courses (21 credits) from the ESG department.*

B.Sc. Environmental Science

Environmental Science Major (75 credits) MAJENV

Core (13 courses or 39 credits)

MAT 198 **Calculus I (for Life Sciences)**
MAT 199 **Calculus II (for Life Sciences)**
PHY 193 PHL 193 **Physics for Life Sciences I & Lab**
PHY 194 PHL 194 **Physics for Life Sciences II & Lab**
CHM 191 191 **General Chemistry I & Lab CHL**
CHM 192 192 **General Chemistry II & Lab CHL**
BIO 196 BIL 196 **Intro to Mol & Cell Bio I & Lab**
BIO 207 **Intro to Evolution & Ecology**
ESG 100 **Intro to Env Studies**
ESG 127 **Intro to Physical Geography**
ESG 260 **Research Methods**
ESG 261 **Quant. Methods *or* PHY101 Statistical Methods**
ESG 262 **Intro to GIS**

Additional required DNS courses:
Any 5 courses (15 credits) from this list:

PHY 206 **Waves and Optics & Lab PHL 206**
PHY 207 **Thermal and Fluid Physics**
CHM 111 111 **Organic Chemistry I & Lab CHL**
CHM 141 141 **Analytical Chemistry & Lab CHL**
BIO 211 211 **Sustainable Org Ag & Lab BIL**
BIO 205 **Diversity of Life I & Lab BIL 205**
BIO 206 **Diversity of Life II**
BIO 331 331 **Freshwater Biology & Lab BIL**
BIO 327 **Advanced Ecology**

Additional required ESG courses:
Any 7 courses (21 credits) from this list:

ESG 226 **Physical Oceanography**
ESG 227 **Biogeochemical & Environmental Oceanography**
ESG 250 **Geomorphology**
ESG 251 **Soils & Vegetation**
ESG 263 **Intro to Remote Sensing**
ESG 265 **Atmosphere & Weather**
ESG 269 **Earth's Crust**
ESG 349 **Watershed Management**
ESG 354 **Environmental Impact Assessment**
ESG 361 **Glacial Environments**
ESG 362 **Advanced GIS**
ESG 363 **Natural Hazards**
ESG 364 **Field Course**
ESG 365 **Mid-Latitude Weather Systems**
ESG 367 **Climate Change**

Environmental Science Honours (81 credits) HONENV

Same as Environmental Science Major, plus

Core (2 courses or 6 credits)

ESG461 **Honours Proposal**
ESG462 **Honours Thesis**

Environmental Science Minor (24 credits) MINENV

Core (3 courses or 9 credits)

ESG100 **Intro to Env Studies**
ESG127 **Intro Physical Geography**
ESG261 **Quant. Methods**
OR
PHY101 **Statistical Methods**

*Additional required DNS courses***:**
Any 3 courses (9 credits) from the list of additional required DNS courses for the Environmental Science Major

*Additional required ESG courses***:**
Any 2 courses (6 credits) from the list of additional required ESG courses for the Environmental Science Major

Sustainable Agriculture and Food Systems (SAFS)

Minor in Sustainable Agriculture and Food Systems (24 credits) MINAGR

AGR 100 **Intro to Sustainable Agriculture and Food Systems**

AGR 104 **Edible History of Humanity**

AGR 333 **Climate Change, Agriculture and Food Security**

Additional required: Any 5 courses (15 credits) from the list of AGR coded courses

Certificate in Sustainable Agriculture and Food Systems (30 credits) CONAGR

AGR 100 **Intro to Sustainable Agriculture and Food Systems**

AGR 104 **Edible History of Humanity**

AGR 333 **Climate Change, Agriculture and Food Security**

Additional required: Any 7 courses (21 credits) from the list of AGR coded courses

List of Courses

ESG 100 **Introduction to Environmental Studies** **3-3-0**
An introductory approach toward understanding the global environment and the human impact on this environment. Topics covered include processes operating in natural systems, the identification of problems caused by human interaction with these systems, solutions to these problems and the implementation of possible solutions.

ESG 126 **Introduction to Human Geography** **3-3-0**
An introduction to the field of human geography; its scope and methods. The aim is to focus on the relationship between people and their environment, including population trends, resource use, political and economic forces and urban planning.

ESG 127 **Introduction to Physical Geography** **3-3-0**
An introduction to the principles and methods of climatology and geomorphology. Topics discussed include Earth's radiation balance, atmospheric wind systems, major climate types, and the work of geomorphic agents, such as water and wind, on the development of physical landscapes.

ESG 162 **Canada: A Nation of Regions** **3-3-0**
This course examines Canada's evolving regional geography through an exploration of the natural, social, political, cultural and economic forces involved in creating a distinctly Canadian landscape. The course divides Canada into various regions: The Atlantic Region, St. Lawrence-Great Lakes Lowlands, The Canadian Shield, The Western Interior, British Columbia and The North in an effort not only to understand the vast differences within Canada, but also to deepen our understanding of Canada as a whole.

ESG 163 **Introduction to Landscape and Cultural Geography** **3-3-0**
Cultural geography is concerned with making sense of people and the places that they occupy, an aim that is achieved through analysis and understandings of cultural processes, cultural landscapes and cultural identities. This course explores contemporary cultural geography and landscape studies by applying and evaluating - at different scales - the concepts of cultural diffusion, cultural region, cultural ecology and cultural landscape. Particular attention will be placed on interpretations of how cultural spaces are constructed, contextualized and conserved.

ESG 175 **Economic Geography** **3-0-0**
The production of, and trade in, goods and services vary by city, region, and country. In recent years, these spatial variations have widened in some cases, and narrowed in others. But common to all are the drivers-of-change. These include major geo-political events, the adoption of innovative cost-saving practices, and the creation and evolution of entrepreneurial networks and industrial clusters. This course will explore the key elements of these dynamics, and explore the ongoing debate about the appropriate role of government in an increasingly-globalized world.
This course is cross-listed with ECO 175.

ESG 211 **Historical Geography of the Eastern Townships** **3-3-0**
A retrospective approach to the Eastern Townships blending history and landscape. Various themes will be presented to examine the principle elements of landscape change during the 19th and 20th centuries in relation to the spread of the agricultural frontier, the changing cultural geography of the region, and the introduction of the area as a recreational retreat.

ESG 224 **Human Impact on the Environment** **3-3-0**
Changing environmental relationships in the modern context of population growth and technological advance. The human impact on the world's atmosphere and climate, water, land and soils, vegetation, and animal life.
Prerequisite: ESG 100 or ESG 126

ESG 226 **Physical Oceanography** **3-3-0**
An introduction to physical and geological oceanography. Topics to be covered include: the history of oceanography, plate tectonics and the origin of the oceans basins, marine sediments, seawater properties, ocean climates, geostrophic currents, deep ocean circulation, waves and tides.
Prerequisite: ESG 127

ESG 227 **Biogeochemical and Environmental Oceanography** **3-3-0**
An introduction to marine life and the interaction between the oceans and society at large. Topics will include: biological productivity (phytoplankton, zooplankton), biogeochemical, cycles in the oceans, life in various marine habitats, marine resources, fisheries, mariculture, pollution, coastal development and other environmental issues affecting the oceans.
Prerequisite: ESG 226 or ESG 127

ESG 248 **Geography of Food** **3-3-0**
This course examines the growing harvesting, processing, packaging, transporting, marketing, consumption, and disposal of food and food-related items. By employing spatial concepts and analysis the impacts of food systems on the natural environment, this course examines conventional/industrial food systems, as well as alternatives such as organic food, local food, community-supported agriculture, farmers' markets, slow food movements and others.
Prerequisites: ESG 100 and ESG 126

ESG 249 **Resource Management** **3-3-0**
This course examines the interactions between natural and social processes in the development, use and conservation of natural resources. Theories and concepts explored are: integrated resource management, ecosystem management, adaptive management and the role of public participation. Case studies explore trends in forestry, fisheries, agriculture, mining, wildlife and water management.
Prerequisites: ESG 100

ESG 250 **Geomorphology** **3-3-0**
Selected topics in geomorphology with particular emphasis on fluvial processes and land forms of southern Quebec. Aspects of applied physical geography may be covered. Fieldwork is an integral part of this course.
Prerequisite: ESG 127

ESG 251 **Soils and Vegetation** **3-3-0**
The systematic examination of the development and distribution of the major soil and vegetation types of the world and of the ways in which these elements of the physical environment have become resources subject to varying utilization patterns.
Prerequisite: ESG 127

ESG 260 **Research Methods** **3-3-0**
An introduction to research methodology and its application to environment and geography. Course modules include research design, hypothesis testing, sampling techniques, interview techniques, archival techniques and other approaches to primary and secondary data gathering.
Prerequisite: ESG 126 and ESG 127

ESG 261 **Quantitative Methods** **3-3-0**
Quantitative methods in environmental studies and geography; the nature of explanation; problems of observation and data collection; descriptive statistical analysis; inferential statistical analysis.
Prerequisite: ESG 126 and ESG 127

ESG 262 **Introduction to Geographic Information Systems** **3-3-0**
An introduction to geographic information systems including cartographic concepts, basic remote sensing (aerial photography and digital imagery), vector and raster digital spatial data models, data input and editing, database management, structured query language, and elementary spatial analysis.
Prerequisites: ESG 126 and ESG 127

ESG 263 Introduction to Remote Sensing 3-3-0

An introduction to remote sensing including concepts and techniques, including air photo interpretation, satellite imagery and others, and their application in earth observation and analysis. Experiential learning is a part of this course, allowing student to do measurements and analysis using remote sensing instruments to apply and improve the theoretical knowledge acquired during class.
Prerequisites: ESG 126 and ESG 127

ESG 264 Outdoor Recreation 3-3-0

This course examines: (i) theories and concepts concerning the recreational use of natural settings (the human dimensions), (ii) the nature, capabilities and limitations of natural settings (the natural dimensions) and, (iii) the institutional arrangements which exist to manage outdoor recreation settings (the management dimensions), including national parks and protected areas.
Prerequisite: ESG 100 or ESG 126

ESG 265 The Atmosphere and Weather 3-3-0

A comprehensive description of the principal characteristics of Earth's atmosphere including air temperature, density, pressure and moisture; the development of clouds, wind and precipitation, and physical explanations of weather events such as mid-latitude cyclones, thunderstorms and hurricanes.
Prerequisite: ESG 127

ESG 266 Environmental Policy 3-3-0

An introduction to the field of environmental policy, with an emphasis on the regulation of technological hazards. Consideration will also be given to different approaches to environmental policy, including "command-and-control" regulation and enforcement as well as the emergence of market incentives and voluntary initiatives. Topics will include: air quality, water quality, solid and hazardous waste, toxic substances, pollution-prevention and environmental assessment.
Prerequisite: ESG 224

ESG 267 Global Environmental Change: a physical perspective 3-3-0

An examination of the general trends and concepts associated with global environmental change using a physical geographic approach. This includes analysis of the complex interlinkages of the atmosphere-ocean-terrestrial-biosphere systems, of environmental changes during the Quaternary Period, and of the environmental issues associated with these changes. The human response to global environmental change will be covered in less detail.
Prerequisite: ESG 100 and ESG 127

ESG 268 The Human Landscape and Environmental Change 3-3-0

This course uses various aspects of environmental change to identify links between the sciences and the humanities. A convergence of these two conceptual approaches can provide a more holistic understanding of the long-term processes impacting both human and physical environments. How different cultures conceptualise their relationships with the physical environment is central to how environmental management decisions are made.
Prerequisite: Any one of ESG 100, ESG 126, ESG 162 or ESG 163

ESG 269 The Earth's Crust 3-3-0

The course is a general study of the materials and dynamics of Earth's crust. Students will learn about igneous, metamorphic sedimentary rocks, rock weathering and transport of material at the surface. They will also learn the basic principles of physical geology and how the Earth works: volcanic activity, earthquakes, rock deformation, mountain building, and plate tectonics. We will also explore the vastness of geologic time.
Prerequisite: ESG 127

ESG 300 Environmental Studies Seminar 3-3-0

Selected topics in Environmental Studies will be examined. The course allows detailed study of particular areas of environmental research through student-led seminars and general class discussion.
Prerequisites: ESG 224 and ESG 267; open only to U3 ESG Honours and Majors in Environmental Studies

ESG 339 The Canadian Arctic 3-3-0

The ecology of traditional Eskimo occupance; socio-economic change through contact with explorers, whalemen, traders, missionaries, and administrators. Demographic centralization; industrial development; nunamiut and kabloonamiut; frontier or homeland? The outlook for renewable resources. Problems of sovereignty over arctic space.
Prerequisite: Any one of ESG 100, ESG 126, ESG 162 or ESG 163

ESG 340 The Circumpolar North 3-0-0

An introduction to the physical and cultural geography of the Circumpolar North. This course will focus upon the cultural and political ecology of the human population in this region. The emphasis will be upon the contexts of human life and human experience in the North. This course also includes discussions of the northern landscape: nunamiut and kabloonamiut; demographic centralization; challenges to sovereignty over arctic space. The emphasis will be on lectures and class participation. There will be time set aside to discuss lecture topics and to add concerns of interest to the students; class participation is highly encouraged.
Prerequisite: Any one of ESG 100, ESG 126, ESG 162 or ESG 163

ESG 346 Independent Study I / Internship I 3-0-0

The student is required to select an independent research project or internship, and, under the supervision of a faculty member, complete a formal report. Open to U3 majors and honours students at the discretion of the Department.

ESG 347 Independent Study II / Internship II 3-0-0

The student is required to select an independent research project or internship, and, under the supervision of a faculty member, complete a formal report. Open to U3 majors and honours students at the discretion of the Department.

ESG 348 Urban Planning 3-3-0

Consideration of several aspects of the city planning process: the legal basis of planning, the official plan, zoning, transportation, planning procedure and implementation, the goals of planning.
Prerequisite: ESG 126.

ESG 349 Watershed Management 3-3-0

This course examines integrated water management, including assessment of biophysical freshwater systems, implications of natural resource development and land use on water quality and quantity, climate change impacts, water security, as well as institutional arrangements and the role of stakeholder involvement in watershed-scale decision-making. Field studies in the St. Francis River Watershed.
Prerequisite: ESG 249

ESG 350 Environmental Justice 3-3-0

An introduction to the field of environmental justice, with an emphasis on fairness and equity in environmental management. The course will examine the history of activism and the development of theoretical work and empirical evidence regarding the connections between race, class and the environment.
Prerequisite: ESG 224

ESG 353 Landscape 3-3-0

This course explores landscapes as products of interacting physical and human processes, and examines how those processes can change landscapes over time. The course uses an integrated approach to examine and interpret contemporary landscapes and reconstruct landscapes of the past, and highlights the utility of landscape science for environmental management applications. The course will be conducted through lectures and student-led seminars.
Prerequisite: ESG 126 and ESG 127

ESG 354 Environmental Impact Assessment 3-3-0

Environmental impact assessment (EIA) is intended to provide a basis for deciding whether and how to proceed with a proposed resource development project so as to prevent or minimize environmental degradation. This course will examine the theory, methods, regulatory frameworks and social implications of EIA with emphasis on recent Canadian case studies.
Prerequisite: ESG 249

ESG 358 International Environmental Issues 3-3-0

Environmental factors and their impact on global agricultural production, population growth and distribution. Fresh water and its effect on socio-economic development and political stability. Issues in trans-boundary pollution are discussed. Case studies from developed and developing countries.
Prerequisite: ESG 224

ESG 361 Glacial Environments 3-3-0

The study of processes in glaciated environments. Particular emphasis will be placed on the effects of past glaciations on the Canadian landscape and on the action of contemporary Canadian glaciers. Arctic and alpine environments provide many excellent examples of these processes.
Prerequisite: ESG 250

ESG 362 Advanced Geographic Information Systems 3-3-0

Project-based applications stress the utility of advanced GIS analysis in environment and geography.
Prerequisite: ESG 262

ESG 363 Natural Hazards 3-3-0

The course is an examination of the occurrence, nature and explanation of hazardous natural processes. Attention will be given to defining natural hazards, describing their physical characteristics and discussing the human response to these events. Geological hazards, such as earthquakes, floods and volcanoes, and climatological hazards, such as hurricanes, tornadoes and blizzards, will be studied.
Prerequisite: Any one of ESG 250, ESG 269 or ESG 265

ESG 364 Field Course in Environment and Geography 3-0-0
The course will introduce students to field techniques and data collection and analysis in human, environmental and physical geography. Sometimes offered during Spring semester, depending on faculty resources and student enrollments. A field camp fee will be assessed.
Prerequisite: Open to U3 majors and honours students at the discretion of the Department.

ESG 365 Mid-Latitude Weather Systems 3-3-0
Examination of several of the major factors in mid-latitude cyclones including: air masses, upper and middle atmospheric structure, baroclinic instability, vorticity, divergence and geostrophic flow. Discussion of normal and extreme weather events such as blizzards, thunderstorms, extra-tropical cyclones, tornadoes and Nor'easters. An introduction to weather forcasting and weather on the internet.
Prerequisite: ESG 265

ESG 366 Ethical Perspectives on Environmental Problems 3-3-0
An introduction to the major philosophical traditions in the field of environmental ethics: natural law, utilitarianism, virtue theory and deontology. The use of case studies in environmental problems, e.g. ocean dumping, nuclear wastes, air pollution, greenhouse gases, etc., as a way of exploring several contemporary positions such as biocentrism, ecocentrism, the land ethic and deep ecology.
Prerequisite: ESG 126 and ESG 127

ESG 367 Climate Change 3-3-0
The course examines the debate surrounding global climate change with climatic and paleo-climatic perspectives. The climate system's natural variability, and predicted impacts and environmental implications are examined. The course will include a short review of the present climate system, and a section on the Holocene climate. We will also examine how predictive climate models are developed and tested against recent and Holocene paleo-climatic data.
Prerequisite: ESG 267

ESG 370 Special Topics in Environment and Geography 3-3-0
A lecture/seminar course offered by regular and visiting faculty on environmental/geographical topics related to their research interests. Topics are determined by the instructor therefore content of the course varies year by year. The course will be offered on an occasional basis.
Prerequisite: Open only to U3 Honours and Majors in Environment and Geography.

ESG 461a Honours Research Proposal 3-0-0
An introduction to the planning, execution and reporting of Environment and Geography research. The student is required to select an appropriate research project and, under the supervision of a faculty member, complete a formal research proposal. The proposal must include a detailed Introduction, including the purpose, objectives and research hypothesis, a detailed Conceptual Background, with associated Literature Review and Bibliography, and a description of the Research Methods and Data Collection Techniques to be used in the project. Preliminary data collection should also take place. The Proposal will be presented at a Departmental seminar to be scheduled during the last two weeks of classes.
Prerequisite: Permission of Department

ESG 462b Honours Thesis 3-0-0
The continuation of ESG 461. Information and data collected for the Honours Research Proposal, plus additional data collected will be analysed, discussed and presented in an Honours thesis. Research findings will be presented at a Departmental seminar to be scheduled during the last two weeks of classes; the final submission of the thesis must occur before the last day of the formal examination period. The completion of both ESG 461 and ESG 462 is necessary to satisfy the requirements for Honours in Environment and Geography.
Prerequisite: ESG 461 and permission of the Department

AGR courses:

AGR-coded courses are associated with the Sustainable Agriculture and Food Systems (SAFS) programs. Not all AGR-coded courses will be offered until the full majors and honours programs are launched. However, students in GEO, EST and ENV major, honours and minor programs can take AGR-coded courses as electives that will count toward their degree.

AGR 100 Introduction to Sustainable Agriculture and Food Systems 3-3-0
Conventional, industrial agriculture and fisheries are the source of the majority of our food, but are increasingly linked to economic injustice, loss of food security, and poor health, while also being criticized for being unsustainable, causing environmental degradation. Alternative food systems are emerging, providing innovative, sustainable, local, and organic solutions. This course provides an interdisciplinary survey of the environmental, social, economic and cultural aspects of agriculture and food, and outlines some of the emerging sustainable food systems. This course will help students develop an informed critique of conventional agricultural systems. This course will also provide practical advice for becoming a part of the revolution in agriculture and food systems, and will introduce the topics and skills to be learned during the rest of the program in sustainable agriculture and food systems.

AGR 104 An Edible History of Humanity 3–3–0
This course traces food through human history. Topics include: how the Neolithic period transformed hunter-gatherers to agriculturalists; how sedentary societies that store food create inequalities in wealth and power; how specialty products such as beaver-pelts and spices motivated exploration and colonization; how crops and fossil fuels expanded agricultural productivity, allowing many people to pursue non-farming occupations; how political leaders use power over food supply to mobilize armies and to crush dissent, and currently; how the 20th century Green Revolution solved some problems but now creates new ones.

AGR 130 Environmental Implications of Agriculture 3–3–0
When agricultural operations are sustainably managed, they preserve and even restore critical habitats, protect watersheds, and maintain soil health and water quality. On the other hand, some of the negative environmental impacts from unsustainable farming practices include: land conversion, deforestation and habitat loss, wasteful water consumption, soil erosion and degradation, pollution and contaminated runoff, climate change, genetic erosion and loss of resilience, toxicity to pollinators and other critical eco-system damage This course will expose students to the effects of these impacts, positive and negative, and introduce various indicators of environmental impact based on farmer's production methods, and the impact these methods have on emissions to the environment. The goal is an introductory ability to assess environmental impact at the farm level.

AGR 171 Permaculture Design I: Design Principles 3-0-3
This course introduces students to permaculture design principles. Derived from "permanent agriculture", permaculture is the design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. Permaculture is a multidisciplinary approach that utilizes systems thinking, as well as landscape design techniques, to create plans for food production, water use, energy use and habitat that mimic patterns observed in nature. Permaculture designs must be deeply rooted in the particular place in which they occur: geography, ecology, climate, culture, economy, and the needs and priorities of the resident human community. Permaculture is applicable to a wide rage of places, such as urban lots, schoolyards, municipal parks, and rural farms all over the planet, so students will be well-equipped to apply these principles in a variety of socio-economic and environmental contexts. This course follows a standard worldwide format. Students who successfully complete AGR 171 and AGR 172 will obtain the internationally-recognized "Permaculture Design Certificate (PDC)".

AGR 172 Permaculture Design II: Design Project 3–3–3
AGR 172 is a follow-up course to AGR 171. Permaculture is an integrated design system for human food production, water and energy use, modeled on nature. AGR 172 is a continuation and deepening of the design principles and applications covered in AGR 171. Students in AGR 172 will perform various permaculture design practices in a variety of settings, for various needs. The course involves hands-on work, in the lab and in the field, and requires completion of a significant design project. Students who complete both AGR 171 and AGR 172 will obtain an internationally-recognized "Permaculture Design Certificate (PDC)", enabling them to work as a certified permaculturalist. An extra fee is required for the certificate.

Pre-requisite: AGR 171

AGR 174 Sustainable Agriculture Practicum I 3–0–6
This YEAR 1 Field Course occurs during the Spring Session, May to mid-June at the Campus Educational Farm. It involves planning the growing season, preparing the agricultural gardens, and planting, pruning and other early season activities.
Pre-requisite: AGR 130

AGR 175 Sustainable Agriculture Internship I 3–0–6
This course can replace AGR 174 Sustainable Agriculture Practicum I for qualified students who have arranged a practical agricultural experience or placement equivalent to that provided in AGR 174, to occur off-campus.
Pre-requisites: AGR 130 and Permission of the Department

AGR 201 Market Gardening 3–2–1
This course explores the principles and practices associated with a Market Garden enterprise: a small-scale, intensive production of fruits, berries, vegetables, flowers, herbs, perennials, shrubs, seeds, bulbs and tubers, mushrooms and fungi, and more, as cash crops. Market Garden businesses frequently sell directly to consumers via local farmers' markets and community supported agriculture (CSA) and to local restaurants and inns. Market Garden enterprises are commonly characterized by their diversity of crops, grown on a small area of land, typically less than a hectare, and often in greenhouses. Principles and practices include: CSA initiatives, web and social media presence, product diversity, marketing, business plans, financing and capital, accounting and logistics, the regulatory environment, problem-solving and more. This course includes case studies, field trips to Bishop's Campus Educational Farm, the Bishop's Greenhouse, and local Market Garden enterprises.
Offered Alternate years

AGR 202 Culture and Food 3–3–0
This course presents a social perspective on food and culture. It explores the distinctiveness of foods and food preparation within different cultures and their roles in the building of social identity. In a complementary way, the course also explores the universality of human experiences with food. Significant attention is paid to the role of food and societal food practices in the contemporary global era. Topics include food practices, food's role in socialization, identity, health and social change, as well as food marketing and the changing global food system.
Offered Alternate years

AGR 203 Healthy Nutrition 3–3–0
This course surveys the basic principles of human nutrition, and is intended for students with limited science background. The primary aim of the course is to clarify the profound relationship between nutrition and human health, both current health and future health. Topics include health and disease effects due to over-nutrition (focusing on macronutrients), malnutrition (focusing on micronutrients), weight management strategies, nutritional needs through the life cycle, public nutrition and the relationships between nutrition and chronic diseases.
Offered Alternate years

AGR 210 Food Science 3–3–0
This course provides an overview of the science of food preparation and transformation, focusing on the principles of sustainability: waste reduction, nutrient retention, minimization of packaging. Topics include food chemistry, analysis, microbiology, food safety assessment, product development, packaging, and the effects of processing on physico-chemical, rheological, and sensory characteristics.
Offered Alternate years
Pre-requisites: BIO 194 or BIO 196 and CHM 191 and CHM 192

AGR 220 Soil Science 3–3–0
This course provides an introductory survey of soils and their management: properties of soils, soil formation, description, and use. The course focuses on the role of soils in sustainable agriculture, causes and processes of degradation (including erosion, pollution, and nutrient depletion), and the maintenance of healthy soils.
Pre-requisites: BIO 194 or BIO 196 and AGR 130
Co-requisite: AGL 220

AGL 220 Soil Science Field Laboratory 1–0–6
This practical, field-lab course will focus on learning to obtain and use various indicators for assessing environmental impact, soil and water nitrate concentrations, soil bacteria level, soil acidity, water consumption, and more. The field labs will normally occur outdoors at the Campus Educational Farm.
Co-requisite: AGR 220

AGR 230 Ecological Agriculture 3–3–0
Ecological Agriculture is the science of sustainable agriculture. It emphasizes the interrelationships among soils, plants, insects, animals, humans and other components of agroecosystems, and applies ecological concepts and principles to the design and management of these systems. Ecological Agriculture techniques are of particular value in remote regions and in developing countries, where resources are limited and sustainable food security is a significant priority. This course introduces students to the concepts, principles and practices of Ecological Agriculture such as: diversification to maximize biomass production; waste and loss minimization techniques; by-product recycling; encouragement of decomposers and nitrogen fixers ; maintenance of soil fertility by humus application, crop rotations and correct application of farmyard manure; processing of farm products on the farm with direct sales to local consumers; integrative, ecological control of pests and weeds, ethical animal husbandry; utilization of wild-life and woodland; farm energy production off-grid; and minimization of capital investments.
Pre-requisite: AGR 130
Co-requisite: AGL 230

AGL 230 Ecological Agriculture Field Laboratory 1–0–3
A Practical Course of small, field-based projects, implementing some of the concepts explored in AGR 230. The field labs will normally occur outdoors at the Campus Educational Farm, during the fall semester, before freeze-up in late November.
Co-requisite: AGR 230

AGR 270 Special Topics/Field Course in Sustainable Agriculture and Food Systems I 3–1–5
A special topics seminar/field course offered by regular and visiting faculty on topics related to their research interests in sustainable agriculture and food systems. Topics are determined by the instructor and may include case-studies, projects and farm and agri-business visits, with the result that content of the course varies from one offering to the next. The course will be offered on an occasional basis.
Pre-requisites: AGR 100 and AGR 104

AGR 274 Sustainable Agriculture Practicum II 9–0–18
This intensive YEAR 2 Field Course occurs during the Summer Session, mid-June to end-July, at the Campus Educational Farm. It involves managing and maintaining the farm and gardens (under the direction of the Farm Technician), harvesting and distributing the early crops, and planning and designing future projects.
Pre-requisite: AGR 174

AGR 275 Sustainable Agriculture Internship II 9–0–18
This course can replace AGR 274 Sustainable Agriculture Practicum I for qualified students who have arranged a practical agricultural experience or placement equivalent to that provided in AGR 274, to occur off-campus.
Pre-requisites: AGR 274 and Permission of the Department

AGR 303 Food Preparation and Preservation 3–1-3
This course presents an overview of food processing and food preservation, and associated food processing unit operations. Topics include: principles of food preservation methods such as temperature and water activity control, effects of preservation methods on food quality; pasteurization and the canning industry; refrigeration and freezing - refrigerants and compressors; drying and evaporation; acidification and fermentation; extrusion technology; chemical preservation; food additives; irradiation; and aseptic processing. As part of this course, students will have the opportunity to obtain their Hygiene and Food Safety - Food Handler Certificate from the Quebec government (a 6-hour, training course at extra cost).
Offered Alternate years

AGR 304 Agritourism 3–3–0
Agritourism includes farm stands or shops, U-pick, farm stays, tours, on-farm classes, fairs, festivals, pumpkin patches, corn mazes, Christmas tree farms, winery weddings, orchard dinners, youth camps, barn dances, hunting or fishing, guest ranches, and more. Food and wine tourism is a rapidly growing sector of tourism, which reflects changing lifestyles and increasing diversification within the tourism industry. This course explores the development of the food and wine tourism industry, the concept and size of agritourism, food and wine business development, marketing and broad trends affecting tourism enterprises within this sector - with case studies and field visits within the Eastern Townships region of Quebec.
Offered Alternate years

AGR 305 Agricultural Entrepreneurship 3–3–0
Agricultural Entrepreneurship is designed to provide students with an understanding of the key concepts and processes involved in starting and managing new ventures in an agricultural, agritourism or food business. These concepts include: opportunity recognition, business model conceptualization, feasibility analysis, understanding market structure and niche markets, customer values, new product development, raising start-up capital, and development and management of successful new ventures. The course is appropriate for students interested in a variety of new ventures, from for-profit private companies to social enterprises and cooperatives.
Offered Alternate years
Pre-requisites: BMG 214

AGR 311 Agricultural Pests and Integrated Pest Management 3–3–0
This course presents the principles of sustainable Integrated Pest Management (IPM) and teaches their application vegetable and fruit and berries production. Sustainable IPM principles include no disruption to agro-ecosystems, natural pest control mechanisms, and no synthetic pesticides. The course begins with a survey of pests, plant pathogens, diseases and weeds, continues with non-chemical and biological means of control, monitoring and forecasting methods, and ends with sustainable practices and discussion of the techniques employed for IPM on the Campus Educational Farm.
Offered Alternate years
Pre-requisite: AGR 230

AGR 333 Climate Change, Agriculture, and Food Security 3–3–0
This course examines the role that agriculture plays in climate change as a producer of greenhouse gases, and how this intersects with food security concerns around the globe. Likewise, the course examines how climate change impacts agriculture and food security. Agriculture's role as mitigating agent in climate change, through various peasant practices and modern innovations, and their effect on food security is examined.
Pre-requisites: AGR 100 and AGR 104

AGR 341 Sustainable Food Systems 3–3–0
Agriculture and food industries are a subject of growing interest in terms of their resource requirements, ecological impacts, and sustainability. This course builds on concepts encountered in AGR 100, and other program courses, field courses and practica. It examines methods of modeling and analysis used to study food systems, and give students opportunities to conduct case study analyses. Finally, students will learn how models might be relevant to the development of policy related to local and regional food systems or dietary changes to reduce environmental impact.
Pre-requisites: AGR 100 and AGR 104

AGR 342 Agroecology and Indigenous Food Systems 3–3–0
This course explores the growing field of agroecology research as a transdisciplinary, participatory and action-oriented process, and the wide range of historical and contemporary food systems practices and issues that impact Indigenous communities all around the world, and their connections to the ecosystems that support them. *Pre-requisites: AGR 100 and AGR 104*

AGR 370 Special Topics/Field Course in Sustainable Agriculture and Food Systems II 3–1–5
A third year special topics seminar/field course offered by regular and visiting faculty on topics related to their research interests in sustainable agriculture and food systems. Topics are determined by the instructor and may include case-studies, projects and farm and agri-business visits, with the result that content of the course varies from one offering to the next. The course will be offered on an occasional basis.
Pre-requisites: AGR 100 and AGR 104

AGR 461 Honours Proposal in Sustainable Agriculture and Food Systems 3–0–0
This course provides an introduction to the planning, execution and reporting of Sustainable Agriculture and Food Systems research. The student is required to select an appropriate research project and, under the supervision of a faculty member, complete a formal research proposal. The proposal must include a detailed Introduction, including the purpose, objectives and research hypothesis, a detailed Conceptual Background, with associated Literature Review and Bibliography, and a description of the Research Methods and Data Collection Techniques to be used in the project. Preliminary data collection should also take place. The Proposal will be presented at a Departmental seminar to be scheduled near the end of the semester.
Prerequisite: Permission of Department.
As per department policy, a minimum cumulative grade average of 70% is required to be admitted into AGR 461.

AGR 462 Honours Thesis in Sustainable Agriculture and Food Systems 3–0–0
This course is a continuation of AGR 461. Information and data collected for the Honours Research Proposal, plus additional data collected will be analysed, discussed and presented in an Honours thesis. Research findings will be presented at a Departmental seminar to be scheduled during the last two weeks of classes; the final submission of the thesis must occur before the last day of the formal examination period. The completion of both AGR 461 and AGR 462 is necessary to satisfy the requirements for Honours in Sustainable Agriculture and Food Systems.
Prerequisite: AGR 461 and permission of the Department.
As per department policy, a minimum of 75% in AGR 461 is required to be admitted into AGR 462.

AGR 471 Experiential Learning in Sustainable Agriculture and Food Systems I 3–0–0
The aim of this course is to expose students to the application of what they have learned with a practical, field project or placement. Students will be expected to engage in a project or field placement, with off-campus, community projects preferred. A project proposal will be required. Each experiential learning project will include an "external supervisor", and an internal supervisor (a departmental faculty member). The project will be expected to take significant time to complete, at least 100 hours. The student's performance during the practical work will be evaluated by the external supervisor. The student will also be required to produce a final report concerning the project outcomes, and/or a presentation of the findings. The course is normally restricted to students with a cumulative average grade of at least 70%.
Prerequisite: This course may only be registered during the final 30 credits of the student's program and by permission of the Department.

AGR 472 Experiential Learning in Sustainable Agriculture and Food Systems II 3–0–0
This course follows the same course structure and requirements as AGR 471, and builds further depth in this field of study.
Prerequisite: AGR 471 and by Permission of the Department.