Environment and Geography Programs

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

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

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

Sustainable Agriculture and Food Systems (SAFS)
B.A. Dual Specialization in Sustainable Agriculture and Food Systems, 48 credits
Minor in sustainable Agriculture and Food Systems, 24 credits

Future programs:
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*
*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.

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.

Program Overview

The Department of Environment and Geography offers both B.A. and B.Sc. majors and 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, at all scales, from local to global. 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 order for decisions-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.
<table>
<thead>
<tr>
<th>Program</th>
<th>Course Description</th>
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<tbody>
<tr>
<td><strong>B.A. Environmental Studies</strong></td>
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<tr>
<td><strong>Environmental Studies Major</strong></td>
<td>(48 credits)</td>
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<tr>
<td>Core (8 courses or 24 credits)</td>
<td>ENG 116  Effective Writing (or any University-level English literature 3-credit course)</td>
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<td>ESG 100  Intro to Env Studies</td>
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<td>ESG 126  Intro Human Geography</td>
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<td>ESG 127  Intro Physical Geography</td>
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<td></td>
<td>ESG 260  Research Methods</td>
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<td>ESG 261  Quant. Methods (or one of the following: BMA 140, PMA 260, or PHY 101)</td>
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<td>ESG 262  Intro to GIS</td>
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<td></td>
<td>Additional required: Any 8 courses (24 credits) from the ESG department</td>
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<tr>
<td><strong>Environmental Studies Honours</strong></td>
<td>(60 credits)</td>
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<tr>
<td>Same as Environmental Studies Major, plus:</td>
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<tr>
<td>Core (2 courses or 6 credits)</td>
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<tr>
<td>ESG 461  Honours Proposal</td>
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<tr>
<td>ESG 462  Honours Thesis</td>
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<tr>
<td>Additional required: Any 3 courses (9 credits) from the ESG department</td>
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<tr>
<td><strong>B.A. Geography</strong></td>
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<tr>
<td><strong>Environmental Science</strong></td>
<td>(75 credits)</td>
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<tr>
<td>Core (13 courses or 39 credits)</td>
<td>MAT 198  Calculus I (for Life Sciences)</td>
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<td></td>
<td>MAT 199  Calculus II (for Life Sciences)</td>
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<td></td>
<td>PHY 193  Physics for Life Sciences I &amp; Lab PHL 193</td>
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<td></td>
<td>PHY 194  Physics for Life Sciences II &amp; Lab PHL 194</td>
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<tr>
<td></td>
<td>CHM 191  General Chemistry I &amp; Lab CHL 191</td>
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<td>CHM 192  General Chemistry II &amp; Lab CHL 192</td>
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<td>BIO 196  Intro to Mol &amp; Cell Bio I &amp; Lab BIL 196</td>
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<td>BIO 207  Intro to Evolution &amp; Ecology</td>
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<td>OR</td>
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<td>PHY 101  Statistical Methods</td>
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<td>ESG 262  Intro to GIS</td>
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<td>Additional required DNS courses: Any 5 courses (15 credits) from this list:</td>
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<tr>
<td>PHY 206  Waves and Optics &amp; Lab PHL 206</td>
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<tr>
<td>PHY 207  Thermal and Fluid Physics</td>
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<td>OR</td>
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<tr>
<td>PHY 101  Statistical Methods</td>
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### B.A. Sustainable Agriculture and Food Systems (SAFS)

#### Dual Specialization in Sustainable Agriculture and Food Systems (48 credits)

<table>
<thead>
<tr>
<th>Course Code</th>
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<tr>
<td>AGR100</td>
<td>Intro to Sustainable Agriculture and Food Systems</td>
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<tr>
<td>AGR130</td>
<td>Environmental Implications of Agriculture</td>
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<tr>
<td>AGR333</td>
<td>Climate Change, Agriculture &amp; Food Security</td>
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<tr>
<td>ESG100</td>
<td>Intro to Env Studies</td>
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<td>OR</td>
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<tr>
<td>ESG127</td>
<td>Intro to Phys Geo</td>
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<tr>
<td>ESG260</td>
<td>Research Methods</td>
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<td>OR</td>
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<tr>
<td>ESG261</td>
<td>Quant Methods</td>
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<td>OR</td>
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<tr>
<td>PHY101</td>
<td>Stats</td>
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</tbody>
</table>

1 additional course from either MINSAG or MINSFS lists below

**Required Options**

#### Sustainable Agriculture Minor

Complete any 5 courses from this list:

- AGR171  Permaculture Design I
- AGR172  Permaculture Design II
- AGR201  Market Gardening
- AGR204  Urban and Community Agriculture
- AGR220  Soil Science
- AGR230  Ecological Agriculture
- AGR305  Agricultural Entrepreneurship
- AGR311  Agricultural Pests and Integrated Pest Management
- BIO111  Organic Gardening
- OR
- BIO211  Sustainable Organic Agriculture

**Required Options**

#### Sustainable Food Systems Minor

Complete any 5 courses from this list:

- AGR104  Edible History of Humanity
- AGR171  Permaculture Design I
- AGR172  Permaculture Design II
- AGR202  Culture and Food
- AGR203  Healthy Nutrition
- AGR210  Food Science
- AGR303  Food Preparation and Preservation
- AGR304  Agritourism
- AGR341  Sustainable Food Systems
- AGR343  Agroecology
- AGR344  Indigenous Food Systems

*Each of the minors (MINSAG or MINSFS) can be taken individually.

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

**DBLSAF**

- AGR100  Intro to Sustainable Agriculture and Food Systems
- AGR130  Environmental Implications of Agriculture
- AGR333  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)

**CONSAF**

- AGR100  Intro to Sustainable Agriculture and Food Systems
- AGR130  Environmental Implications of Agriculture
- AGR333  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 geopolitical 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 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.  
Prerequisite: ESG 100

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.  
Prerequisite: 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: any two of ESG 100, ESG 126, ESG 127 or AGR 100

ESG 261  Quantitative Methods  3-3-0
Quantitative methods in environment and geography; the nature of explanation; problems of observation and data collection; descriptive statistical analysis; inferential statistical analysis.  
Prerequisite: any two of ESG 100, ESG 126, ESG 127 or AGR 100

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.  
Prerequisite: 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.  
Prerequisite: 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. This course involves multiple field trips.  
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 100 or ESG 126

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  3-3-0t
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 288  Underwater Environmental Assessment  3-3-0
This course examines human impact on the underwater environment, including limnology, and the monitoring and restoration of ecosystems affected by invasive species. The course also introduces students to the different tasks performed by a scientific diver: from the collection of samples, environmental monitoring and aquatic inventory, to the restoration operations. Specific scientific diving training including PADI Open Water certification, can lead to Diver-in-Training certification from the Canadian Association for Underwater Sciences (CAUS). Additional course fees will be charged to students for the diving instruction expenses.  
Prerequisites: ESG 100

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 267; open only to U3 ESG Honours and Majors in Environmental Studies
ESG 339  The Canadian Arctic  3-3-0
The ecology of traditional Inuit occupation; socio-economic change through contact with explorers, whalers, traders, missionaries, and administrators. Demographic centralization; industrial development; nunamiat and kabloonamiat; 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: nunamiat and kabloonamiat; 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 majors and honors 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 majors and honors 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, the implications of natural resource development and land use on water quality and quantity, climate change impacts, water and food security, dams and diversions, as well as the role of stakeholder collaboration in watershed-scale assessment, planning and decision-making.
Prerequisite: ESG 100 or 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 100 or 126

ESG 353  Landscape  3-3-0
This course explores landscapes as products of interacting physical and human processes, and examines how these 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 100 or 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 100 or ESG 126

ESG 361  Glaciers and Climate Change  3-3-0
The study of glaciers as monitors and indicators of climate change. Particular emphasis will be placed on the effects of present and past glaciations on climate and the key roles played by glaciers on climate change. Topics will include glacial influence on sea level rise, water resources and landscape creation, among others. Arctic and alpine environments provide many excellent examples of how glaciers influence climate change.
Prerequisite: ESG 250 or ESG 267

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 majors and honors 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’ westers. An introduction to weather forecasting and weather on the internet.
Prerequisite: ESG 263

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.

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
AGR 171 Permaculture Design I: Design Principles

The continuation of AGR 171. Permaculture is an integrated design system for human food production, water and energy use, modeled on nature. AGR 171 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 171 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 lab and field work, 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 permaculturist. An extra fee is required for the certificate.

Pre-requisite: AGR 171

AGR 172 Permaculture Design II: Design Project

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 lab and field work, 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 permaculturist. An extra fee is required for the certificate.

Pre-requisite: AGR 171
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 — only offered once that SAFS majors are approved.

AGR 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  
Note: AGL 220 is only offered once the SAFS majors are approved. Until then, AGR 220 has no lab associated with it.

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. This course has various concepts, 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 — only offered once the SAFS majors are approved.

AGR 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  
Note: AGL 230 is only offered once the SAFS majors are approved. Until then, AGR 230 has no lab associated with it.

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 or AGR 130

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 II 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 174 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, including temperature and water activity control, pasteurization, refrigeration and freezing, drying, fermentation, additives, irradiation, and others. Students will examine sustainability issues associated with food preparation and preservation practices. The course will contain theoretical, practical and experiential aspects, and feature invited guest speakers from the food handling community. As part of this course, students will have the opportunity to obtain their official “Food Handler Certification” from the Canadian Institute of Food Safety (at extra cost), which meets Canada’s and Quebec’s legal requirement for food safety training.

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.  
Pre-requisites: AGR 100
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 or AGR 130
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.