Environment, Agriculture and Geography

Faculty

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Program Overview

The Department of Environment, Agriculture and Geography offers both B.A. and B.Sc. majors and a wide variety of courses focusing on the intersection of humans and natural environment. In order for a complete understanding of 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 so 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 social, economic, environmental and agricultural 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, agriculture, 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, Agriculture 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. Honours in SAFS, 60 credits
B.A. Major in SAFS, 48 credits
Minor in sustainable Agriculture and Food Systems, 24 credits

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, subject to the Chair's approval.
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. Likewise, you can major in SAFS and minor in EST, ENV or GEO.
3. For B.A. programs, you must take a 3-credit course from the Division of Natural Sciences and Mathematics to fulfill your divisional requirement.

B.A. Environmental Studies

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 Major (48 credits) MAJEST

Core (7 courses or 21 credits)

ENG 116 **Effective Writing** *(or any University-level English literature 3-credit course)*
ESG 126 **Introduction to Human Geography**
ESG 127 **Living in the Environment**
ESG 260 **Research Methods**
A statistics course: *ESG 261, BMA 140, PMA 260, or PHY 101*
ESG 262 **Introduction to Geographic Information Systems**
ESG 300 **Advanced Environmental Seminar**

Additional required: Any 9 ESG-coded courses (27 credits)

Environmental Studies Minor (24 credits) MINEST

Core (2 courses or 6 credits)

ESG 126 **Introduction to Human Geography**
ESG 127 **Living in the Environment**

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

B.A. Geography

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 EAG department

Geography Major (45 credits) MAJGEO

Core (5 courses or 15 credits)

ESG 126 **Introduction to Human Geography**
ESG 127 **Living in the Environment**
ESG 260 **Research Methods**
A statistics course: *ESG 261, BMA 140, PMA 260, or PHY 101*
ESG 262 **Introduction to Geographic Systems**

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

Geography Minor (24 credits) MINGEO

Core (2 courses or 6 credits)

ESG 126 **Introduction to Human Geography**
ESG 127 **Living in the Environment**

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

Certificate in Environmental Studies and Geography (30 credits) CONESG

ESG 126 **Introduction to Human Geography**
ESG 127 **Living in the Environment**

Additional required: Any 8 ESG-coded courses (24 credits)

B.Sc. Environmental Science

Environmental Science Honours (81 credits) HONENV

Same as Environmental Science Major, plus

Core (2 courses or 6 credits)

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

Environmental Science Major (75 credits) MAJENV

Core (12 courses or 36 credits)

MAT 191 **Calculus I**
MAT 192 **Calculus II**
PHY 193 **Physics for Life Sciences I & Lab PHL 193**
PHY 194 **Physics for Life Sciences II & Lab PHL 194**
CHM 191 **General Chemistry I & Lab CHL 191**
CHM 192 **General Chemistry II & Lab CHL 192**
BIO 196 **Introduction to Cellular and Molecular Biology & Lab BIL 196**
BIO 207 **Introduction to Evolution and Ecology**
ESG 127 **Living in the Environment**
ESG 260 **Research Methods**
ESG 262 **Introduction to Geographic Information Systems**
A statistics course: *ESG 261, BMA 140, PMA 260, or PHY 101*

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

ECO 237 **Economics of the Environment**
ECO 337 **Ecological Economics**
MAT 103 **Environmental Modeling**
PHY 206 **Waves and Optics & Lab PHL 206**
PHY 207 **Thermal and Fluid Physics**
CHM 111 **Organic Chemistry I: Introductory & Lab CHL 111**
CHM 141 141 **Analytical Chemistry & Lab CHL**
BIO 211 **Sustainable Organic Agriculture & Lab BIL 211**
BIO 205 **Animal Diversity & Lab BIL 205**
BIO 206 **Plant Diversity**
BIO 327 **Advanced Ecology**
BIO 331 331 **Freshwater Biology & Lab BIL**

Additional required ESG/AGR courses: Any 8 courses (24 credits) from this list:

AGR 130 **Environmental Implications of Agriculture**
AGR 171 **Permaculture Design I**
AGR 172 **Permaculture Design II**
AGR 210 **Food Scienc**
AGR 220 **Soil Science**
AGR 231 **Organic Fruit Production**
AGR 232 **Organic Vegetable Production**
AGR 240 **Water Conservation in Agriculture**
AGR 311 **Agricultural Pests and Integrated Pest Management**
ESG 226 **Physical Oceanography**
ESG 227 **Biogeochemical & Environmental Oceanography**
ESG 250 **Geomorphology**
ESG 251 **Biogeography**
ESG 263 **Introduction to Remote Sensing**
ESG 265 **The Atmosphere & Weather**
ESG 267 **Global Environmental Change: a physical perspective**
ESG 269 **The Earth's Crust**
ESG 349 **Water Resource Management**
ESG 354 **Environmental Impact Assessment**
ESG 361 **Glaciers and Climate Change**
ESG 362 **Advanced Geographic Information Systems**
ESG 363 **Natural Hazards**
ESG 364 **Field Course in Environment and Geography**
ESG 365 **Mid-Latitude Weather Systems**
ESG 367 **Climate Change**

Environmental Science Minor (24 credits) MINENV

Core (2 courses or 6 credits)

ESG 127 Living in the Environment

A statistics course: *ESG 261, BMA 140, PMA 260, or PHY 101*

Additional required DNS and other courses:

Any 3 courses (9 credits) from the list of additional required DNS and other courses for the Environmental Science Major

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

B.A. Sustainable Agriculture and Food Systems (SAFS)

Honours in SAFS (60 credits) HONSAF

Same as B.A. Major in SAFS (48 credits), plus:

Any 6 AGR credits

AGR 461 Honours Proposal in SAFS

AGR 462 Honours Thesis in SAFS

Major in SAFS (48 credits) MAJSAF

Core (10 courses or 30 credits)

AGR 100 Introduction to Sustainable Agriculture and Food Systems

AGR 130 Environmental Implications of Agriculture

AGR 171 Permaculture Design I

AGR 172 Permaculture Design II

A statistics course: *ESG 261, BMA 140, PMA 260, or PHY 101*

AGR 174 Sustainable Agriculture Practicum I

AGR 274 Sustainable Agriculture Practicum II (9 credits)

AGR 333 Climate Change, Agriculture and Food Security

Additional required courses - Choose 3 courses (9 credits) from each category:

Sustainable Agriculture courses:

BIO 111 Organic Gardening

AGR 201 Market Gardening

AGR 204 Urban Agriculture

AGR 220 Soil Science

AGR 231 Organic Fruit Production

AGR 232 Organic Vegetable Production

AGR 240 Water Conservation in Agriculture

AGR 300 Agri-Food Business Management

AGR 311 Agricultural Pests and Integrated Pest Management

AGR 312 Sustainable Agroforestry

Sustainable Food Systems courses:

ESG 248 Geography of Food

AGR 104 An Edible History of Humanity

AGR 200 Methods for Studying Sustainable Foodscapes

AGR 202 Culture and Food

AGR 203 Healthy Nutrition

AGR 205 Sustainable Food Value Chains

AGR 206 Economics of the Agri-Food System

AGR 208 Agri-Food Entrepreneurship

AGR 210 Food Science

AGR 211 Lighthouse Farms for a Sustainable Future

AGR 300 Agri-Food Business Management

AGR 303 Food Preparation and Preservation

AGR 304 Agritourism

AGR 341 Sustainable Food Systems

AGR 343 Agroecology

AGR 344 Indigenous Food Systems

Minor in SAFS (24 credits) MINSAF

AGR 100 Intro to Sustainable Agriculture and Food Systems

AGR 130 Environmental Implications of Agriculture

AGR 333 Climate Change, Agriculture and Food Security

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

Certificate in SAFS (30 credits) CONSAF

AGR 100 Intro to Sustainable Agriculture and Food Systems

AGR 130 Environmental Implications of Agriculture

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 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 Living in the Environment 3-3-0
An introduction to physical geography with an emphasis on human existence within Earth's systems, including 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 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 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 126 or ESG 127

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 126 or ESG 127

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 126 or ESG 127

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 Biogeography 3-3-0
Biogeography is the study of the distribution of species and ecosystems in geographical space and through geological time. Have you even wondered why the tropics are more diverse than the poles? Why certain plant and animal groups are located where they are? How both ecosystems, and individual species, respond to climate change? And what part humans play in all these questions? This course will explore these and other topics, and assess to what extent this information can be useful for ongoing conservation practices.
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.
Prerequisites: any two of 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.
Prerequisites: any two of 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 or permission of the instructor

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 or permission of the instructor

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 126 or ESG 127

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 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 127

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 (300$) will be charged for the diving expenses.
Prerequisite: Permission of the instructor
Outside academic Co-requisites: It is required that students also obtain First-Aid training with CPR and oxygen administration. This certification will be offered separately.

ESG 300 Advanced Environmental Seminar 3-3-0
As an advanced seminar course, this course allows detailed study of particular areas of environmental research through faculty presentations, student-led seminars and general class discussion.
Prerequisite: Open only to U3 and U4 Honours and Majors students in Environmental Studies, Environmental Science or Geography programs

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 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 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 Water Resource 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 126, ESG 127 or ESG 249-
Credits will only be given for one of ESG 349 or AGR 240

ESG 350 Environmental Justice 3-3-0
An introduction to the field of environmental justice, with an emphasis on fairness and equity in struggles related to ecological resources, hazardous wastes, and climate change. The course will examine the history of activism and the development of theoretical work and empirical evidence regarding the connections between the environment and forms of oppression based on factors such as race and class.
Prerequisite: ESG 126

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 126, ESG 127 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 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 127, 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 or permission of the instructor

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 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 forecasting 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 127

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. A minimum cumulative grade average of 70% is required to be admitted into ESG461.

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. A minimum of 75% in AGR 461 is required to be admitted into AGR 462.

AGR courses:

AGR-coded courses are associated with the Sustainable Agriculture and Food Systems (SAFS) programs.

AGR 100 Introduction to Sustainable Agriculture and Food Systems 3-3-0

Conventional, industrial agriculture and fisheries are the source of most 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 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 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 is applicable to a wide range 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 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 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 permaculturalist. An extra fee is required for the certificate.
Prerequisite: A grade of 75% in 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.
Prerequisite: AGR 130 and Permission of the Department

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.
Prerequisites: AGR 130 and Permission of the Department

AGR 200 Methods for Studying Sustainable Foodscape 3-3-0

Foodscapes are diverse and unique social-ecological systems that reflect local biophysical, cultural and socioeconomic conditions. This is the scale and interdisciplinary level at which sustainability can be effectively assessed and managed. This course will introduce students to a diversity of methods and approaches to study foodscapes, rooted in both the natural and the social sciences.
Prerequisite: AGR 100

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.

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.

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.

AGR 204 Urban Agriculture 3–3–0

This course examines various urban gardens (e.g. community gardens, war-time victory gardens, school, senior's residence, hospital, rooftop and other urban gardens) and addresses opportunities and impediments to starting and maintaining such a garden, as well as the social and environmental benefits to community gardening. Emphasis is placed on acquiring and communicating knowledge about the natural science processes that take place in a garden (e.g. nitrogen fixation, carbon dioxide sequestration, soil biodiversity and health), and the interactions that individuals and community groups have with the garden environment (e.g. environmental literacy, nutritional knowledge, life skills, problem solving). Field experience will take place at Bishop's Campus Educational Farm, as well as at local community gardens.

AGR 205 Sustainable Food Value Chains 3–3–0

This course aims to equip students with the concepts, principles, and tools they need to leverage value chain approaches that improve human nutrition through agriculture and food systems. The course will cover key concepts related to food value chains and their sustainability; the different stages of food value chains and how these are created; the process of developing an added value from production to processing to distribution. This course introduces issues influencing the sustainability of food values. It provides the tools and methods to analyze the sustainability of value-adding activities from 'farm to fork".

AGR 206 Economics of the Agri-Food System 3-3-0

This course introduces students to the major aspects of economics, business and resource use in the Canadian agri-food sector. Topics include agricultural supply and demand, markets, prices, agribusiness financing, farm risk management, government policies, international trade in agricultural products, and the circular economy.
This course is cross-listed with ECO 206.
Credit will only be given for one of AGR 206 or ECO 206

AGR 208 Agricultural Entrepreneurship 3–3–0
Agri-Food 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 canvass, 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.
Prerequisite: AGR 206

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.
Prerequisites: BIO 194 or BIO 196 and CHM 191 and CHM 192

AGR 211 Lighthouse Farms for a Sustainable Future 3–3–0
While climate and global environmental change models project a grim future, there are lighthouse farms that shed light on more sustainable and hopeful futures. This course will investigate the transformation of food and farming systems towards sustainability by studying "lighthouse farms"—extraordinary food and farming systems. Students will explore concepts and theories to study food systems transformation, while also gaining knowledge of the sustainability challenges that food and farming systems face.
Prerequisite: AGR 100

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.
Prerequisites: BIO 194 or BIO 196 and AGR 130

AGR 231 Organic Fruit Production 3-3-0
This is an interdisciplinary course that covers the principles and practices of fruit cultivation in temperate regions. It will start with providing important notions in horticultural sciences related to the botany, physiology, growth, and development of perennial plants. It will then survey the main characteristics of important fruit crops cultivated in temperate regions; and move to cover sustainable practices in fruit production from propagation to postharvest handling.
Prerequisite: AGR 130

AGR 232 Organic Vegetable Production 3-3-0
This is an interdisciplinary course that covers the principles and practices of olericulture. The course will familiarize the student with crops grown as vegetables, their characteristics, and organic management practices for their production. The course focuses on practices that minimize the use of off-farm inputs and maximize the stewardship of resources while also considering the profitability and sustainability of the vegetable production system.
Prerequisite: AGR 130

AGR 240 Water Conservation in Agriculture 3-3-0
The agricultural sector is the largest consumer of freshwater worldwide and there is an urgent need for improved agricultural water management. This course examines applied, environmental, and socio-economic aspects of water use and management in agriculture. It explores comprehensive perspectives of agriculture-related water resource management issues, including water resource scarcity and other climate change impacts. Topics include water demand for crop production, irrigation management and water-saving technologies, environmental implications, drought resilience, soil water retention strategies, water recycling opportunities, irrigation ponds, agroecological water perspectives and global water issues.
Prerequisite: AGR 130
Antirequisite: ESG349

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.
Prerequisites: 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.
Prerequisite: 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.
Prerequisites: AGR 174 and Permission of the Department

AGR 300 Agri-Food Business Management 3-1-2
This experiential learning course will build on existing courses to walk you through the tasks of agri-food (farm and/or food transformation) operations and business planning and management. It will give you the opportunity to strategically develop your own sustainable agri-food business, build crop enterprise budgets and comprehensive business plan. It also offers the opportunity to profile different existing agri-food businesses and learn about the tips and challenges of business management. At the end of the course, you will have produced your own agri-food business plan and developed your strategies in the key areas of business planning and management.
Prerequisite: AGR 208

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.

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.
Prerequisite: AGR 130

AGR 312 Sustainable Agroforestry 3–3–0
This course exposes students to agroforestry as a farming system in which trees and shrubs are grown in association with agricultural crops, pastures and livestock, and in which there are both economic and ecological benefits between trees and other components. Emphasis will be on sustainability issues, and how agroforestry can contribute to climate resilient farming. Topics examined include nut trees, windbreaks and shelterbelts, riparian buffers, vegetated swales, understory crops, silvopasturing, acericulture, and wild and cultivated non-timber forest products (such as mushrooms and others). Field trips to the Educational Farm and campus forests.
Prerequisite: AGR 130

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.
Prerequisites: AGR 100 and AGR 130

AGR 341 Sustainable Food Systems 3–3–0
The agriculture and food sectors are subjects of growing interest in terms of their social and ecological impacts, and overall sustainability. This course builds on concepts encountered in AGR 100 and other program courses. It examines methods of analysis used to study food systems, and gives students opportunities to conduct relevant case studies. Students will learn how the analysis of food systems at various scales can help to reduce environmental impact, including through practical applications such as modelling, policy development, and dietary guidelines.
Prerequisite: AGR 100

AGR 343 Agroecology 3–3–0
This course will expose students to the growing field of agroecology, an integrated approach that applies both ecological and social principles to the design and management of food and agricultural systems. Agroecology is a transdisciplinary, participatory and action-oriented process that seeks to optimize the interactions between plants, animals, humans and the environment. This course examines how agroecology can be utilized to transform agriculture and food systems and how to employ agroecological solutions in response to a variety of environmental or social obstacles (e.g., diversified systems, the co-creation of knowledge, promoting gender equality, etc.).
Prerequisites: AGR 100

AGR 344 Indigenous Food Systems 3–3–0
This course examines the food systems of Indigenous peoples. Students will be exposed to 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. Furthermore, this course examines how these relationships have transformed over time and current threats to Indigenous food culture.
Prerequisites: AGR 100 orAGR 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.
Prerequisites: 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.
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 analyzed, 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.
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.