

# BACHELOR OF ONE HEALTH (B.O.H.)

College of Biological Science, College of Social and Applied Human Sciences, Ontario Veterinary College and Ontario Agricultural College. Department of Integrative Biology, Department of Sociology and Anthropology, Department of Geography and Environmental Geomatics, Department of Pathobiology, Department of Population Medicine, School of Environmental Sciences.

The University of Guelph offers a Bachelor of One Health is an honours degree requiring the completion of at least 20.00 credits (usually 20.00 credits).

The College of Biological Science (CBS), in collaboration with the College of Social and Applied Human Sciences (CSAHS), the Ontario Agricultural College (OAC), and the Ontario Veterinary College (OVC), proposes a new undergraduate degree in One Health (OH). This four-year Honours program will prepare our future leaders for the complex challenges at the confluence of human, animal and environmental health, including critical analysis of complex systems, problem solving across disciplinary boundaries, mobilizing knowledge, and informing policy.

## Program Counselling

The Bachelor of One Health Program Counsellor is available to assist in-course students who require information or advice about their program or other academic regulations and who seek information about resources available to students. For information about how to contact a program counsellor, and for more information about program counselling, see Chapter VII – Academic Counselling of the current Undergraduate Calendar.

## Departmental Advisors

On entering the program all students are assigned to a faculty advisor who will mentor them throughout their studies. The faculty advisor is familiar with the academic requirements of the program and is aware of career opportunities. Students are strongly encouraged to attend all meetings called by their advisor, and to set up individual meetings with them when they have questions or concerns about their performance or progress in the program.

## Program Requirements

### 1000 Level Credits

If more than 7.00 credits at the 1000 level are completed, students are required to complete additional credits beyond the minimum total required for the degree.

### 3000 and 4000 Level Credits

There is a requirement for a minimum of 6.00 credits at the 3000- and 4000-levels with a minimum of 2.00 credits at the 4000 level.

### Double-Counting of Credits

A maximum of 2.50 credits required in the core or areas of emphasis may be applied to meet the requirements of a minor or an additional major.

## Core Courses

The core courses in the One Health degree are those courses listed in semesters 1 through 8 in the schedule of studies and includes requirements that may have multiple options to fulfill the requirement.

## Area of Emphasis Prerequisites

Restricted electives in semesters one through four should be chosen based on students' interest in the identified area of emphasis. A minimum of one of the following groupings is required for the degree and will ensure that students have the proper pre-requisites for the affiliated areas of emphasis.

Students interested in Disease, Complexity and Health or Environment, Food and Health should select the following courses:

Code	Title	Credits
CHEM*1040	General Chemistry I	0.50
CHEM*1050	General Chemistry II	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
BIOC*2580	Introduction to Biochemistry	0.50

Students interested in Policy, Economics and Health or Culture, Society and Health should select the following courses:

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
PSYC*1000	Introduction to Psychology	0.50
POLS*2100 or POLS*2230	Comparative Politics Public Policy	0.50
ANTH*2230 or PSYC*2310	Regional Ethnography Social Psychology	0.50

## Area of Emphasis

An area of emphasis (AoE) must be declared and completed in order to graduate with the Bachelor of One Health degree.

If a course is completed to fulfill a core requirement of the degree it cannot be double counted to fulfill an area of emphasis requirement. An additional course from the list of options must be completed.

## Free Electives

Free Electives allow students to select courses that support or complement the One Health degree. Students may select undergraduate courses from any department, provided any individual course restrictions and prerequisites are satisfied. These courses can be at any year level however please see the 1000 level credit requirement above. Students may select courses from area of emphasis list to full fill the free elective requirements however these courses will need to be above and beyond the requirements of their declared area of emphasis to meet the free elective requirement.

## Continuation of Study

Students are advised to consult the regulations for continuation of study outlined in detail in Chapter VIII–Undergraduate Degree & Regulations.

## Conditions for Graduation

To qualify for the degree Bachelor of One Health, students must successfully complete a minimum of 20.00 credits non-co-op program as identified below. Students must declare and complete an area of emphasis. In addition, students must meet the continuation of study requirements at the time of graduation and have a 60.00% cumulative average.

### Co-op

To qualify for the degree Bachelor of One Health Co-op BOH:C, students must successfully complete a minimum of 21.50 credits as identified on the co-op tab of this page. Students must complete at least one sub-core group of courses, declare and complete an area of emphasis. Co-op students must successfully complete COOP\*1100 Introduction to Co-operative Education and COOP\*1000 Co-op Work Term I, COOP\*2000 Co-op Work Term II, and COOP\*3000 Co-op Work Term III, to graduate with the co-op designation. In addition, students must meet the continuation of study requirements at the time of graduation and have a 60.00% cumulative average.

## Learning Outcomes

### Problem Solving and Critical Thinking

- Critically evaluate ideas and arguments by gathering and integrating relevant information, assessing its credibility, recognizing context and assumptions, and synthesizing evidence (information) to formulate a position or draw conclusions.
- Identify and articulate problems and independently research, propose, evaluate and plan solutions that consider the interconnections between human, animal and environmental health, and their sociocultural and scientific determinants.

### Communication

- Accurately and effectively communicate complex issues, ideas, arguments and analyses to a range of audiences, using graphic, oral and written forms and a variety of media.
- Establish and facilitate interactions among partners and stakeholders associated with One Health challenges.

### Professional and Ethical Behaviour

- Demonstrate integrity by respectfully considering diverse points of view, intellectual contributions of others, and different knowledge systems, and by demonstrating a commitment to honesty, ethical standards, confidentiality, equity, diversity and inclusion.
- Demonstrate mastery of key professional behaviours including adaptability, active listening, ethical reasoning, and leadership, when working individually or with others.

### Methodologies and Techniques

- Apply quantitative and qualitative analytical methods to interpret data and critically evaluate evidence to make informed conclusions and decisions.
- Effectively devise and implement a project management plan by setting goals, managing tasks and information, and meeting timelines.
- Apply a systems-based approach to complex health challenges including: identifying key factors and determining their interactions (balancing, synergistic, antagonistic) with each other and contributions to health; identifying key areas of vulnerability and

limiting factors; and developing strategies to manage or mitigate them.

- Apply contemporary methods such as risk assessment, population modelling, and decision-making tools to evaluate competing priorities, identify potential risks, and identify management strategies in One Health.

## Breadth and Depth of Understanding

- Develop a holistic philosophy of health that includes human, animal, and environmental systems, and identifies the role of socio-cultural, economic, political and scientific determinants on sustainable and resilient health systems.
- Describe the major abiotic, biotic and social components of the environment, either managed or unmanaged, and evaluate evidence for major risks and current trends in environmental change facilitated by human activity.
- Critically evaluate and apply an understanding of the sources of sociocultural and biological (physiological and evolutionary) diversity and its potential impacts on health to multiple societal challenges.
- Describe the function and regulation of organismal health (animals, plants, humans) from the perspective of individuals and population.
- Describe relationships between environment change and ecosystem, human and animal health, and their importance to complex societal challenges such as climate change, food security, social change and policy development, conservation, and infectious diseases, at local and global scales.

## Co-op Learning Outcomes

- Develop and apply key employability skills such as problem solving, critical thinking, information management, quantitative analysis, communication, and personal and time management in the workplace environment.
- Develop and apply discipline related techniques and methodologies, learned in the classroom, within a workplace. For example, system-based thinking would be one such method.
- Develop and apply discipline related concepts and knowledge in a workplace environment.
- Reflect on the development of personal and professional skills, knowledge and attitudes, and compare the development of these skills within the classroom and workplace.
- Reflect on personal and professional growth in a workplace and how this development informs curricular, co-curricular and career planning.

## Areas of Emphasis Learning Outcomes

### Disease, Complexity and Health

- Identify and describe infectious or non-infectious diseases that affect health in animals, plants and humans.
- Describe the cause, mode of action, and host response to select diseases affecting multiple hosts.
- Apply knowledge of disease and health to address complex societal challenges such as sustainability in public health, food systems, or wildlife and ecosystem health.

### Environment, Food and Health

- Describe the major abiotic and biotic components of ecosystems on the landscape, from those that are intensively managed (i.e. agricultural, forests) to those that are unmanaged (natural).

- Evaluate and communicate the direct and indirect impacts of environmental change (human induced or otherwise) on the function of managed and unmanaged ecosystems (e.g. diversity, abundance, productivity, pollination, water quality, air quality, nutrient cycling).
- Apply systems approaches and knowledge of ecosystem dynamics and health to develop and evaluate management strategies for promoting sustainable food systems and conserving native ecosystems/species.

## Policy, Economics and Health

- Conduct a comparative analysis of a policy framework related to health.
- Identify relevant political, economic, scientific and social factors influencing the development of health-related policy and evaluate current applications of policy and economic decisions affecting health in the workplace, public health, food and environmental sectors.
- Apply impact assessments, cost-benefit, and other decision-making tools that govern economic and policy decision-making and policy development related to health.

## Culture, Society and Health

- Describe the patterns of cultural diversity and inequality at local and global scales as it relates to human health.
- Describe the diversity of human perceptions of health and the relations between humans, environment and animals.
- Critically evaluate the social-cultural influences on health in the context of food security, disease, and ecosystem function and sustainability.

## Requirements

The One Health degree offers student the opportunity to explore animal, environmental and human health from both the scientific and socio-cultural perspective. One Health is an approach to research and problem-solving that brings together different knowledge systems and perspectives in order to find solutions that ensure people, animals and our environment stay healthy.

Students in the One Health degree are required to complete a One Health core, comprising required courses and restricted electives. Students will also be required to declare one of four areas of emphasis (AoE) by the end of the first year of their program. As part of the OH core, students will complete a set of preparation courses, in year 1 and 2, for their preferred Area of Emphasis. These courses are listed as part of the restricted electives in semesters 1 – 4. Students are advised to review the area of emphasis required courses to ensure that they choose the appropriate restricted electives to meet all pre-requisite requirements for the area of emphasis and professional programs following this degree.

Please note that not all courses are offered in all semesters. Some of the restricted elective courses are listed below in the semester that they are offered. It is suggested that students complete these courses in the suggested semester. Please note though that priority access restrictions could apply in certain semester.

The One Health degree offers four areas of emphasis. Students must declare and complete all requirements for one of the areas of emphasis to graduate with the degree. The areas of emphasis include:

1. Disease, Complexity and Health (DCH) (p. 4)
2. Environment, Food and Health (EFH) (p. 5)

3. Policy, Economics and Health (PEH) (p. 5)
4. Culture, Society and Health (CSH) (p. 6)

Code	Title	Credits
<b>Semester 1</b>		
ANTH*1120	Biological Anthropology	0.50
BIOL*1080	Biological Concepts of Health	0.50
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
GEOG*1220	Explaining Environmental Change	0.50
For DCH and EFH:		
CHEM*1040	General Chemistry I	0.50
For PEH and CSH:		
ECON*1050 or PSYC*1000	Introductory Microeconomics Introduction to Psychology	0.50
<b>Semester 2</b>		
ANTH*1150	Introduction to Anthropology	0.50
BIOL*1070	Discovering Biodiversity	0.50
ONEH*1000	Introduction to One Health	0.50
Select 0.50 from the following:		
MATH*1080	Elements of Calculus I <sup>1</sup>	0.50
0.50 electives		0.50
For DCH and EFH:		
CHEM*1050	General Chemistry II	0.50
For PEH and CSH:		
ECON*1050 or PSYC*1000	Introductory Microeconomics Introduction to Psychology	0.50
<b>Semester 3</b>		
BIOL*2400	Evolution	0.50
ONEH*2000	Case Studies in One Health	0.50
SOC*2280	Society, Knowledge Systems and Environment	0.50
0.50 elective or AoE restricted elective		0.50
For DCH and EFH:		
0.50 AoE elective		0.50
For PEH and CSH:		
ANTH*2230 or PSYC*2310	Regional Ethnography Social Psychology	0.50
<b>Semester 4</b>		
BIOL*2060	Ecology	0.50
Select 0.50 credits from the following:		
SOAN*2120	Introductory Methods	0.50
STAT*2040	Statistics I	0.50
STAT*2230	Biostatistics for Integrative Biology	0.50
For DCH and EFH:		
BIOC*2580	Introduction to Biochemistry	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
0.50 elective or AoE restricted elective		0.50
For PEH and CSH:		
POLS*2100 or POLS*2230	Comparative Politics Public Policy	0.50
1.00 electives or AoE restricted electives		1.00

**Semester 5**

POPM*3240	Epidemiology	0.50
ONEH*3000	Topics in One Health	0.50
GEOG*3020	Global Environmental Change	0.50
or ENVS*3010	Climate Change Biology	
0.50 electives or AoE restricted electives <sup>2</sup>		0.50
One of:		
BIOM*2000	Concepts in Human Physiology <sup>4</sup>	0.50
BIOM*3200	Biomedical Physiology	1.00
BOT*2100	Life Strategies of Plants	0.50
HK*2810	Human Physiology I - Concepts and Principles <sup>3</sup>	0.50
ZOO*3600	Comparative Animal Physiology I	0.50

**Semester 6**

SOAN*3070	Qualitative and Observational Methods	0.50
BIOL*3060	Populations, Communities and Ecosystems	0.50
or SOAN*3380	Contemporary Issues in Culture, Society, Nature	
1.50 electives or AoE electives		1.50

**Semester 7**

ONEH*4000	Applications of One Health <sup>5</sup>	1.00
Up to 2.50 electives or AoE restricted electives		

**Semester 8**

ONEH*4000	Applications of One Health <sup>5</sup>	1.00
Up to 2.50 electives or AoE restricted electives		

<sup>1</sup> For those interested in ECON\*3300 Economics of Health and the Workplace or completing STAT\*2040 Statistics I, MATH\*1080 Elements of Calculus I is also recommended in the first year.

<sup>2</sup> Students who enroll in BIOM\*3200 Biomedical Physiology will not require an elective.

<sup>3</sup> HK\*2810 is only offered in the winter semester.

<sup>4</sup> Restricted to students in the PEH or CSH, areas of emphasis. Students pursuing the DCH or EFH areas of emphasis cannot complete BIOM\*2000, Concepts in Human Physiology. BIOM\*2000 will not be an acceptable pre-requisite for courses within the DCH, or EFH area of emphasis.

<sup>5</sup> Students can only complete ONEH\*4000, Applications in One Health in one semester.

**Area of Emphasis Requirements**

The associated areas of emphasis (AoE) will support mastery of key societal challenges that would benefit from a OH skill set. Students are required to declare an area of emphasis by the end of first year to ensure that all course requirements can be met. Students must complete an area of emphasis in order to graduate with the degree. The requirements for each area of emphasis contains a combination of required and restricted elective courses organized to ensure students develop strength in areas of context and application.

If a course is completed to fulfill a core requirement of the degree it cannot be double counted to fulfill an area of emphasis requirement. An additional course from the list of options must be completed.

The areas of emphasis include:

1. Disease, Complexity and Health (DCH) (p. 4)
2. Environment, Food and Health (EFH) (p. 5)

3. Policy, Economics and Health (PEH) (p. 5)

4. Culture, Society and Health (CSH) (p. 6)

Requirements of each area of emphasis are listed below.

Student interested in Disease, Complexity and Health or Environment, Food and Health will need to select the following courses in semesters within the first two years of the program:

Code	Title	Credits
CHEM*1040	General Chemistry I	0.50
CHEM*1050	General Chemistry II	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
BIOC*2580	Introduction to Biochemistry	0.50

Students interested in Policy, Economics and Health or Culture, Society and Health will need to select the following courses within the first two years of the program:

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
PSYC*1000	Introduction to Psychology	0.50
POLS*2100	Comparative Politics	0.50
or POLS*2230	Public Policy	
ANTH*2230	Regional Ethnography	0.50
or PSYC*2310	Social Psychology	

**Disease, Complexity and Health - 3.00 credits**

This area of emphasis allows students to examine the role of interactions between the environment, animals and humans on disease prevalence and dynamics, host response to disease, and strategies for achieving positive and sustainable health outcomes.

Course Requirements:

Code	Title	Credits
Required:		
MICR*2420	Introduction to Microbiology	0.50
Select 1.00 credits from the following:		
FOOD*2420	Introduction to Food Microbiology	0.50
ENVS*3210	Plant Pathology	0.50
MICR*3230	Immunology	0.50
PATH*3610	Principles of Disease	0.50
PSYC*2020	Clinical Psychology and Mental Health	0.50
Select 0.50 credits from the following:		
FRHD*2060	Adult Development and Aging	0.50
POPM*4040	Epidemiology of Food-borne Diseases	0.50
POPM*4230	Animal Health	0.50
Select 1.00 credits from the following:		
BIOM*4050	Biomedical Aspects of Aging	0.50
ENVS*3230	Agroforestry Systems	0.50
ENVS*3290	Waterborne Disease Ecology	0.50
MICR*3330	World of Viruses	0.50
MICR*4430	Medical Virology	0.50
MICR*4250	Microbiome and Immunity	0.50

PATH*3040	Principles of Parasitology	0.50
PATH*4100	Diseases of Aquatic Animals	0.50

### Environment, Food and Health - 3.00 credits

This area of emphasis allows students to examine factors affecting the function of managed and unmanaged (natural) ecosystems, and explore how interactions between the environment, biodiversity and human activities can affect ecosystem services, specifically related to food security and climate change and conservation.

Course Requirements:

Code	Title	Credits
Required:		
BIOL*3060	Populations, Communities and Ecosystems <sup>5</sup>	0.50
or SOAN*3380	Contemporary Issues in Culture, Society, Nature	

#### Managed and unmanaged environments

Select 0.50 credits from the following:

ENVS*2060	Soil Science	0.50
ENVS*2080	Introduction to Environmental Microbiology	0.50
ENVS*3010	Climate Change Biology <sup>5</sup>	0.50
ENVS*3020	Pesticides and the Environment	0.50
ENVS*3040	Natural Chemicals in the Environment	0.50
TOX*3360	Environmental Chemistry and Toxicology	0.50

#### Environment, biodiversity and ecosystem function

Select 0.50 credits from the following:

ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
GEOG*2210	Environment and Resources	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3310	Soil Biodiversity and Ecosystem Function	0.50
BIOL*4410	Field Ecology	0.75
BIOL*4610	Arctic Ecology	0.75
BIOL*4700	Field Biology	0.50
ENVS*4350	Forest Ecology	0.50
ZOO*4300	Marine Biology and Oceanography	0.75

#### Environment and food production systems

Select 0.50 credits from the following:

AGR*2470	Introduction to Plant Agriculture	0.50
BOT*3310	Plant Growth and Development	0.50
ENVS*2040	Plant Health and the Environment	0.50
ENVS*3230	Agroforestry Systems	0.50
FOOD*2420	Introduction to Food Microbiology	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
MICR*2420	Introduction to Microbiology	0.50

#### Management strategies for ecosystem health

Select 1.00 credits from the following:

AGR*4600	Agriculture and Food Issues Problem Solving	1.00
BIOL*3130	Conservation Biology	0.50
BIOL*3670	Introduction to Wildlife Rehabilitation	0.50

BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4410	Field Ecology	0.75
BIOL*4500	Natural Resource Policy Analysis	0.50
BIOL*4610	Arctic Ecology	0.75
BIOL*4700	Field Biology	0.50
BIOL*4800	Field Biology	0.50
BIOL*4900	Field Biology	0.50
GEOG*3110	Biogeography	0.50
ZOO*4070	Animal Behaviour	0.50
ZOO*4300	Marine Biology and Oceanography	0.75

<sup>5</sup> If the course is taken to complete the core requirement of the program it cannot also be used to meet the Area of Emphasis requirement.

### Policy, Economics and Health - 3.00 credits

This area of emphasis allows students to develop their knowledge in policy development and analysis, including the political and economic underpinnings, and the role of policy development in areas at the intersection of environment, human and animal health.

Course Requirements:

Code	Title	Credits
Required:		
POLS*3670	Comparative Public Policy	0.50

#### Economic behaviour and implications at the individual, environmental or global scale

Select 0.50 credits from the following:

ECON*2100	Economic Growth and Environmental Quality	0.50
ECON*2310	Intermediate Microeconomics	0.50
ECON*2650	Introductory Development Economics	0.50

#### Political context of social and global issues

Select 0.50 credits from the following:

FARE*1300	Poverty, Food and Hunger	0.50
IDEV*2200	Policy, Economy and Society	0.50
PHIL*2280	Key Concepts in Political Philosophy	0.50
POLS*2150	Gender and Politics	0.50
POLS*2200	International Relations	0.50
POLS*2300	Canadian Government and Politics	0.50

#### Decision analysis

Select 0.50 credits from the following:

FARE*3170	Cost-Benefit Analysis	0.50
MGMT*3140	Business Analytics	0.50

#### Application of economic and policy decisions

Select 0.50 credits from the following:

GEOG*2210	Environment and Resources	0.50
ECON*3300	Economics of Health and the Workplace	0.50
FARE*3000	International Food Sector and Policy Analysis	0.50
NUTR*3110	Food Security	0.50
POLS*2250	Public Administration and Governance	0.50



POLS*3370	Environmental Politics and Governance	0.50
<b>Advanced elective</b>		
Select 0.50 credits from the following:		
AGR*4600	Agriculture and Food Issues Problem Solving	1.00
FARE*3250	Food Security, Nutrition and International Development	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
IDEV*4600	Advocating and Effecting Change in Development Policy and Practice	0.50

### Culture, Society and Health - 3.00 credits

This area of emphasis draws upon social, cultural as well as biological aspects of human populations to better understand perceptions of health and factors influencing health, including the distribution of illness and access care, food systems, and interactions with environment and other species on wellbeing.

Course Requirements:

Code	Title	Credits
<b>Cultural Diversity</b>		
Select 0.50 credits from the following:		
ANTH*2230	Regional Ethnography	0.50
ANTH*2660	Contemporary Indigenous Peoples in Canada	0.50
ANTH*3770	Kinship, Family, and Power	0.50
IDEV*1000	Understanding Development and Global Inequalities	0.50
SOAN*2290	Identities and Cultural Diversity	0.50
<b>Philosophy and ways of knowing/thinking</b>		
Select 0.50 credits from the following:		
PHIL*2030	Philosophy of Medicine	0.50
PHIL*2070	Philosophy of the Environment	0.50
PHIL*2080	Animals in Philosophy	0.50
<b>Socio-cultural impacts on feed and environmental sustainability</b>		
Select 0.50 credits from the following:		
GEOG*3020	Global Environmental Change <sup>6</sup>	0.50
GEOG*3090	Gender and Environment	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
HIST*2250	Environment and History	0.50
HIST*3240	Food History	0.50
HIST*3460	Natural Disasters in Global History	0.50
HIST*3690	Darwin, Culture and Society	0.50
<b>Socio-cultural aspects of disease and health</b>		
Select 0.50 credits from the following:		
ANTH*3550	Medical Anthropology	0.50
FRHD*3090	Poverty and Health	0.50
HIST*3310	Disease and History	0.50
PSYC*3110	Topics in Health Psychology	0.50
<b>Advanced electives in society, culture and health</b>		

Select 1.00 credits from the following:

ANTH*4440	Culture, Rights and Development	0.50
ANTH*4550	Topics in the Anthropology of Health	0.50
IDEV*3400	Managing and Evaluating Change in Development	0.50
PHIL*3450	Ethics in the Life Sciences	0.50
POPM*4040	Epidemiology of Food-borne Diseases	0.50
SOC*4420	Sociology of Food	0.50
SOAN*4500	Community Development	0.50

### Credits Summary

Code	Title	Credits
Core Courses (semesters 1-8)		12.00
Area of Emphasis		3.00
Free Electives		5.00
<b>Total Credits</b>		<b>20</b>

Of the total credits required, students are required to complete a minimum of 2.00 credits at the 4000 level and an additional 4.00 credits must be at the 3000 or 4000 level. A maximum of 7.00 credits at the 1000 level may be counted towards the degree requirements.

### Minor Requirements (Honours)

**This minor is not open to students registered in the degree: Bachelor of One Health.**

A minor in One Health will consist of 5.00 credits:

### Required Courses

Code	Title	Credits
ANTH*1150	Introduction to Anthropology	0.50
BIOL*1070	Discovering Biodiversity	0.50
GEOG*1220	Explaining Environmental Change	0.50
ONEH*1000	Introduction to One Health	0.50
ONEH*2000	Case Studies in One Health	0.50

### Restricted Electives

Code	Title	Credits
Select 1.50 credits from key knowledge areas in One Health:		
ANTH*1120	Biological Anthropology	0.50
ANTH*2230	Regional Ethnography	0.50
ANTH*2660	Contemporary Indigenous Peoples in Canada	0.50
BIOL*1080	Biological Concepts of Health	0.50
BIOL*2060	Ecology	0.50
BIOL*3060	Populations, Communities and Ecosystems	0.50
ECON*2100	Economic Growth and Environmental Quality	0.50
ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
ENVS*3210	Plant Pathology	0.50
GEOG*2210	Environment and Resources	0.50
GEOG*3020	Global Environmental Change	0.50
HIST*3310	Disease and History	0.50

IDEV*1000	Understanding Development and Global Inequalities	0.50
MICR*2420	Introduction to Microbiology	0.50
MICR*3230	Immunology	0.50
PATH*3610	Principles of Disease	0.50
PHIL*2030	Philosophy of Medicine	0.50
POLS*2100	Comparative Politics	0.50
POLS*2230	Public Policy	0.50
SOC*2280	Society, Knowledge Systems and Environment	0.50
SOAN*2290	Identities and Cultural Diversity	0.50
SOAN*3380	Contemporary Issues in Culture, Society, Nature	0.50
Select 1.00 credits from One Health areas of application:		
AGR*4600	Agriculture and Food Issues Problem Solving	1.00
ANTH*3550	Medical Anthropology	0.50
ANTH*4550	Topics in the Anthropology of Health	0.50
BIOL*3130	Conservation Biology	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
ENVS*3010	Climate Change Biology	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
GEOG*4210	Environmental Governance	0.50
ONEH*3000	Topics in One Health	0.50
POPM*3240	Epidemiology	0.50
POPM*4230	Animal Health	0.50
POPM*4040	Epidemiology of Food-borne Diseases	0.50
POLS*3370	Environmental Politics and Governance	0.50
POLS*3670	Comparative Public Policy	0.50
PSYC*3110	Topics in Health Psychology	0.50

In consultation with the One Health advisor for the minor a major-specific research, thesis, reading or literature review course may be substituted to meet the area of application credit requirement.

## Co-op Requirements

The One Health degree offers student the opportunity to explore animal, environmental and human health from both the scientific and socio-cultural perspective. One Health is an approach to research and problem-solving that brings together different knowledge systems and perspectives in order to find solutions that ensure people, animals and our environment stay healthy.

Students in the One Health degree are required to complete a One Health core, comprising required courses and restricted electives. Students will also be required to declare one of four areas of emphasis by the end of the first year of their program. As part of the OH core, students will complete a set of preparation courses, in year 1 and 2, for their preferred Area of Emphasis (hereafter referred to as sub-core).

The Co-op program in One Health is a five-year program, including three work terms. Students must complete a Fall, Winter and Summer work term, and must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recruitguelph.ca/cecs/>). Please refer to the Co-operative Education program policy with respect to adjusting this schedule.

## Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3	Academic Semester 4 COOP*1100	Off
3	Academic Semester 5	Academic Semester 6	COOP*1000 Work Term I
4	COOP*2000 Work Term II	COOP*3000 Work Term III	Off
5	Academic Semester 7	Academic Semester 8	N/A

## Recommended Program Sequence

The One Health degree offers four areas of Emphasis. Students must declare and complete all requirements for one of the areas of emphasis to graduate with the degree. The areas of emphasis include:

1. Disease, Complexity and Health (DCH) (p. 4)
2. Environment, Food and Health (EFH) (p. 5)
3. Policy, Economics and Health (PEH) (p. 5)
4. Culture, Society and Health (CSH) (p. 6)

Code	Title	Credits
<b>Semester 1 - Fall</b>		
ANTH*1120	Biological Anthropology	0.50
BIOL*1080	Biological Concepts of Health	0.50
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
GEOG*1220	Explaining Environmental Change	0.50
For DCH and EFH:		
CHEM*1040	General Chemistry I	0.50
For PEH and CSH:		
ECON*1050	Introductory Microeconomics	0.50
or PSYC*1000	Introduction to Psychology	
<b>Semester 2 - Winter</b>		
ANTH*1150	Introduction to Anthropology	0.50
BIOL*1070	Discovering Biodiversity	0.50
ONEH*1000	Introduction to One Health	0.50
Select 0.50 from the following:		
MATH*1080	Elements of Calculus I <sup>1</sup>	0.50
0.50 electives		0.50
For DCH and EFH:		
CHEM*1050	General Chemistry II	0.50
For PEH and CSH:		
ECON*1050	Introductory Microeconomics	0.50
or PSYC*1000	Introduction to Psychology	
<b>Summer Semester</b>		
No academic semester or work term		
<b>Semester 3 - Fall</b>		
BIOL*2400	Evolution	0.50
ONEH*2000	Case Studies in One Health	0.50
SOC*2280	Society, Knowledge Systems and Environment	0.50

0.50 elective or AoE restricted elective	0.50
For DCH and EFH:	
0.50 AoE elective	0.50
For PEH and CHS:	
ANTH*2230 Regional Ethnography	0.50
or PSYC*2310 Social Psychology	
<b>Semester 4 - Winter</b>	
BIOL*2060 Ecology	0.50
COOP*1100 Introduction to Co-operative Education	0.00
Select 0.50 credits from the following:	
SOAN*2120 Introductory Methods	0.50
STAT*2040 Statistics I	0.50
STAT*2230 Biostatistics for Integrative Biology	0.50
For DCH and EFH:	
BIOC*2580 Introduction to Biochemistry	0.50
MBG*2040 Foundations in Molecular Biology and Genetics	0.50
0.50 elective or AoE restricted elective	0.50
For PEH and CSH:	
POLS*2100 Comparative Politics	0.50
or POLS*2230 Public Policy	
1.00 electives or AoE restricted electives	1.00
<b>Summer Semester</b>	
No academic semester or work term	
<b>Semester 5 - Fall</b>	
POPM*3240 Epidemiology	0.50
ONEH*3000 Topics in One Health	0.50
GEOG*3020 Global Environmental Change	0.50
or ENVS*3010 Climate Change Biology	
0.50 electives or AoE restricted electives <sup>2</sup>	0.50
One of	
BIOM*2000 Concepts in Human Physiology <sup>4</sup>	0.50
BIOM*3200 Biomedical Physiology	1.00
BOT*2100 Life Strategies of Plants	0.50
HK*2810 Human Physiology I - Concepts and Principles <sup>3</sup>	0.50
ZOO*3600 Comparative Animal Physiology I	0.50
<b>Semester 6 - Winter</b>	
SOAN*3070 Qualitative and Observational Methods	0.50
BIOL*3060 Populations, Communities and Ecosystems	0.50
or SOAN*3380 Contemporary Issues in Culture, Society, Nature	
1.50 electives or AoE electives	1.50
<b>Summer Semester</b>	
COOP*1000 Co-op Work Term I	0.50
<b>Fall Semester</b>	
COOP*2000 Co-op Work Term II	0.50
<b>Winter Semester</b>	
COOP*3000 Co-op Work Term III	0.50
<b>Summer Semester</b>	
No academic semester or work term	
<b>Semester 7 - Fall</b>	
ONEH*4000 Applications of One Health <sup>5</sup>	1.00

Up to 2.50 electives or AoE restricted electives

**Semester 8 - Winter**

ONEH*4000	Applications of One Health <sup>5</sup>	1.00
Up to 2.50 electives or AoE restricted electives		

<sup>1</sup> For those interested in ECON\*3300 Economics of Health and the Workplace or completing STAT\*2040 Statistics I, MATH\*1080 Elements of Calculus I is also recommended in the first year.

<sup>2</sup> Students who enroll in BIOM\*3200 Biomedical Physiology only require 0.50 Elective or AoE restricted elective.

<sup>3</sup> HK\*2810 is only offered in a winter semester.

<sup>4</sup> Restricted to students in the PEH or CSH Areas of Emphasis, students pursuing the DCH or EFH Areas of Emphasis cannot complete BIOM\*2000 Concepts in Human Physiology. BIOM\*2000 will not be an acceptable pre-requisite for courses within the DCH or EFH Areas of Emphasis.

<sup>5</sup> Students can only complete ONEH\*4000 Applications of One Health in one semester.

**Area of Emphasis Requirements**

The associated areas of emphasis will support a mastery of key societal challenges that would benefit from a OH skill set. Students are required to declare an area of emphasis by the end of first year to ensure that all course requirements can be met. Students must complete an area of emphasis to graduate with the degree. The requirements for each area of emphasis contains a combination of required and restricted elective courses organized to ensure students develop strength in areas of context and application.

If a course is completed to fulfill a core requirement of the degree, it cannot be double counted to fulfill an area of emphasis requirement. An additional course from the list of options must be completed.

The areas of emphasis include:

1. Disease, Complexity and Health (DCH) (p. 4)
2. Environment, Food and Health (EFH) (p. 5)
3. Policy, Economics and Health (PEH) (p. 5)
4. Culture, Society and Health (CSH) (p. 6)

Requirements of each area of emphasis are listed below.

Student interested in Disease, Complexity and Health or Environment, Food and Health will need to select the following courses in semesters within the first two years of the program:

Code	Title	Credits
CHEM*1040	General Chemistry I	0.50
CHEM*1050	General Chemistry II	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
BIOC*2580	Introduction to Biochemistry	0.50

Students interested in Policy, Economics and Health or Culture, Society and Health will need to select the following courses within the first two years of the program:

Code	Title	Credits
ECON*1050	Introductory Microeconomics	0.50
PSYC*1000	Introduction to Psychology	0.50



POLS*2100	Comparative Politics	0.50
or POLS*2230	Public Policy	
ANTH*2230	Regional Ethnography	0.50
or PSYC*2310	Social Psychology	

### Disease, Complexity and Health - 3.00 credits

This area of emphasis allows students to examine the role of interactions between the environment, animals and humans on disease prevalence and dynamics, host response to disease, and strategies for achieving positive and sustainable health outcomes.

Course Requirements:

Code	Title	Credits
Required:		
MICR*2420	Introduction to Microbiology	0.50
Select 1.00 credits from the following:		
FOOD*2420	Introduction to Food Microbiology	0.50
ENVS*3210	Plant Pathology	0.50
MICR*3230	Immunology	0.50
PATH*3610	Principles of Disease	0.50
PSYC*2020	Clinical Psychology and Mental Health	0.50
Select 0.50 credits from the following:		
FRHD*2060	Adult Development and Aging	0.50
POPM*4040	Epidemiology of Food-borne Diseases	0.50
POPM*4230	Animal Health	0.50
Select 1.00 credits from the following:		
BIOM*4050	Biomedical Aspects of Aging	0.50
ENVS*3230	Agroforestry Systems	0.50
ENVS*3290	Waterborne Disease Ecology	0.50
MICR*3330	World of Viruses	0.50
MICR*4430	Medical Virology	0.50
MICR*4250	Microbiome and Immunity	0.50
PATH*3040	Principles of Parasitology	0.50
PATH*4100	Diseases of Aquatic Animals	0.50

### Environment, Food and Health - 3.00 credits

This area of emphasis allows students to examine factors affecting the function of managed and unmanaged (natural) ecosystems, and explore how interactions between the environment, biodiversity and human activities can affect ecosystem services, specifically related to food security and climate change and conservation.

Course Requirements:

Code	Title	Credits
Required:		
BIOL*3060	Populations, Communities and Ecosystems <sup>5</sup>	0.50
or SOAN*3380	Contemporary Issues in Culture, Society, Nature	

#### Managed and unmanaged environments

Select 0.50 credits from the following:

ENVS*2060	Soil Science	0.50
ENVS*2080	Introduction to Environmental Microbiology	0.50
ENVS*3010	Climate Change Biology <sup>5</sup>	0.50

ENVS*3020	Pesticides and the Environment	0.50
ENVS*3040	Natural Chemicals in the Environment	0.50
TOX*3360	Environmental Chemistry and Toxicology	0.50

#### Environment, biodiversity and ecosystem function

Select 0.50 credits from the following:

ENVS*2330	Current Issues in Ecosystem Science and Biodiversity	0.50
GEOG*2210	Environment and Resources	0.50
ENVS*3270	Forest Biodiversity	0.50
ENVS*3310	Soil Biodiversity and Ecosystem Function	0.50
BIOL*4410	Field Ecology	0.75
BIOL*4610	Arctic Ecology	0.75
BIOL*4700	Field Biology	0.50
ENVS*4350	Forest Ecology	0.50
ZOO*4300	Marine Biology and Oceanography	0.75

#### Environment and food production systems

Select 0.50 credits from the following:

AGR*2470	Introduction to Plant Agriculture	0.50
BOT*3310	Plant Growth and Development	0.50
ENVS*2040	Plant Health and the Environment	0.50
ENVS*3230	Agroforestry Systems	0.50
FOOD*2420	Introduction to Food Microbiology	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
MICR*2420	Introduction to Microbiology	0.50

#### Management strategies for ecosystem health

Select 1.00 credits from the following:

AGR*4600	Agriculture and Food Issues Problem Solving	1.00
BIOL*3130	Conservation Biology	0.50
BIOL*3670	Introduction to Wildlife Rehabilitation	0.50
BIOL*3680	Wildlife Rehabilitation: Caring for Sick, Injured, and Orphaned Wildlife	0.50
BIOL*4150	Wildlife Conservation and Management	0.50
BIOL*4500	Natural Resource Policy Analysis	0.50
GEOG*3110	Biogeography	0.50
ZOO*4070	Animal Behaviour	0.50

<sup>5</sup> If the course is taken to complete the core requirement of the program it cannot also be used to meet the Area of Emphasis requirement.

### Policy, Economics and Health - 3.00 credits

This area of emphasis allows students to develop their knowledge in policy development and analysis, including the political and economic underpinnings, and the role of policy development in areas at the intersection of environment, human and animal health.

Course Requirements:

Code	Title	Credits
Required:		
POLS*3670	Comparative Public Policy	0.50

#### Economic behaviour and implications at the individual, environmental or global scale

Select 0.50 credits from the following:		
ECON*2100	Economic Growth and Environmental Quality	0.50
ECON*2310	Intermediate Microeconomics	0.50
ECON*2650	Introductory Development Economics	0.50
<b>Political context of social and global issues</b>		
Select 0.50 credits from the following:		
FARE*1300	Poverty, Food and Hunger	0.50
IDEV*2200	Policy, Economy and Society	0.50
PHIL*2280	Key Concepts in Political Philosophy	0.50
POLS*2150	Gender and Politics	0.50
POLS*2200	International Relations	0.50
POLS*2300	Canadian Government and Politics	0.50
<b>Decision analysis</b>		
Select 0.50 credits from the following:		
FARE*3170	Cost-Benefit Analysis	0.50
MGMT*3140	Business Analytics	0.50
<b>Application of economic and policy decisions</b>		
Select 0.50 credits from the following:		
ECON*3300	Economics of Health and the Workplace	0.50
FARE*3000	International Food Sector and Policy Analysis	0.50
NUTR*3110	Food Security	0.50
POLS*2250	Public Administration and Governance	0.50
POLS*3370	Environmental Politics and Governance	0.50
<b>Advanced elective</b>		
Select 0.50 credits from the following:		
AGR*4600	Agriculture and Food Issues Problem Solving	1.00
FARE*3250	Food Security, Nutrition and International Development	0.50
GEOG*3210	Indigenous-Settler Relationships in Environmental Governance	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
IDEV*4600	Advocating and Effecting Change in Development Policy and Practice	0.50

### Culture, Society and Health - 3.00 credits

This area of emphasis draws upon social, cultural as well as biological aspects of human populations to better understand perceptions of health and factors influencing health, including the distribution of illness and access care, food systems, and interactions with environment and other species on wellbeing.

Course Requirements:

Code	Title	Credits
<b>Cultural Diversity</b>		
Select 0.50 credits from the following:		
ANTH*2230	Regional Ethnography	0.50
ANTH*2660	Contemporary Indigenous Peoples in Canada	0.50
ANTH*3770	Kinship, Family, and Power	0.50

IDEV*1000	Understanding Development and Global Inequalities	0.50
SOAN*2290	Identities and Cultural Diversity	0.50
<b>Philosophy and ways of knowing/thinking</b>		
Select 0.50 credits from the following:		
PHIL*2030	Philosophy of Medicine	0.50
PHIL*2070	Philosophy of the Environment	0.50
PHIL*2080	Animals in Philosophy	0.50
<b>Socio-cultural impacts on feed and environmental sustainability</b>		
Select 0.50 credits from the following:		
GEOG*3020	Global Environmental Change <sup>6</sup>	0.50
GEOG*3090	Gender and Environment	0.50
GEOG*3320	Food Systems: Issues in Security and Sustainability	0.50
HIST*2250	Environment and History	0.50
HIST*3240	Food History	0.50
HIST*3460	Natural Disasters in Global History	0.50
HIST*3690	Darwin, Culture and Society	0.50
<b>Socio-cultural aspects of disease and health</b>		
Select 0.50 credits from the following:		
ANTH*3550	Medical Anthropology	0.50
FRHD*3090	Poverty and Health	0.50
HIST*3310	Disease and History	0.50
PSYC*3110	Topics in Health Psychology	0.50
<b>Advanced electives in society, culture and health</b>		
Select 1.00 credits from the following:		
ANTH*4440	Culture, Rights and Development	0.50
ANTH*4550	Topics in the Anthropology of Health	0.50
IDEV*3400	Managing and Evaluating Change in Development	0.50
PHIL*3450	Ethics in the Life Sciences	0.50
POPM*4040	Epidemiology of Food-borne Diseases	0.50
SOC*4420	Sociology of Food	0.50
SOAN*4500	Community Development	0.50

### Credits Summary

Code	Title	Credits
Core Courses (semesters 1-8)		12.00
Area of Emphasis		3.00
Free Electives		5.00
Co-op Work Terms		1.50
<b>Total Credits</b>		<b>21.5</b>

Of the total credits required, students are required to complete a minimum of 2.00 credits at the 4000 level and an additional 4.00 credits must be at the 3000 or 4000 level. A maximum of 7.00 credits at the 1000 level may be counted towards the degree requirements.