2019-2020 Graduate Calendar

The information published in this Graduate Calendar outlines the rules, regulations, curricula, programs and fees for the 2019-2020 academic year, including the Summer Semester 2019, Fall Semester 2019 and the Winter Semester 2020.

For your convenience the Graduate Calendar is available in PDF format.

If you wish to link to the Graduate Calendar please refer to the Linking Guidelines.

The University is a full member of:

- Universities of Canada

Contact Information:

University of Guelph
Guelph, Ontario, Canada
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Revision Information:

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>May 1, 2019</td>
<td>Initial Publication</td>
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<tr>
<td>June 28, 2019</td>
<td>Revision 1</td>
</tr>
<tr>
<td>September 2, 2019</td>
<td>Revision 2</td>
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Disclaimer
The Office of Graduate and Postdoctoral Studies has attempted to ensure the accuracy of this on-line Graduate Calendar. However, the publication of information in this document does not bind the university to the provision of courses, programs, schedules of studies, fees, or facilities as listed herein.

Limitations
The University of Guelph reserves the right to change without notice any information contained in this calendar, including any rule or regulation pertaining to the standards for admission to, the requirements for the continuation of study in, and the requirements for the granting of degrees or diplomas in any or all of its programs.

The university will not be liable for any interruption in, or cancellation of, any academic activities as set forth in this calendar and related information where such interruption is caused by fire, strike, lock-out, inability to procure materials or trades, restrictive laws or governmental regulations, actions taken by the faculty, staff or students of the university or by others, civil unrest or disobedience, Public Health Emergencies, or any other cause of any kind beyond the reasonable control of the university.

The University of Guelph reaffirms section 1 of the Ontario Human Rights Code, 1981, which prohibits discrimination on the grounds of race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, handicap, age, marital status or family status.

The university encourages applications from women, aboriginal peoples, visible minorities, persons with disabilities, and members of other under-represented groups.
Introduction

Collection, Use and Disclosure of Personal Information

Personal information is collected under the authority of the University of Guelph Act (1964), and in accordance with Ontario's Freedom of Information and Protection of Privacy Act (FIPPA) http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90f31_e.htm. This information is used by University officials in order to carry out their authorized academic and administrative responsibilities and also to establish a relationship for alumni and development purposes. Certain personal information is disclosed to external agencies, including the Ontario Universities Application Centre, the Ministry of Advanced Education and Skills Development, and Statistics Canada, for statistical and planning purposes, and is disclosed to other individuals or organizations in accordance with the Office of Registrarial Services Departmental Policy on the Release of Student Information. For details on the use and disclosure of this information call the Office of Registrarial Services at the University at (519) 824-4120 or see https://www.uoguelph.ca/registrar/.

Statistics Canada - Notification of Disclosure

For further information, please see Statistics Canada's web site at http://www.statcan.gc.ca and Section XIV Statistics Canada.

Address for University Communication

Depending on the nature and timing of the communication, the University may use one of these addresses to communicate with students. Students are, therefore, responsible for checking all of the following on a regular basis:

Email Address

The University issued email address is considered an official means of communication with the student and will be used for correspondence from the University. Students are responsible for monitoring their University-issued email account regularly.

Home Address

Students are responsible for maintaining a current mailing address with the University. Address changes can be made, in writing, through Registrarial Services.

Name Changes

The University of Guelph is committed to the integrity of its student records, therefore, each student is required to provide either on application for admission or on personal data forms required for registration, their complete, legal name. Any requests to change a name, by means of alteration, deletion, substitution or addition, must be accompanied by appropriate supporting documentation.

Student Confidentiality and Release of Student Information Policy Excerpt

The University undertakes to protect the privacy of each student and the confidentiality of their record. To this end the University shall refuse to disclose personal information to any person other than the individual to whom the information relates where disclosure would constitute an unjustified invasion of the personal privacy of that person or of any other individual. All members of the University community must respect the confidential nature of the student information which they acquire in the course of their work.

Complete policy at https://www.uoguelph.ca/secretariat/office-services/university-secretariat/university-policies.
Learning Outcomes

Graduate Degree Learning Outcomes

On May 27, 2013, the University of Guelph Senate approved the following five University-wide Learning Outcomes as the basis from which to guide the development of graduate degree programs, specializations and courses:

1. Critical and Creative Thinking
2. Literacy
3. Global Understanding
4. Communication
5. Professional and Ethical Behaviour

These learning outcomes are also intended to serve as a framework through which our educational expectations are clear to students and the broader public; and to inform the process of outcomes assessment through the quality assurance process (regular reviews) of programs and departments.

An on-line guide to the learning outcomes, links to the associated skills, and detailed rubrics designed to support the development and assessment of additional program and discipline-specific outcomes, are available for reference on the Learning Outcomes website.

Critical and Creative Thinking

Critical and creative thinking is a concept in which one applies logical principles, after much inquiry and analysis, to solve problems with a high degree of innovation, divergent thinking and risk taking. Those mastering this outcome show evidence of integrating knowledge and applying this knowledge across disciplinary boundaries. Depth and breadth of understanding of disciplines is essential to this outcome. At the graduate level, originality in the application of knowledge (master’s) and undertaking of research (doctoral) is expected. In addition, Critical and Creative Thinking includes, but is not limited to, the following outcomes: Independent Inquiry and Analysis; Problem Solving; Creativity; and Depth and Breadth of Understanding.

Literacy

Literacy is the ability to extract information from a variety of resources, assess the quality and validity of the material, and use it to discover new knowledge. The comfort in using quantitative literacy also exists in this definition, as does using technology effectively and developing visual literacy.

In addition, Literacy includes, but is not limited to, the following outcomes: Information Literacy, Quantitative Literacy, Technological Literacy, and Visual Literacy.

Global Understanding

Global understanding encompasses the knowledge of cultural similarities and differences, the context (historical, geographical, political and environmental) from which these arise, and how they are manifest in modern society. Global understanding is exercised as civic engagement, intercultural competence and the ability to understand an academic discipline outside of the domestic context.

In addition, Global Understanding includes, but is not limited to, the following outcomes: Global Understanding, Sense of Historical Development, Civic Knowledge and Engagement, and Intercultural Competence.

Communication

Communication is the ability to interact effectively with a variety of individuals and groups, and convey information successfully in a variety of formats including oral and written communication. Communication also comprises attentiveness and listening, as well as reading comprehension. It includes the ability to communicate and synthesize information, arguments, and analyses accurately and reliably.

In addition, Communication includes, but is not limited to, the following outcomes: Oral Communication, Written Communication, Reading Comprehension, and Integrative Communication.

Professional and Ethical Behaviour

Professional and ethical behaviour requires the ability to accomplish the tasks at hand with proficient skills in teamwork and leadership, while remembering ethical reasoning behind all decisions. The ability for organizational and time management skills is essential in bringing together all aspects of managing self and others. Academic integrity is central to mastery in this outcome. At the graduate level, intellectual independence is needed for professional and academic development and engagement.

In addition, Professional and Ethical Behaviour includes, but is not limited to, the following outcomes: Teamwork, Ethical Reasoning, Leadership, Personal Organization and Time Management, and Intellectual Independence.
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Animal Biosciences

In addition to a core group of faculty members the Department of Animal Biosciences works closely with professionals from the Ontario Ministry of Agriculture and Food (OMAF), Agriculture and Agri-Food Canada (AAFC), and other affiliated organizations. The graduate program encompasses MSc by course-work, MSc by thesis, and PhD options in four main fields:
- Animal Breeding and Genetics (quantitative or molecular)
- Animal Nutrition (monogastric or ruminant)
- Animal Physiology (environmental and reproductive)
- Animal Behaviour and Welfare

Administrative Staff

**Chair**
James Squires (223 ANNU, Ext. 53928)  
jsquires@uoguelph.ca

**Graduate Program Coordinator**
Niel Karrow (123 ANNU, Ext. 53646)  
nkarrow@uoguelph.ca

**Graduate Program Assistant**
Wendy McGrattan (144 ANNU, Ext. 56215)  
wmcgratt@uoguelph.ca

Graduate Faculty

*Please see the Department's webpage at [www.aps.uoguelph.ca](http://www.aps.uoguelph.ca) for an updated listing of faculty.

Christine Baes  
BSc Guelph, MSc Hohenheim, PhD Christina-Albrechts - Assistant Professor

Gregory Bedecarrats  
Licence de Biochimie, MSc, Dipl. Rennes (France), PhD McGill - Associate Professor

Dominique P. Bureau  
BSc (Agr), MSc Laval, PhD Guelph - Professor

Angela Canovas  
BSc Lledia, MSc Valencia, PhD Lledia - Assistant Professor

John P. Cant  
BSc (Agr) Nova Scotia, MS, PhD California - Professor

Abigail Carpenter  
BS Michigan, MS Minnesota, PhD Kansas State - Assistant Professor

Trevor Devries  
BSc, PhD British Columbia - Associate Professor

Jennifer Ellis  
BSc, MSc, PhD Guelph - Assistant Professor

Ming Z. Fan  
BS Xinjiang, MS Harbin, PhD Alberta - Professor

Alexandra Harlander  
DVM, DVSC Vienna, Ph.D. Germany - Assistant Professor

Lee-Anne Huber  
BSc, MSc, PhD Guelph - Assistant Professor

Niel A. Karrow  
BSc Guelph, MSc, PhD Waterloo - Associate Professor

Elijah Kiarie  
BSc, MSc Nairobi, PhD Manitoba - Assistant Professor

Jialang Li  
MSc Changchun Veterinary College (China), PhD Ottawa - Professor

Ira B. Mandell  
BS, MS Ohio State, PhD Saskatchewan - Associate Professor

Georgia Mason  
BA, PhD Cambridge - Professor

Katrina Merkies  
BSc, PhD Guelph - Associate Professor

Richard D. Mocca  
BSc, MSc Guelph - Professor

Vern R. Osborne  
BSc, MSc, PhD Guelph - Associate Professor

Wendy Pearson  
BSc, MSc, PhD Guelph - Assistant Professor

Eduardo Ribeiro  
DVM Santa Catarina State, MSc, PhD Florida - Assistant Professor

J. Andrew B. Robinson  
BSc (Agr), MSc Guelph, PhD Cornell - Associate Professor

Flavio S. Schenkel  
BBA, BSc, and MSc Brazil, PhD Guelph - Professor

Program Requirements

Candidates for the MSc degree by course work and major paper option must complete a prescribed series of courses, conduct a research project, prepare a thesis based on their results and defend this in a final examination. The number of course credits required in this option will be decided by the student's advisory committee in consultation with the student, and may exceed the minimum 1.5 credits required by the Faculty of Graduate Studies. Generally, 4 or 5 courses (1.5-2.0 credits) will be taken, including the mandatory Seminar course, ANSC*6600 and ANSC*6610 (0.25 credits each).

Course Work and Major Research Paper (MRP)

Candidates for the MSc degree by course work and major paper option must complete a minimum of 4.0 credits (7 courses). Of these courses, one will be the Major Paper in Animal and Poultry Science, ANSC*6900 (1.0 credit). The major paper will be a detailed, critical review of an area of study related to the specialization chosen by the student and should include analyses and interpretations of relevant data. At the beginning of the program, the student and student's advisory committee will design the coursework program according to the program guidelines and the aspirations and background of the student. Students will normally choose a minimum of 4 courses in the area of specialization, and a minimum of two courses outside the area of specialization. These latter courses can be offered by departments other than Animal Biosciences. A maximum of one approved senior-level undergraduate course can be included in the list of prescribed courses. Recommended graduate courses in the three areas of specialization are as follows:

Animal Breeding and Genetics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANSC*6010</td>
<td>Animal Breeding and Genetics</td>
<td>1.00</td>
</tr>
<tr>
<td>ANSC*6210</td>
<td>Principles of Selection in Animal Breeding</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6370</td>
<td>Quantitative Genetics and Animal Models</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6390</td>
<td>QTL and Markers</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6450</td>
<td>Topics in Animal Biotechnology</td>
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Animal Nutrition and Metabolism

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANSC*6090</td>
<td>Animal Nutrition and Metabolism</td>
<td>1.00</td>
</tr>
<tr>
<td>ANSC*6010</td>
<td>Topics in Comparative Animal Nutrition</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6030</td>
<td>Metabolising Metabolic Processes</td>
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</tr>
<tr>
<td>ANSC*6360</td>
<td>Techniques in Animal Nutrition Research</td>
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</tr>
<tr>
<td>ANSC*6450</td>
<td>Topics in Animal Biotechnology</td>
<td>0.50</td>
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<tr>
<td>ANSC*6460</td>
<td>Lactation Biology</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6470</td>
<td>Advanced Animal Nutrition and Metabolism I</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6480</td>
<td>Advanced Animal Nutrition and Metabolism II</td>
<td>0.50</td>
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Animal Behaviour and Welfare

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>ANSC*6090</td>
<td>Animal Behaviour and Welfare</td>
<td>1.00</td>
</tr>
<tr>
<td>ANSC*6440</td>
<td>Advanced Critical Analysis in Applied Ethology</td>
<td>0.50</td>
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<tr>
<td>ANSC*6700</td>
<td>Animals in Society: Historical and Global Perspectives on Animal Welfare</td>
<td>0.50</td>
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<tr>
<td>ANSC*6710</td>
<td>Assessing Animal Welfare in Practice</td>
<td>0.50</td>
</tr>
<tr>
<td>ANSC*6720</td>
<td>Scientific Assessment of Affective States in Animals</td>
<td>0.50</td>
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</table>
ANSC*6730 [0.50] Applied Environmental Physiology and Animal Housing
ANSC*6740 [0.50] Special Topics in Applied Animal Welfare Science
UNIV*6030 [0.50] Seminars and Analysis in Animal Behaviour and Welfare

The MSc by course work and major paper degree will require a minimum of three semesters of full-time study (or the equivalent).

PhD Program

The PhD program is research oriented and provides instruction and experiences that develop the student's ability to independently formulate hypotheses and design and execute experiments or conduct observational studies to reach definitive conclusions.

Admission Requirements

Students entering a PhD program should show potential for independent, productive, and original research. A PhD program can be entered by three routes: following completion of an MSc program; following transfer prior to completion of an MSc program; and directly from a bachelor degree.

In general, a minimum average grade of 'B' for a completed MSc program plus strong letters of reference are required. Students wishing to be considered for transfer to a PhD program prior to completion of the MSc program must request the transfer before the end of the fourth semester and have an excellent academic record as well as a strong aptitude for research.

Direct admission to the PhD program may be permitted for applicants who hold a bachelor's degree and have an excellent academic history and strong indications of research potential.

Program Requirements

Satisfactory completion of a PhD program requires a comprehensive knowledge of the area of emphasis and the ability to conduct original research in this area, plus a sound general background in two related areas of study. This competence is demonstrated in a qualifying examination and through the design and execution of a substantial and original research project. Based on this research, a thesis is prepared and defended in a final examination.

The number of courses required for a PhD program will be decided by the student's advisory committee in consultation with the student. The minimum requirement is ANSC*6620 and ANSC*6630.

Collaborative Specializations

Neuroscience

The Department of Animal Biosciences participates in the MA/MSc/PhD collaborative specialization in neuroscience. Please consult the Neuroscience listing for a detailed description of the MA/MSc/PhD collaborative specialization.

Toxicology

The Department of Animal Biosciences participates in the masters/doctoral collaborative specialization in toxicology. The research and teaching expertise of these faculty include aspects of toxicology; they may serve as advisors for masters and doctoral students in Toxicology. Students choosing this option must meet the requirements of the Toxicology collaborative specialization, as well as those of their home department. Please consult the Toxicology listing for a detailed description of the masters/doctoral collaborative specialization.

Courses

Although the courses offered are listed by field, several are relevant to more than one field. Some courses are only offered when there is a certain minimum enrolment.

Animal Breeding and Genetics

ANSC*6210 Principles of Selection in Animal Breeding W [0.50]
Definition of selection goals, prediction of genetic progress and breeding values, and the comparison of selection programs.
Department(s): Department of Animal Biosciences

ANSC*6240 Topics in Animal Genetics and Genomics W [0.50]
Current literature and classical papers pertaining to quantitative genetics, animal breeding and animal genomics are reviewed in detail through presentation, discussion and critical analysis.
Department(s): Department of Animal Biosciences

ANSC*6370 Quantitative Genetics and Animal Models F [0.50]
The course covers quantitative genetics theory associated with animal models; linear models applied to genetic evaluation of animals; estimation of genetic parameters for animal models; and computing algorithms for large datasets.
Department(s): Department of Animal Biosciences

ANSC*6390 QTL and Markers W [0.50]
Advanced training in QTL mapping and selection assisted by genetic markers.
Department(s): Department of Animal Biosciences

Animal Nutrition

ANSC*6450 Topics in Animal Biotechnology F [0.50]
The course will explore current methods and recent advances of biotechnology, innovation, and emerging translational products of significance to animal production and human health.
Prerequisite(s): MCB*2050 / MBG*2040 / ANSC*4050 or equivalent
Department(s): Department of Animal Biosciences

Animal Physiology

ANSC*6470 Advanced Animal Nutrition and Metabolism I F [0.50]
A systematic review of key aspects of energy, protein, amino acid and carbohydrate utilization and metabolism in farm animals.
Department(s): Department of Animal Biosciences

ANSC*6480 Advanced Animal Nutrition and Metabolism II W [0.50]
A systematic review of key aspects of lipid, vitamin and mineral utilization and metabolism in farm animals.
Department(s): Department of Animal Biosciences

Animal Behaviour and Welfare

ANSC*6440 Advanced Critical Analysis in Applied Ethology F [0.50]
Students explore the process of scientific inquiry and experimental design within the context of applied ethology research. Discussions include the peer review process, critical analyses and applications of methods for applied animal behaviour research.
Department(s): Department of Animal Biosciences

ANSC*6700 Animals in Society: Historical and Global Perspectives on Animal Welfare F [0.50]
A seminar course covering society's duties to animals. Students will learn about the major ethical theories that deal with society's duties towards animals, the main scientific approaches to animal welfare, and the relationship of science to ethics. A brief history of human-animal relationships will be covered and cultural differences described. Students will use this to analyze some current issues.
Department(s): Department of Animal Biosciences
### ANSC*6710 Assessing Animal Welfare in Practice W [0.50]
A lecture/seminar course covering the principles of applied animal welfare assessment. Students will learn what influences an animal welfare assessment and will understand the components necessary to create an effective and targeted animal welfare program for industry or regulatory application.

**Offering(s):** Winter offering on-campus, Summer offering Distance Education.

**Prerequisite(s):** ANSC*6700

**Department(s):** Department of Animal Biosciences

### ANSC*6730 Applied Environmental Physiology and Animal Housing W [0.50]
A lecture/seminar course covering the principles of applied environmental physiology including temperature regulation, space requirements, animal responses to light and other aspects of the physical environment. Students pursue a topic in depth to develop or update recommended codes of practice and resource-based standards.

**Department(s):** Department of Animal Biosciences

### ANSC*6720 Scientific Assessment of Affective States in Animals W [0.50]
Graduate students will explore the biology and validity of behavioural and physiological techniques used in animal welfare assessment such as: sympathetic activation, HPA functioning, stereotypic behaviour and preference responses. A combination of lecture, instructor-led discussion and student-led discussion will explore these methods of animal welfare assessment.

**Department(s):** Department of Animal Biosciences

### ANSC*6740 Special Topics in Applied Animal Welfare Science S [0.50]
A lecture/seminar course covering in depth topics in applied animal welfare science. The course will review the scientific research into the welfare of a specific animal species or a specific animal welfare problem common across species, focusing on the main threats to welfare, relevant indicators of welfare, and possible solutions to improve welfare.

**Department(s):** Department of Animal Biosciences

### ANSC*6700 Scientific Communication I F,W [0.25]
This course is required for successful completion of a PhD degree. Via reading, guest lectures, online modules and in-class discussion, students will learn about the principles of effective communication, and with training and feedback, create a departmental webpage and oral presentation outlining their research plans.

**Prerequisite(s):** ANSC*6600

**Restriction(s):** Restricted to Animal Biosciences PhD students.

**Department(s):** Department of Animal Biosciences

### ANSC*6620 Scientific Communication II F,W [0.00]
This course is required for successful completion of a PhD degree. Via reading, guest lectures, online modules and in-class discussion, students will learn about the principles of effective communication, and with training and feedback, create a departmental webpage and oral presentation outlining their research plans.

**Prerequisite(s):** ANSC*6600

**Restriction(s):** Restricted to Animal Biosciences PhD students.

**Department(s):** Department of Animal Biosciences

### ANSC*6630 Thesis Proposal and Professional Development I F,W [0.00]
This course is required for successful completion of a PhD degree. Via reading, guest lectures, online modules and in-class discussion, students will learn about the principles of effective communication, and with training and feedback, create a departmental webpage and oral presentation outlining their research plans.

**Prerequisite(s):** ANSC*6600

**Restriction(s):** Restricted to Animal Biosciences PhD students.

**Department(s):** Department of Animal Biosciences

### ANSC*6900 Major Paper in Animal and Poultry Science F,W,S [1.00]
A detailed, critical review of an area of study related to the specialization of students in the MSc by course work and major paper option that includes analysis and interpretation of relevant data.

**Department(s):** Department of Animal Biosciences

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**General**

**UNIV*6030** [0.50] Seminars and Analysis in Animal Behaviour and Welfare

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**ANSC*6500 Biometry for Animal Sciences W [0.50]**
For students involved in animal research. The course will provide outlines of appropriate presentation and analysis of experimental data with emphasis on different analytical techniques.

**Department(s):** Department of Animal Biosciences

**ANSC*6100 Special Project F,W,S [0.50]**
Supervised program of study in some aspect of animal and poultry science that can involve an experimental project and/or detailed analysis of the literature.

**Department(s):** Department of Animal Biosciences

**ANSC*6490 Advanced Dairy Management W [0.50]**
A comprehensive systems science and integrative capstone course that encompasses the “closings of the loop” education of dairy production systems. Students will be exposed to real-time issues relating to dairy production from, environment, economics, nutrition, housing, health, welfare, society and agrology. This course will allow the student to practice their training from the courses they have been exposed to as undergraduates into many case study evaluations on farms provincially, nationally and internationally.

**Restriction(s):** Instructor consent required.

**Department(s):** Department of Animal Biosciences

**ANSC*6600 Scientific Communication I F,W [0.25]**
This course is required for completion of a thesis-based MSc degree. Via reading, guest lectures, online modules and in-class discussion, students will learn about the principles of effective communication, and with training and feedback create a departmental webpage and oral presentation outlining their research plans.

**Restriction(s):** Restricted to Animal Biosciences students.

**Department(s):** Department of Animal Biosciences

**ANSC*6610 Thesis Proposal and Professional Development I F,W [0.25]**
This course is required for successful completion of an MSc thesis degree. With guidance and instruction, students complete a research proposal, or a literature review for their thesis. Students will also spend 8 hours on professional development (e.g. via mygradskills.ca, MITAC Step workshops).

**Restriction(s):** Restricted to Animal Biosciences students.

**Department(s):** Department of Animal Biosciences