

ANSC*4060 - Gut Microbiome

Winter 2026 Course Outline

Section: 02

Credits: 0.50

Land Acknowledgement: Guelph

The University of Guelph resides on the ancestral lands of the Attawandaron people and the treaty lands and territory of the Mississaugas of the Credit. We recognize the significance of the Dish with One Spoon Covenant to this land and offer respect to our Anishinaabe, Haudenosaunee and Métis neighbours. Today, this gathering place is home to many First Nations, Inuit, and Métis peoples and acknowledging them reminds us of our important connection to this land where we work and learn.

Calendar Description

A systematic review of the gut microbiome including dietary effects, sampling methods and sequencing techniques as well as bioinformatic and statistical analysis of diversity and composition of gut microbes in agricultural animals, pets and fish.

Prerequisite(s): NUTR*3210, 0.50 credits in Statistics

Department(s): Department of Animal Biosciences

A systematic review of the gut microbiome including dietary effects, sampling methods and sequencing techniques as well as bioinformatic and statistical analysis of diversity and composition of gut microbes in agricultural animals, pets and fish.

Course Description

This course will have weekly lectures to introduce the field of gut microbiome research of livestock, pets and fish with an emphasis on dietary effects, such as probiotic and prebiotics. Lectures will also cover the latest collection methods, DNA extraction and sequencing technologies. Weekly seminars will be performed on computers with an introduction to bioinformatics and coding in a Unix environment. Students will perform bioinformatics on small practice sequence datasets using QIIME2 and DADA2 pipelines followed by statistics and plotting in Rstudio. The goal of the course is to teach students background knowledge on the gut microbiome, latest methodologies, bioinformatic tools and interpretation of results so they can perform a full analysis of the gut microbiome in the future.

Course Fit Within Program/Curriculum

In both nutrition and physiology groups at the ABSc department, there are multiple courses and research programs that focus on feeding probiotics, prebiotics and other feed additives to improve livestock, fish and pet performance and health by enhancing the gut microbiome. I have worked with many students to teach them about the microbiome and train them how to use bioinformatic and statistical programs to analyze their microbiome data. This is also true for students in other animal related departments at UoG, e.g. IB, ENVS and PATH. This proposed course will help deliver this educational knowledge and training in an efficient, thought provoking and accessible manner.

Lecture Schedule

WedFri 11:30am-12:50pm in ANNU*030 (1/5 to 4/21)

Instructor Information

David Huyben

Assistant Professor

Email: huybend@uoguelph.ca

Office: ANNU 135

Office Hours:

Email to setup a meeting to be in person or on Teams.

Learning Resources

Required Resources

Lecture slides, lecture recordings, assignment outlines, datasets, tutorials, papers and additional reading materials will be posted on the course website: Courselink (<https://courselink.uoguelph.ca/>).

Students are responsible to acquire their own computer to complete assignments. The library and ABSc department has desktop computers for use as well. Please speak to library services for more info: Library (<https://www.lib.uoguelph.ca/>).

Minimum computer requirements to run the below software are as follows:

- **Operating System:** 64-bit Windows, macOS, or Linux.
- **Processor:** Any Intel-compatible processor is sufficient for basic use.
- **RAM:** 4GB is the absolute minimum, suitable for light tasks. 16GB is recommended.
- **Disk Space:** 10GB.

Course Resources

This course requires the use of several software applications that include:

- **Microsoft Office 365:** <https://www.uoguelph.ca/ccs/taxonomy/term/376/all> (<https://www.uoguelph.ca/ccs/taxonomy/term/376/all/>)
- **Zoom:** <https://www.zoom.com/>
- **RStudio:** <https://posit.co/download/rstudio-desktop/>
- **Terminal (Mac) or Powershell (Mac and Windows):** <https://learn.microsoft.com/en-us/powershell/>
- **MobaXterm (Windows):** <https://mobaxterm.mobatek.net/download.html>

Campus Resources

If you are concerned about any aspect of your academic program: Make an appointment with a Program Counsellor (<https://www.uoguelph.ca/uaic/programcounsellors/>) in your degree program. If you are struggling to succeed academically: There are numerous academic resources offered by the Learning Commons (<https://www.lib.uoguelph.ca/using-library/spaces/learning-commons/>) including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills.

Cost of Textbooks and Learning Resources

No required textbook for this course.

Field Trip Fees

No field trip in this course other than viewing labs on campus for free.

Library Course Reserve (Ares)

For this course, you will be required to access course reserve materials through the University of Guelph McLaughlin Library. To access these items, select **Ares** on the navbar in CourseLink. Note that you will need your Central Login ID and password in order to access items on reserve.

For further instructions on accessing reserve resources, visit How to Get Course Reserve Materials (<https://www.lib.uoguelph.ca/find/course-reserves-ares/>).

If at any point during the course you have difficulty accessing reserve materials, please contact the e-Learning Operations and Reserve Services staff at:

Tel: 519-824-4120 ext. 53621 | Email: libres2@uoguelph.ca | Location: McLaughlin Library, First Floor, University of Guelph

Course Learning Outcomes

1. Critical and Creative Thinking: Create a literature review and identify knowledge gaps focused on their animal microbiome of interest by integrating and applying knowledge from several studies.
2. Literacy: Extract information from various resources (e.g. lectures and reports), access the quality of the material and in written form accurately describe trends in the microbiome field.
3. Global Understanding: Understand the historical development and new advancements in microbiome sampling, sequencing and bioinformatic techniques related to many fields around the world.

4. Communicating: Communicate and synthesize arguments in oral form to the instructor and classmates about microbiome field.
5. Professional and Ethical Behaviour: Demonstrate leadership and time management skills by leading discussions and accomplishing individual written, presentation and computer seminar tasks.

Schedule of Topics for Lectures & Seminars

Week of	Topic	Activities	Due
1/7	Lecture #1: Defining the animal gut microbiome and advances in sequencing technologies	Seminar #1: Reviewing gut microbiome studies to write a literature review – part 1	
1/14	Lecture #2: Development of the animal gut microbiome and impacts of nutrition/ disease	Seminar #2: Reviewing gut microbiome studies to write a literature review – part 2	
1/21	Lecture #3: Literature Review Outline Presentations (all students)	Seminar #3: Introduction to Unix environment and bioinformatics	
1/28	Lecture #4: Sampling, storage, library preparation and sequencing methodologies	Seminar #4: Downloading data from NCBI and starting bioinformatics tutorial	
2/4	Lecture #5: Bioinformatics and analyzing alpha/beta diversity of gut microbiome data	Seminar #5: Continuing bioinformatics tutorial and writing up results	
2/11	Lecture #6: Multivariate statistics and analyzing significant effects on gut microbiome data	Seminar #6: Introduction to R and starting statistics tutorial	
2/18		Winter Break	
2/20		Winter Break	
2/25	Lecture #7: Dietary effects on the animal gut microbiome and impacts of pre-, pro- and post-biotics	Seminar #7: Continuing statistics tutorial and writing up results	
3/4	Lecture #8: Host and environmental effects on the animal gut microbiome	Seminar #8: Downloading and analyzing practice data	
3/11	Lecture #9: Human gut microbiome and impacts on nutrition and disease (guest lecture)	Seminar #9: Open session help with instructor on practice data	
3/18	Lecture #10: Open session (students work on final tasks)	Seminar #10: Open session help with instructor on practice data	
3/25	Lecture #11: Gut Microbiome Results Presentations (first half of students)	Seminar #11: Open session help with instructor on practice data	
4/1	Lecture #12: Gut Microbiome Results Presentations (second half of students)	Seminar #12: Open session help with instructor on practice data	
4/3		Holiday	
4/8	No class		
4/15	No class		

Teaching and Learning Activities

Lectures

The course will be comprised of lectures (reviews) by the course instructor, presentations on cutting-edge research topics made by well-established scientists (guest lecturers), and discussions on the gut microbiome of different livestock, pet and fish species as well as new sampling, sequencing and bioinformatic methodologies. The instructors will provide a small number of scientific papers to read prior to each class.

Seminars

Students will work with the instructor to follow tutorials on how to do bioinformatic analysis and statistical analysis of both practice, public and their own sequence data. Computer room time will also be used for reviewing peer-review publications on their target species that includes identifying current knowledge and knowledge gaps in their fields relating to the gut microbiome.

Presentations

The students will present their literature review (plans) and their bioinformatic analysis on the practice data (sourced from the instructor) for 10min with questions from the instructor and other students.

Papers

Several papers on their literature review, tutorials and bioinformatic analysis of their practice data will be assessed.

Assessment Breakdown

Description	Weighting (%)	Due Date
Task 1 - Literature Review Outline Presentation	15%	Jan 21 2026 11:59pm
Task 2 - Literature Review Paper	15%	Jan 28 2026 11:59pm
Task 3 - Tutorial Bioinformatic Results Paper	15%	Feb 11 2026 11:59pm
Task 4 - Tutorial Statistics Results Paper	15%	Mar 4 2026 11:59pm
Task 5 - Bioinformatic Results Presentation	20%	Apr 1 2026 11:59pm
Task 6 - Statistic Results Paper	20%	Apr 8 2026 11:59pm

Assessment Details

Papers - Tasks 2, 3, 4 and 6

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Literature review, bioinformatic tutorial, statistics tutorial, and results papers.

65

Course Learning Outcomes Assessed: 1, 2, 3, 4, 5

Presentations - Tasks 1 and 5

Presentations - Tasks 1 and 5

Literature review and results presentations.

35

Course Learning Outcomes Assessed: 1, 2, 3, 4

Last Day to Drop Course

The final day to drop Winter 2026 courses without academic penalty is the last day of classes: April 06

After this date, a mark will be recorded, whether course work is completed or not (a zero is assigned for missed tests/assignments). This mark will show on the student's transcript and will be calculated into their average.

Course Grading Policies

Submission of Assignments

Submit assignments to Dropbox by the above deadlines in word, pdf, ppt or other forms.

Late Assignment

Discuss with the instructor before the deadline if the assignment will be late and seek extension approval. Otherwise, late assignments will be given 0%.

Standard Statements for Undergraduate Courses

Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent

academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

The Academic Misconduct Policy (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/>) is outlined in the Undergraduate Calendar.

Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability. Use of the SAS Exam Centre requires students to make a booking at least 10 days in advance, and no later than the first business day in November, March or July as appropriate for the semester. Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time. For students at the Guelph campus, information can be found on the SAS website. (<https://www.uoguelph.ca/sas/>)

Accommodation of Religious Obligations

If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements.

See the Academic calendar for information on regulations and procedures for Academic Accommodations of Religious Obligations (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-accommodation-religious-obligations/>).

Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all undergraduate students except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in the Undergraduate Calendar - Dropping Courses (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/dropping-courses/>).

Email Communication

As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

Health and Wellbeing

The University of Guelph provides a wide range of health and wellbeing services at the Vaccarino Centre for Student Wellness (<https://wellness.uoguelph.ca/>). If you are concerned about your mental health and not sure where to start, connect with a Student Wellness Navigator (<https://wellness.uoguelph.ca/navigators/>) who can help develop a plan to manage and support your mental health or check out our mental wellbeing resources (<https://wellness.uoguelph.ca/shine-this-year/>). The Student Wellness team are here to help and welcome the opportunity to connect with you.

Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g., final exam or major assignment).

Recording of Materials

Presentations that are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources

The Academic Calendars (<http://www.uoguelph.ca/registrar/calendars/?index>) are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the Undergraduate Calendar for information on regulations and procedures for Academic Consideration. (<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-consideration-appeals-petitions/>)