ANSC*6030 - Modelling Metabolic Processes

Fall 2024 Course Outline
Section: 01
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

Building and testing of mathematical models of metabolic processes using continuous simulation software to assist in weekly assignments. Choice of model based on students' research interests (e.g. protein synthesis, nutrient uptake, rumen fermentation). Term project to reproduce model from scientific knowledge.
Department(s): Department of Animal Biosciences

Course Description

The emphasis of the course is really on teaching you to be able to build and test complex models of the systems you will study in your future research careers. You will build a repertoire of modelling techniques from weekly assignments. Lectures will be used to discuss the results of the previous assignment(s) and introduce the methods for the subsequent piece of work. I will lead the discussion and lecture on modelling methodology. Each of you will obtain independence in model construction and analysis with a term project to develop, reproduce, test or use a model related to a research area of your interest. Once the basics of modelling have been taught, we will examine different types of more advanced models considering such phenomena as distribution in space and chaos. The orientation of the models selected is towards an improvement in understanding of biological systems currently being studied by experimentation. A previous knowledge of animal biochemistry and physiology is useful.

Course Fit Within Program/Curriculum

This course is valuable for students interested in using isotopes to trace metabolic reactions, integrating knowledge about different parts of a biological system, predicting cell or animal responses to their environment, or developing methods for digital agriculture.

Lecture Schedule

Th 8:30am-11:20am in ANNU*101 (9/5 to 12/13)

Instructor Information

John Cant
Email: jcant@uoguelph.ca

Course Level Learning Outcomes

After completion of the course, you should be able to:

1. Knowledgeably discuss simulation modelling of any nature

2. Build and test complex mathematical models

3. Use the computer language Python

4. Understand the processes of numerical and analytical integration

5. Think of biological problems in terms of mathematical constructs

6. More fully understand your area of experimental research, no matter the subject

Teaching and Learning Activities

Weekly Activities

1 introduction to modelling philosophies due sep 19

2 the 1-compartment model due sep 26

3 the 2-compartment model due oct 3

4 reference state parametization due oct 10

5 isotope dilution kinetics due oct 24

6 behaviour analysis due oct 31

7 enzyme kinetics due nov 7

8 goodness of fit and sensitivity analysis due nov 14

9 distributed-in-space modelling

10 chaos modelling

12 project presentations

Assessment Breakdown

Description	Weighting (%)	Due Date
weekly assignments	55	every thurs
participation in discussion	15	every thurs
term project oral presentation	15	week 12
term project written paper	15	week 13

Assessment Details

Assignment

Weekly Assignments 55%

Course Learning Outcomes Assessed: 1, 2, 3, 4, 5, 6

Discussion

Participation in Discussion 15%

Course Learning Outcomes Assessed: 1

Presentation

Term Project Oral Presentation 15%

Course Learning Outcomes Assessed: 1, 2, 3, 4, 5, 6,

Paper

Term Project Written Paper 15%

Course Learning Outcomes Assessed: 1, 2, 3, 4, 5, 6

Last Day to Drop Course

The final day to drop Fall 2024 courses without academic penalty is the last day of classes: November 29

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

Assignments are to be submitted in CourseLink Dropbox. A preliminary draft of the weekly assignment is due by midnight each Monday and the final write-up is due at the beginning of Thursday's class. The write-up should be in 12-pt font, with only salient figures and tables, title and date, and a max of 4 pages. It should include the original question along with the answer and be clear enough to make sense to your boss, your parents, or a fellow student in Tazmania.

Standard Statements for Graduate 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/graduate-calendar/general-regulations/academic-misconduct/) is outlined in the Graduate 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.

Use of the SAS Exam Centre requires students to make a booking at least 10 business 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 Accommodation of Religious Obligations (https://calendar.uoguelph.ca/graduate-calendar/general-regulations/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

Courses that are one semester long must be dropped by the end of the last day of classes; two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for Dropping Courses (https://calendar.uoguelph.ca/graduate-calendar/general-regulations/registration/) dropping courses are available in the Graduate Calendar (https://calendar.uoguelph.ca/graduate-calendar/general-regulations/registration/).

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 Graduate Calendar for information on regulations and procedures for Academic Consideration (https://calendar.uoguelph.ca/graduate-calendar/general-regulations/grounds-academic-consideration/).