

Course Outline Form: Winter 2017

General Information

Course Title: MATH*6071 Biomathematics

Course Description: The application of mathematics to model and analyze biological systems. Specific models to illustrate the different mathematical approaches employed when considering different levels of biological function.

Credit Weight: 0.5

Academic Department (or campus): Mathematics & Statistics

Campus: University of Guelph

Semester Offering: Winter 2017

Class Schedule and Location: TUE, 14:30-15:40, SSC1504, MACN434
THU, 14:30-15:50, SSC1504

Instructor Information

Instructor Name: Hermann J Eberl
Instructor Email: heberl@uoguelph.ca
Office location and office hours: MACN508, THU 9:30-10:30

Course Content

Specific Learning Outcomes:

- Students will be introduced to selected current research topics and techniques in Mathematical Biology
- The course will improve the students' science literacy
- This course will improve the students' scientific communication skills

Course material:

This course will introduce students to selected current research topics in Mathematical Biology. These will be drawn from the current scientific literature in the areas of infectious diseases modeling, theoretical ecological modeling, microbial population and resource dynamics, and modeling and simulation in biofluid dynamics. Mathematically

this will rely primarily, but not exclusively on differential equations and their applications (including qualitative and quantitative techniques).

Course components:

Introductory lectures. A cursory overview will be presented of selected basic modeling concepts for infectious diseases, ecological and microbial systems, as well as some key results in these areas. These lectures will serve as a refresher for those students who have taken undergraduate courses in Mathematical Biology previously, and as an introduction for those students who have not had undergraduate exposure to Mathematical Biology. These lectures will form the foundation for several *research seminars, student presentations, group projects, and research summaries* throughout the course.

Group project. In groups, students will explore mathematical models of microbial systems, using a combination of qualitative and quantitative analytical techniques. The findings of the group projects will be documented in a written report.

Student presentations. Early on in the semester, each student will be assigned one or more research papers from the current Mathematical Biology literature and prepare a presentation of the material to the class. A short (10 minutes, including discussion), preliminary presentation will be due in the first half of the semester (before reading week), the main presentation (40 minutes including discussion) will take place in the second half of the semester (after reading week).

Research seminars will take place approximately bi-weekly, given by experts in the field. Each seminar presentation will conclude with a discussion section in which the students will be expected to contribute. The research seminars will also provide the framework for the research summaries.

Research summaries. Approximately bi-weekly, the students will submit a summary of a research paper from the published literature in their own words. These papers will be thematically related to the research seminars from the preceding week. A template for the research summaries, including a questionnaire will be provided.

Expectations.

This course will introduce students to research in Mathematical Biology. Accordingly, independent reading of published articles from the scientific literature will be an important aspect throughout the semester. Depending on the students' background they should expect that this might require additional work in preparation of the assigned course reading. In written assignments (research seminars, group projects) and in oral presentations, the students will be required to express themselves in adequate scientific literary form. This will involve the use of suitable software for mathematical typesetting.

Assessment and Grades

Course Assignments and Tests:

Bi-weekly research paper summaries are due in class as per the following schedule

Assignment/summary 1	Jan 24
----------------------	--------

Assignment/summary 2	Feb 7
Assignment/summary 3	Feb 28
Assignment/summary 4	Mar 7
Assignment/summary 5	Mar 21
Assignment/summary 6	Apr 4

Reading assignments will be posted approximately two weeks before the due date on <http://www.uoguelph.ca/~heberl/M6071.html>

Research Seminars

Bi-weekly research seminars will take place as per the following schedule

Seminar 1	Jan 17	SSC1504, 14:30
Seminar 2	Jan 31	SSC1504, 14:30
Seminar 3	Feb 14	SSC1504, 14:30
Seminar 4	Feb 28	SSC1504, 15:00
Seminar 5	Mar 14	SSC1504, 14:30
Seminar 6	Mar 28	SSC1504, 14:30

The seminars are part of the departmental Biomathematics and Biostatistics seminar series. Topics with abstracts will be announced ahead of the seminar on <https://mathstat.uoguelph.ca/>.

Final examination date and time: This course has no final exam

Student presentations: will be scheduled in class

Student projects: project reports are due on Mon April 18 (softcopy in pdf form)

Grades:

Research summary assignments (<i>best 5 out of 6 at 5% each</i>)	25%
Presentation (<i>Final presentation at 25%, Preliminary/flash presentation at 5%</i>)	30%
Seminar participation (<i>research seminars and student presentations</i>)	20%

Group projects (*final written report*)

25%

Course Resources

Required textbooks: none

Required research reading: research articles will be announced in class

Software: LaTeX, <http://www.latex-project.org/get/>

Research Seminar announcements: <https://mathstat.uoguelph.ca/events/>

Other Resources:

- Software for the numerical exploration of differential equations, such as xppaut, octave, R etc
- Additional resources (literature and software) will be announced in class and links will be provided on the course web-page: <http://www.uoguelph.ca/~heberl/M6071.html>

All literature for this course will be accessible without cost through the library; all computational tasks can be performed with free software for the standard operating systems Linux, MacOS, Windows. Students will need access to a computer.

Course Policies

Grading Policies

- late assignments will not be accepted without *a priori* instructor consent
- see also <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-grds.shtml>

Course Policy on Group Work:

- Literature summary assignments are individual work; group submissions will not be accepted.
- The model exploration project will be group projects; individual submissions will not be accepted.

Course Policy regarding use of electronic devices and recording of lectures

Electronic recording of classes is expressly forbidden without consent of the instructor. When recordings are permitted they are solely for the use of the authorized student and may not be reproduced, or transmitted to others, without the express written consent of the instructor.

Additional Course Information

The use of computers is an important part of this course. All students must make sure that they have access to a suitable computer (e.g. through CPES computing laboratories, their personal computers, or resources in their grad student offices). We will use software that is freely available for Linux, Windows and MacOS/X operating systems.

University Policies

Academic Accommodation of Religious Obligations

If you are unable to complete a course requirement due to religious obligations, please let the instructor know within the first two weeks of class. See the academic calendar for more information:

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomreliq.shtml>

Academic Consideration

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, id#, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Academic Misconduct

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 is detailed in the Undergraduate Calendar:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Student Accessibilities Services (SAS) as soon as possible.

For more information, contact SAS at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

Course Evaluation Information

Please see <http://www.mathstat.uoguelph.ca/files/TeachevaluationformF10.pdf>

Drop date

The last date to drop one-semester courses, without academic penalty, is Friday, March 10, 2017. For regulations and procedures for Dropping Courses, see the Academic Calendar:
<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>