MATH 462: Projects in Mathematical Biology

January-April 2020 Syllabus

COURSE INFORMATION

Instructor:	Daniel Coombs
Email:	coombs@math.ubc.ca
Phone:	604-822-2859
Office Hours & Location:	Mondays, 1pm-2pm and Wednesdays, 11am-12pm, and by appointment. Office: Math Annex 1109
Pre-Requisites:	Math 345 or Math 361, or equivalent experience

LECTURE DATES | TIMES | ROOMS

Lecture:	MWF 10am
	Mathematics 225

COURSE DESCRIPTION

Development and analysis of mathematical models for complex systems in ecology, evolution, cell biology, neurophysiology, and other biological and medical disciplines.

LEARNING OBJECTIVES

After the course, students will be able to:
- Formulate and analyze mathematical models of biological phenomena
- Apply dimensional analysis and scaling arguments for biological phenomena
- Confidently read mathematical modelling studies; critique their methods; understand their strengths and limitations
- Attend research seminars in mathematical modelling of biological systems and have some idea of what is going on
- Complete a biological modelling project and present the results of the project in different formats
- Use a computer to implement simple numerical methods to solve problems arising in class

COURSE ORGANIZATION / STRUCTURE

- For the first 9-10 weeks of the semester, there will be regular homework sets, mostly based on reading and understanding published modelling papers. Students will also present work related to the homework sets in class.
- Submitted work should be typed and formatted neatly (lengthy mathematical derivations may be handwritten and attached). Homework can be submitted by email (as a single PDF file, less than 10MB) or submitted as a hard copy in class.
- Students are expected to attend and report on at least two relevant research seminars at UBC during the semester. Suggestions of seminars to attend will be given.
- Shortly after the reading week break, students (individually or in small groups) will complete a major mathematical modelling project. This project will be structured as follows. Students will propose their project in class and submit a short summary of what they intend to work on. After a few weeks they will present preliminary results in class. At the end of the semester, students will write a 10 page summary paper describing their modelling, results and conclusions, and give a 30-minute final presentation in a mini-conference format. The final presentations will take place at a time to be scheduled during the first week of the exam period and the final papers will be due by April 24, 2020.
- Participation in all classes is an important part of learning and good attendance is mandatory.
- There will not be a midterm or a final exam.

STUDENT EVALUATION

Evaluation Method	Percentage of Final Grade
Homework and minor presentations	45%
Attendance and reporting (research seminars)	10%
Modeling project	40%
Active participation in class	5%
TOTAL	**100%**

LATE POLICY

Late homework will not be accepted without prior approval. Requests for regrading of any work must be made by email before the class following return of the grade.

COURSE MATERIALS

Course readings and other materials will be posted on Canvas or the instructor's web site.

COURSE SCHEDULE

subject to dynamic updates – precise topics will depend on student preferences and interests, to be discussed!

Week	Date	
1	Jan 6,8,10	Introduction, scaling laws, re-scaling of equations
2	Jan 13,15,17	Differential equations models for chemical kinetics, ecology and epidemiology applications
3	Jan 20,22,24	More on DE models; numerical methods
4	Jan 27,29,31	Chaos in population dynamics
5	Feb 3,5,7	Adding spatial effects to DE models
6	Feb 10,12,14	Catch-up and continuation week
-	Feb 17,19,21	**Reading week - no class**
7	Feb 24,26,28	Topics TBA; *Begin project discussions*
8	Mar 2,4,6	Topics TBA; *Project proposals (in class and on paper) this week*
9	Mar 9,11,13	Topics TBA
10	Mar 16,18,20	Topics TBA
11	Mar 23,25,27	Topics TBA
12	Mar 30, Apr 1,3	Topics TBA; *Preliminary results presentations (in class)*
13	Apr 6,8	Topics TBA
	During Apr 14-17	*Final presentations (time to be scheduled).*
	By 5pm, Apr 24.	*Final project write-ups due.*

UBC POLICY ON ACADEMIC INTEGRITY

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

For more information, see: http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0

ACADEMIC CONCESSION

The University is committed to supporting students in their academic pursuits. Students may request academic concession in circumstances that may adversely affect their attendance or performance in a

course or program. Students who intend to, or who as a result of circumstance must, request academic concession must notify their instructor, dean, or director as specified in the link below. http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,48,0,0

STATEMENT ON UNIVERSITY'S VALUES AND POLICIES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students ae expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here: senate.ubc.ca/policies-resources-support-student-success.

LAND ACKNOWLEDGMENT

This course is held on the UBC Point Grey (Vancouver) campus, which sits on the traditional, ancestral, unceded territory of the xʷməθkʷəy̓əm (Musqueam) First Nation.