Introduction to Mathematical Biology

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Course description

This course provides an introduction to mathematical modelling with a specific focus on questions in biology. We will focus on models of biological systems and their analysis using various tools including dimensional analysis and non-dimensionalization, stability analysis, bifurcation theory, multiple time scale analysis and various computational methods (using matlab or python, XPPAUT). We'll start with ODE models and their analysis. Later in the course, we will focus on probabilistic and stochastic models, using the latter to derive some simple ODE models to build intuition into what lies behind most deterministic (ODE/PDE) models.

Although no formal background in biology is required, topics from across the life sciences will come up. The focus will be on the mathematics and any biological knowledge needed will be introduced in class.

Course details

Lectures: MWF 12:00 -12:50 pm

Location: SWNG 407

Instructor: Prof Eric Cytrynbaum (he/him)

Contact: via Piazza or email to cytryn@math.ubc.ca

Office hours: Immediately after lecture (the room is unused) or by appointment if you aren't free after lecture.

Schedule (https://canvas.ubc.ca/courses/192110/pages/schedule)

Resources (https://canvas.ubc.ca/courses/192110/pages/resources)

Learning goals (https://canvas.ubc.ca/courses/192110/pages/learning-goals)

Final Exam Information (https://canvas.ubc.ca/courses/192110/pages/final-exam-information)

Workload

1. There will be six quizzes throughout the term, roughly every two weeks. I will drop your lowest one.

2. There will be six assignments posted throughout the term. These will be optional. Submitted assignments will be "marked" with feedback but are not for points. Solutions will be posted shortly after the deadlines. It is strongly recommended that you work on all assignment questions BEFORE solutions are posted (whether or not you submit them) because reading solutions is a far less effective method of learning than working things out yourself. See the course AI policy below for more details on use of AI for studying.

3. Final exam.

Grading scheme:

Quizzes (6, drop one)	10 pts each	50 pts
Final exam		50 pts

Missing quizzes, exams, late homework

If you are unable to attend more than one quiz (one can be dropped as described above), you must submit an **Academic Concession form (https://www.math.ubc.ca/undergraduate-academic-concession-form)** by email to me before (preferred) or within two days after (only in the case of emergencies) the quiz date. Provided the concession is granted, your final exam mark will be used in place of the missing quiz mark. Undocumented absence from more than one quiz will result in a score of zero on all but the first missed quiz.

No extensions for the homework will be given.

As always, DO NOT make any travel plans for December until the exam schedule is announced (some time in October) as no accommodation will be made for students unable to attend the final exam due to conflicting plans.

AI Policy

As grades in this course are based on quizzes and the final exam, for which access to electronic devices will not be allowed, the use of AI in this course is a question of study habits. If you do use AI to assist with studying, I strongly recommend that you use a system prompt (see also master

prompt or custom instructions) instructing the AI to treat any questions that you ask about assignment problems as requests for tips, hints, and subtle guidance. For example, here is something you could add to your system prompt:

`Whenever I preface a question with "Math 361", treat it as a request for TA-style guidance on a course problem, not a request for the solution. In that mode:`

- `Ask what I've already tried and where I'm stuck before offering anything.`
- `Point me to the relevant concept, lecture, or section rather than applying it for me.`
- `Give hints one small step at a time – never chain enough hints together that they add up to the full solution. If I keep asking for "just one more hint," notice that and redirect me to explain my own reasoning instead.`
- `If I share my own attempted solution, you can react to it directly – say what's wrong or right, without supplying the corrected version yourself.`
- `You can fully explain underlying concepts, definitions, and worked examples on different problems – the restriction is on solving the specific assigned problem, not on teaching the material.`
- `If I ask directly for the final answer, decline, briefly explain why, and redirect to the next step I should try myself.`
- `This only applies to problems I flag as Math 361 homework; general questions get your normal help.`

Land Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (Musqueam). The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on culture, history, and traditions from one generation to the next.

If you would like to know more about the joint history of UBC and Musqueam, one place to start is at UBC's **Indigenous Portal (https://indigenous.ubc.ca/)** .