**MAT 124: Mathematical Biology**

This is a preliminary syllabus only. It is subject to change and will be finalized prior to the start of the Spring 2020 quarter.

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<thead>
<tr>
<th>Class Time:</th>
<th>MWF, 10:00-10:50 AM, Olson 101</th>
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<tbody>
<tr>
<td>Instructor:</td>
<td>Stephanie Dodson, <a href="mailto:sadodson@ucdavis.edu">sadodson@ucdavis.edu</a></td>
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<tr>
<td>Office:</td>
<td>Mathematical Sciences Building, Room 2145</td>
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<td>Office Hours:</td>
<td>TBD</td>
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<td>Course Website:</td>
<td>Canvas</td>
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**Course Description**

Mathematical biology is a rich area of active research that seeks to answers questions about the firing of single neurons to the life cycles of fish. Through the lens of neurological systems and population biology, we will study phenomenon spanning the milisecond to year time scales and individual to population levels. A large focus will be on linking the observed behaviors to the mathematical model. Depending on time and interest, models and analysis will be drawn from systems of linear and nonlinear differential equations, network dynamics, weakly coupled oscillators, stochastic processes, agent-based models, and partial differential equations. Numerical methods (preformed in MATLAB) will be used to complement the analytical material.

**Prerequisites:** MAT 22A or 67 (Linear Algebra) and MAT 22B (Ordinary Differential Equations)

No neuroscience background is required. Minimal coding experience is assumed.

**Learning Outcomes**

This course aims to introduce students to an array of models and analytic techniques commonly used within the mathematical biology community. By the end of the course, students will be able to:

- Design mathematical models in biological applications
- Communicate model assumptions and objectives
- Interpret model solutions and qualitative behaviors in the context of the application
- Locate and determine stability of equilibria points
- Construct and interpret phase portraits of linear and nonlinear dynamical systems
- Use numerical approaches to simulate and solve biological models

**Class Time**

I highly urge you to attend all classes. Class time will include lectures and short active learning problem-based sessions and will give you the opportunity to see the material first hand. Math is best learned by doing! The active-learning activities will help you by enhancing conceptual understanding of the material.

**Homework**

The (roughly 8) weekly homework assignments will allow you to practice the course concepts, and allow for the most direct and individualized feedback about how you are progressing as a learner.

- Assignments will be available online every Wednesday, and are due the following Wednesday at the beginning of class (10 AM).
- Late assignments will not be accepted without a legitimate excuse and prior approval.
- Students are encouraged to collaborate on homework assignments, but assignments must be written up separately and individually.
• Homework assignments must take the form of a single, stapled packed with your name and neatly written (or typed) solutions labeled with problem numbers. Solutions should show all work, not just the final answer. Assignments that do not meet these requirements will receive a 20% deduction.
• If you cannot attend class on the day an assignment is due, drop it off at my office prior to 9:30 AM.

Exams
Exams will not be given at any other times, except in classes of severe illness or family emergency. If a serious conflict arises, you need to contact me as soon as possible and documentation verifying the excuse will be required.

– Midterm: TBD

No calculators or notes are permitted on the exam.

The final exam will taken the form of a group project. In groups of 3-4, students will investigate a chosen topic by reading and reproducing results from a scientific paper. Appropriate papers will be provided for groups to select from, but groups have some freedom in the topic as long as it is related to the course content. Assessment will include a final group presentation and papers written individually by each member of the group.

Guest Seminars
In this course, we will only be able to cover a small fraction of active areas of research in mathematical biology. To highlight the diversity of mathematical biology research at UC Davis, during the quarter three faculty and/or graduate students will guest lecture about their research. Attendance at these lectures will count as additional homework grades. Dates and topics TBD.

Assessment

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<tbody>
<tr>
<td>Homework</td>
<td>35%</td>
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<tr>
<td>Midterm Exam</td>
<td>30%</td>
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<td>Final Project</td>
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Course Materials
There is no required textbook. Course notes and homework will be posted on the course webpage. Optional text resources that will complement the course material are (will continually be updated)

• Mathematical Physiology I: Cellular Physiology by James Keener and James Sneyd, published by Springer 2009.

Accomodations for Students with Disabilities
Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Student Disability Center (SDC). Faculty are authorized to provide only the accommodations requested by the SDC. If you have any questions, please contact the SDC at (530) 752-3184 or sdc@ucdavis.edu. If you are given accommodations for exams, please let me know a minimum of 2 weeks before the midterm so that I have time to make appropriate arrangements.
Diversity and Inclusion Statement
I strive to create a learning environment that supports a diversity of thoughts, perspectives, experiences, and honors your identities. To help accomplish this:

- As a participant in class discussion and recitation sessions, you should strive to honor the diversity of your classmates and differing viewpoints the diversity contributes.

- If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know.

- Please come talk with me if you feel your performance in the course is being impacted by your experiences outside of class, including, but not limited to, religious holidays, family emergencies, jury duty, and long-term health problems.

- If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

Additional Course Policies and Expectations

- Please create a respectful learning space for your peers by arriving before the start of class and not using cell phones or computers during class time without prior approval.

- All announcements will be posted on the course webpage (Canvas). It is your responsibility to check the webpage periodically for assignments and notes.

- Emails to me will be answered within 24 hours on weekdays and 48 hours on weekends. Please respect these timelines and be courteous and professional in emails.

- All students are expected to comply with and uphold the principles described in the UC Davis Code of Academic Conduct.

- I am here to facilitate your learning; let me know if you have questions! I can always be reached by e-mail, and can schedule additional office hours.

Course Outline
TBD