

AMATH 410, Introduction to Computational Biology and Chemistry  
Case Study Presentation and Course Project

**These two components will represent 5 and 35 percent of the course grade.**

The point of the case study and course project is to allow each student to explore the area of the computational life sciences covered in AMATH 410 that most interests him or her. Both will also allow students to proceed at a pace, with computational and mathematical tools, that are an appropriate challenge to him or her. The course project should therefore be a serious, challenging, and an enjoyable undertaking.

**GUIDELINES FOR CASE STUDY PRESENTATION:**

- **Identify a paper from the research literature on which to base your case study presentation and course project (see below).** Each student will give a brief (5 minute) in-class presentation of a paper that applies the modeling and computational techniques we have learned in the course. These studies will then be developed into course projects.
- Confirm this paper with me in office hours OR the Tues. lab session **before** you start your presentation or project.
- For your case study presentation,
  - Prepare 3 slides (powerpoint, or other software). Slide 1: intro to topic. Slide 2: mathematical or computational model used. Slide 3: conclusions / insight from this model. If there are many different conclusions, summarize or pick several key conclusions.
  - Either (1) print out a hardcopy of these slides on transparencies (overheads), much preferred OR (2) print out nine (9) copies of the slides on paper, and bring them to class the day you are to present. A hardcopy is required and electronic copies are **not** acceptable – do not bring your presentation on a disk or laptop or email it to me. This is to save time with projector setup (with eight presentations to do in very limited time).
  - Prepare and **practice** a 5 minute presentation of the main ideas in these three slides. Time yourself as you practice – it is difficult to give a summary of anything in 5 minutes, and you will only have and only be graded on a timed 5 minutes the day you present! This is exactly what happens in many research conferences.

**GUIDELINES FOR COURSE PROJECT:**

- Write MATLAB code that implements one of the central models in the paper (or the central model, if there is only one), and reproduce one to three of the associated figures in the paper.
- Identify an interesting new question that can be asked about the model and topic of the paper.
- Extend or modify the MATLAB code to answer this question.
- Prepare a paper describing your findings. This paper should have 5 sections: introduction, reproduction of results in paper, novel results, discussion, appendix. The appendix should include all MATLAB code used to reproduce figures in the paper and to extend them to answer your research question.

**GUIDELINES FOR CHOOSING A PAPER AND TOPIC FROM THE RESEARCH LITERATURE:**

- The topic should be in the life sciences, at any scale.
- The model must be relatively simple / easy to implement in MATLAB using the techniques covered in class (either up to this point or the techniques to be covered later, as listed on the syllabus). MATLAB code for implementing the model must not be fully given along with the paper already, so there is some work for you to do here.
- A superb place to look for these papers is in the references section for each chapter of our textbook, Ellner and Guckenheimer (E+G).
- Some example papers and topics from Ch. 2 are below, to give you an idea of what to look for in this and any of the later chapters.
  - Easterling et al, 2002 (citation given on p. 29 of E+G).
  - The papers cited in section 2.6 of E+G: exploring elasticity and other questions.
  - The papers cited in section 2.7.2 of E+G: density dependence.