

Syllabus

Course description

Environmental Modelling: An overview.

Models give us a way to look at the world through a mixture of data and theory. A good model can help us to understand how the world works and how decisions that we make might change the world in ways that are important to us.

Style

Class will include a mix of lectures and in class hands-on examples, using students' own computers.

I will often provide an R-markdown document for you to go through prior to class so you can learn at your own pace and we will then use class time for the hands-on examples and assignments.

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Teaching team

Instructor: Naomi Tague (<https://tagueteamlab.org/>)

- **Office:** Bren Hall 4516
- **Office hours:** email to set a time
- **Email:** tague@ucsb.edu

Teaching assistant: Ojas Sarup

- **Office:** Bren Hall 1005
- **Office hours:** TBA
- **Email:** ojassarup@ucsb.edu

Where we will be

- **Lectures:** Tues, Thur 8:00am - 9:15 am (**BH 1414**)
- **Discussion Section 1** Tues 1:00pm-2:00pm (**BH 1510**)
- **Discussion Section 2** Tues 2:00pm-2:50pm (**BH 1510**)

please attend discussion section where. you signed up

Learning objectives

- Gain familiarity with different types of models and the situations where you might use them
- Understand how to choose the ‘right model’ for the job
- Know how to build simple models including
 - input-output models
 - basic dynamic models
 - matrix models
- Gain some basic skills that are useful in applying models including
 - parameter sensitivity analysis
 - uncertainty analysis
 - model calibration and evaluation

Computing

- I will assume that everyone has some basic R skills (from ESM 203, ESM 232, MEDS program courses or other courses), including how to use ggplot, and Rmarkdown and build simple functions
- Many classes will be working classes so bring laptop to class
- Some of the material (example functions and Rmarkdown code) will also be available on *github* I will also provide this material on *canvas* but if you are familiar with *git* then it may be faster to clone and then update the repository. We will discuss this further when we get to this part of the course

Tentative topics

Week	Lecture topics
April 2	Into and Conceptual Models
April 9	Constructing Simple Models in R
April 15	Sensitivity Analysis
April 22	Model Applications
April 29.	Dynamic Models
May 6	Stability and Sensitivity with Dynamic Models
May 13	Choosing and Evaluating Models
May 20	Model Calibration
May 27	Optimization
June 3	Discrete Dynamic, Wrap Up

Assignments

There are 8 assignments. Some assignments will be done in groups. Assignments will vary in length but most will be short coding assignments with a 1- paragraph write up.

Assignments will be submitted on Canvas *Canvas* provides grading rubrics that you may find helpful.

Protocols and Guidance

- Learning to program is hard and I may not always explain in a way that is accessible to you - So if you don't understand something *ASK*
 - ideally ask in class - you will help me to learn how to explain (or find an answer if I don't know it) and you will help others
 - if you don't feel comfortable asking , reach out to me or Ojas
- Environmental modeling and the coding involved gets better with practice and play - Don't just read the Rmarkdown - try the code, try variations on the ideas presented, make up stuff to try, get your feet wet
- Programming means making mistakes, expect it, stay calm and try again - if you get frustrated step away and come back; be creative
- **Respect and Support each other**
 - when working in groups, pay attention to your partner, if they are not at your skill level, help them learn - recognize that we all have different backgrounds
 - listen - different perspectives contribute to modeling - ask questions; figure out how different people *see* the world (what is there conceptual model)
 - you learn by helping others - do that!
- If you are really struggling, reach out to Ojas or myself, we can help (or if you just want to chat about something)