

Mathematical Modeling Syllabus, Spring 2023

- **INSTRUCTOR:** Dr. Hundley

OFFICE: Olin 222

OFFICE HOURS: Monday at 9, Wed at 2. I'm available online typically on Tuesdays and Thursdays (just send a quick email). On Friday afternoon, I can be available by appointment.

If you can't meet during office hours, you may drop by any time my office door is open.

OFFICE PHONE: 527-5151

EMAIL: hundledr@whitman.edu

Class Webpage: <http://people.whitman.edu/~hundledr/courses/M350.html>

- **Text:** "Introduction to Empirical Modeling", in progress. The course notes will be distributed as we go, and are available on our class website (as they are distributed) or on CLEo.
- **Technology:** We'll be using Matlab extensively. There is a free version of Matlab, called Octave, that can be either downloaded to your home computer, or you can work with it online. If you use it online, you'll probably want to create an account with them (it's free).
- **Grading Criteria.**

- HOMEWORK/LAB WORK:

Homework and lab work is extremely important for the class, and will be assigned daily and collected weekly. You are expected to produce your own solutions to all homework problems! There may be occasions when we do "group work", and even in those cases, each student should turn in their own copy of the work.

We'll discuss turning in solutions later (sometimes this can be done electronically). Collectively, homework will account for 25% of the overall grade.

- EXAMS:

We will have two midterms, one during week 5 (Feb 15th), one at week 11 (Apr 12) and a final exam. The exams are set for two Wednesdays, but may be moved to that Friday with at least a week's notice (it depends on where we are in the course material); They will all be weighted equally, and will take 75% of the overall grade. Some of these may have a take home (Matlab/Octave) component.

GRADING: Grading is done on a standard scale:

90-100%=A, 80-89%=B, 70-79%=C, 60-69%=D, 59 and below=F

I will use the plus/minus grading only sparingly in borderline cases.

- Help! I encourage you to come see me. If you can't make it during office hours, either email me if you have short questions, or make an appointment.
- Academic Honesty. Academic standards will be *strictly* adhered to as outlined in the College's policies. This means that cheating will not be tolerated. Looking at another student's exam or quiz (whether or not you mean to copy answers) while taking it will be considered cheating. *Please don't test this policy!* Students caught cheating for the first time will fail the exam or quiz during which the cheating took place, and the Dean of Students will be notified. Continuation of this behavior will lead to an automatic failing grade for the course, and may include other administrative action.
- If you have a learning disability, please let me know as soon as possible so that we can make alternative assessment methods. Please do not wait until the day of the exam!

I would like to create a learning environment for you that supports a diversity of thoughts, perspectives and experiences. To help accomplish this:

1. If you have a name and/or set of pronouns that differ from those that appear in your official College record, please let me know (feel free to send me an email if that's easier for you).
2. If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with me. I want to be a resource for you. Remember that you can also submit anonymous feedback. Also, the Academic Resource Center has a great staff that are there to help you as well.
3. I (like many people) am still in the process of learning about diverse perspectives and identities. If there was something in class that made you feel uncomfortable, please talk to me about it. (Again, anonymous feedback is always an option).

Religious Accommodations as required by Washington State:

In accordance with the College's Religious Accommodations Policy (link below), I will provide reasonable accommodations for you if, because of religious observances, you have conflicts with scheduled exams, assignments, or required attendance in class. Please review the course schedule at the beginning of the semester to determine any such potential conflicts and let me know by the end of the second week of class about your needs for religious accommodations. If you believe that I have failed to abide by this policy, the link to the grievance policy is also included below, as per state law.

Link for the College's Religious Accommodations policy:

<https://www.whitman.edu/campus-life/diversity/intercultural-center/religious-and-spiritual-life/religious-accomodations>

Link for the College's Grievance policy:

<https://www.whitman.edu/human-resources/grievance-policy>

Link for the Washington State law:

<https://app.leg.wa.gov/RCW/default.aspx?cite=28B.137>

- **General Discussion of Topics**

Mathematical modeling is the process by which we translate some physical process into mathematical statements. There are several ways of doing this- Some modeling classes are mostly statistics, some are mostly differential equations (or partial differential equations), and still others are physics-based. Most of this class will look at empirically driven models, or models that come from analyzing data.

The main methods of analysis come from Calculus, linear algebra and statistics. It will also be important for us to implement algorithms on the computer, so we'll use Matlab fairly extensively. Initially, we won't do a lot of programming, but you will need to be able to read and change some basic code.

First, we go to some simple statistical models, where we look at the n armed bandit, learn Matlab, then we'll look at "genetic algorithms".

We then go back into linear algebra, discuss some topics from statistics, and we'll look at some basic face recognition algorithms.

Once we've looked at building linear functions, we move to general nonlinear functions. We'll select from topics in Data Clustering, and Neural Networks.