

# HSSP 14095: Mathematical Models and How to Build One

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## Course Description

So, when ARE you going to use all the math you have been learning? In this class, we will talk about the how mathematical models are constructed, what they can do for us, and how you could build one!

Join us if you'd like to model anything from language death to games of rock-paper-scissors. In the latter part of the course, we will make models from scratch to study phenomena of your choice!

## Prerequisites/Corequisites

Limits, basic probability, derivatives. Integrals would be helpful but are not required.

## Course organization

Each week, we will upload slides and any other documents used in the class.

All the videos for the course will appear in this YouTube playlist: [https://www.youtube.com/playlist?list=PLn\\_cBC3Z\\_ENLnkiHHQaFQIgoUIPGRjkN7](https://www.youtube.com/playlist?list=PLn_cBC3Z_ENLnkiHHQaFQIgoUIPGRjkN7)

## Learning objectives

After taking this class, students will be able to:

1. Describe an overview of the modeling process.
2. Critique the assumptions of simple mathematical models.
3. Describe some ways that word problems can be translated into math.

## **Course Structure**

**Lesson 1: Introduction**

**Lesson 2: Population growth and competing languages**

**Lesson 3: Leveling up: RPG core engines**

**Lesson 4: TBD!**

Stay tuned for an upcoming survey about what you might want to learn about!

**Lessons 5-6: Make Your Own**

## **Modeling approach**

1. Define the problem.
2. Make assumptions. What is important? What can we omit?
3. Define variables. What do we want to know?
4. Build a model and look at the solutions. Look at a
5. Analyse your model. What are its strengths? Where are the weak points? How do we know if a model is good?

## **Inclusion statement**

In an perfect world, math would be objective. Unfortunately, some universal truths of mathematics have been exploited to build biased algorithms and to make biased arguments. Anyone building a mathematical model should be acquainted with the ways subjectivity enters into mathematics. We hope that we can highlight these instances and give you the tools to recognize bias in modeling.

It is our intent that students from all diverse backgrounds and perspectives be well-served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that the students bring to this class be viewed as a resource, strength and benefit. It is our intent to present materials and activities that are respectful of diversity: gender identity, sexuality, disability, age, socioeconomic status, ethnicity, race, nationality, religion, and culture. Your suggestions are encouraged and appreciated. Please let us know of ways to improve the effectiveness of the course for you personally, or for other students or student groups.