Math 087 **Mathematical Modeling and Computation** **Spring 2024**

Course Information

TIME: R+ block (Mo, We 9:00–10:15)
LOCATION: see SIS (this is an in-person class)
INSTRUCTOR: George McNinch
PREREQUISITES: Math34 (calculus) & Math 70 (linear algebra)
QUESTIONS: please e-mail `george.mcninch@tufts.edu`
OFFICE: 559 JCC

COURSE DESCRIPTION:

Mathematical modeling concerns the use of techniques and ideas from mathematics to predict, describe, and attempt to understand the behavior of real-world systems. A model may help to *explain a system* and to make *predictions about its behavior*.

The course will introduce some computational techniques as tools for the study of mathematical models. The course does not assume prior knowledge of computer programming, but in the course you will learn to write and use some code (we mainly use the Python language and several libraries for scientific computing) to develop models.

The models considered can involve:

- continuous mathematics (such as differential equations and linear programs), and
- discrete mathematics (for example, graph methods and integer programming).

Moreover, there are various approaches to a modelling:

- deterministic approach (a *deterministic model* always performs the same way for a given set of initial conditions)
- stochastic approach (*randomness* is present, and variable states are not described by unique values, but rather by *probabilities*)

In the course, we will study methods and models of each flavor.

WHAT CAN YOU EXPECT FROM THIS COURSE?

There will be weekly homework assignments; typically these will involve some combination of pencil-and-paper work and computer code.

There will be two *midterm reports* and a *final report*; expect the prompts for the reports to be more involved than the homework questions; also, you are expected to compose your responses carefully, in the style of a lab report.

Your grade in the course will be determined by your performance on the homework and the reports.

WHY WOULD YOU WANT TO TAKE THIS COURSE?

The course is aimed at students who have an interest in computational mathematics and applied modeling. The course introduces various widely used application oriented modeling techniques and tools. The course should be a good starting point for students interested in participating in the annual Mathematical Contest in Modeling.