Fall 2024

COSC/MATH 201

Modeling and Simulation

WOFFORD

👨🏻‍🏫 INSTRUCTOR

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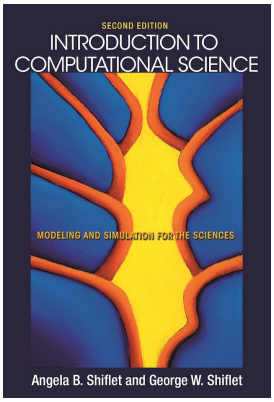
⏰ Office hours will be held **Mondays (1:00-2:30PM), Tuesdays (12:30PM-2:00PM), Wednesdays (2:30PM-4:30PM), and Thursdays (9:00AM-11:00AM)**. We can also individually schedule other times, if needed. I am always happy to chat!

🗺️ MEETING TIME & LOCATION

We will meet every Monday, Wednesday, and Friday (unless otherwise specified):
- (Section A) from 9:30AM - 10:20AM in **OLIN 212**
- (Section B) from 10:30AM - 11:20AM in **OLIN 212**

📖 TEXTBOOK

You will need to obtain a copy of Introduction to Computational Science: Modeling and Simulation for the Sciences (2nd edition) by Angela Shiflet and George Shiflet.



📋 COURSE OVERVIEW

Welcome to **COSC/MATH 201: Modeling and Simulation**!

This course serves as an introduction to the field of **computational science**, an exciting intersection of *computer science*, *mathematics*, and the *sciences* (biology, chemistry, physics, etc.). With the advancement of computers, scientists now have more potential than ever to explore and solve extremely large and difficult problems. Using computers, they can abstract problems into models, then run simulations on these models to hopefully yield interesting results. Problems being studied include understanding galaxy formations, finding cures for diseases, and training a robot to drive on the surface of a planet it has never encountered. One recent example has been using computers to study the spread of COVID-19.

Topics will include *system dynamics models*, *empirical modeling*, *cellular automaton simulations*, *agent-based simulations*, *computational error*, and *Monte Carlo simulations*. Students will investigate the implementation of algorithms in various scientific programming environments. Time permitting, other topics to be explored include *high-performance computing* and *matrix models*.

Prerequisites: MATH 181 (*Calculus I*) with a minimum grade of D.

Catalog Description: An introduction to modeling and simulation as part of the interdisciplinary field of computational science. Large, open-ended scientific problems often require the algorithms and techniques of discrete and continuous computational modeling and Monte Carlo simulation. Students learn fundamental concepts and implementation of algorithms in various scientific programming environments. Throughout, applications in the sciences are emphasized.

✅ COURSE OBJECTIVES

By taking this course, my goal is for you to:

- **Gain an understanding of the modeling process** and how to utilize it.
- **Learn a variety of different modeling techniques** such as system dynamics models, empirical models, data-driven models, and agent-based models.
- **Learn how to run computer simulations using models** to understand real-world problems, including simulations with randomness.
- **Use computational tools** to solve dynamical systems and cellular automata
- **Understand the importance of computational error** and its effects on simulations.
- **Develop skills to understand, interpret, and solve problems** that you have never seen before.
- **Explore the R programming language**, a programming language that is popular within data science, statistics, and computational science.

You will fulfill these objectives by:

- Reading your textbook
- Completing multiple hands-on projects
- Taking two midterm exams and a final exam
- Being engaged during in-class discussions and activities

📝 GRADING

All grades will be recorded in Moodle as the semester progresses, including your final grade. Your final grade will be weighted as follows:

Projects (40%)

You will complete multiple projects to help solidify your understanding of the material, each submitted via Moodle. They will be equally weighted, and each given a grade out of 10 points.

Midterm Exams (40%)

There will be two midterm exams given during the semester (15% each), where you will be tested on your knowledge of the material up to that point.

Final Exam (20%)

You will take one final exam at the scheduled time during finals week that will review everything covered during the semester.

GRADING SCALE

We will utilize the following grading scale (grades will be rounded, so a 92.49% will map to an A-, and a 92.5% will map to an A):

0% - 59%	F		80% - 82%	B-
60% - 69%	D		83% - 86%	B
70% - 72%	C-		87% - 89%	B+
73% - 76%	C		90% - 92%	A-
77% - 79%	C+		93% - 100%	A

📜 POLICIES

ATTENDANCE

You are expected to attend class. I do understand that absences are sometimes unavoidable, so I appreciate an email letting me know in advance that you will be absent. You are responsible for catching up on missed classes. Finally, in accordance with Wofford policy, you must be present for the final exam.

CLASSROOM

You are allowed to bring your computer to work along with the examples in class. I highly advise you, however, to not become distracted by your devices (notebook, phone, tablet, etc.) for things other than course-related use. Not only are you missing out and inhibiting your learning, but it is often a distraction to others as well. I strongly encourage you to use features such as **do not disturb** or **focus mode**. It is also worth mentioning that research has shown that taking notes by hand instead of typing results in a better learning experience.

LATENESS

You are expected to keep up with all coursework and due dates during the semester. Submitting coursework past the due date/time (even by a single minute!) will result in a 1 point penalty (out of 10) for that particular project. After that, you have 24 hours to submit the late work until a second penalty is given (another point). After 48 hours past the due date, the project will not be accepted under any circumstances and will receive a 0. There are a few reasons that are acceptable (medical, family emergencies, etc.), but I will usually only grant extensions for those cases when receiving an email or phone call before the due date. I will decide on a case-by-case basis, but having official documentation will help make your case.

COMMUNICATION

I will use email as my main means of communication. Feel free to contact me using "christbm@wofford.edu". The top of this syllabus shows other ways to contact me as well. You are also welcome to stop by office hours to chat about any questions or concerns you have.

ACADEMIC INTEGRITY

Please do your own work!

I have caught students cheating in the past, and take these matters very seriously. Any student I determine is guilty of academic dishonesty will have their case referred to the department and the college to be pursued further (trust me, you do not want that to happen). You may discuss ideas with other students, but **all work must be your own**. You can discuss approaches and ideas with others, but there should be no sharing of code.

To make sure you understand what constitutes academic dishonesty, please read the Wofford Honor Code. By enrolling in this course, you are pledging that you agree to the Wofford Honor Code and that all submitted work is your own. Please talk to me if you are unsure what constitutes academic dishonesty.

REASONABLE ACCOMMODATIONS

If you need accommodations with anything at all, please contact both the Wofford Accessibility Services and myself at the beginning of the semester. We will do our best to assist you as best we can.

USE OF GENERATIVE AI

Any AI-generated submissions are not permitted and will be treated as plagiarism. Any use of generative AI for any stage of your work in this course is considered a violation of the honor code. The one exception is the use of generative AI for syntax-related questions (e.g. "How do you write a for loop in Java?" or "How do I import a library in R?").