Scientific Investigations Using Computation
Syllabus

Spring 2023

Class time: Richardson Arts Ctr 112, Tues/Thurs 9:30 – 10:50 (in-person)
Lab time: Olin 212, Tuesday 2:30 – 5:30 (in-person)

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Office Hours:
Most Tuesdays: 1 pm – 2 pm
Most Wednesdays 10 am – 2 pm
(for other times, or to confirm, please send e-mail; see class website)

Instructor Website: **http://www.shodor.org/wofford/PanoffRM**

Course website: **http://www.shodor.org/wofford/panoffrm/COSC150/**

Communication: The Course Website will be one of the principal means of communicating information, assignments, and expectations. In addition we will use e-mail to contact each other during the semester.

Required Text: *Various articles, web resources, and background reading as posted to class website.*

Course Description: With improved and nearly-ubiquitous computational abilities, especially given the explosion of the amount of data, all of us now routinely utilize computational tools and technologies to ask and answer ***driving questions***, to formulate and test hypotheses, and to mediate our interaction with the real world. Thus, in addition to ***theory*** and ***experiment***, ***computation*** has emerged as a third major paradigm of science and learning. While running and modifying computational models across the mathematical,

physical, life and social sciences, we will explore important science concepts and implement scientific methods using computational tools to gain a better understanding of our world. We will focus on a driving question: ***How do you know if it is right?***

Learning Outcomes: In this course you can expect to experience the ***power of observation, the excitement of exploration, and the joy of discovery*** through studying models and simulations across the domains of mathematics and science. By the end of the course, you should advance in knowledge and skill in using a wide range of computer-based tools to:

- Understand scientific methods and their application through inquiry-based computational investigations in different sciences;
- Explore, experience, and express scientific modeling processes through multiple representations (*e.g.,* data, concept map, story, mathematical formulation);
- Demonstrate your ability to run, analyze, and extend ***empirical, system, and agent models*** through individual and collaborative work;
- Survey, analyze, and summarize literature on historical and current issues being addressed by scientists;
- Experience real-world examples of ***Computational Science, Data Science, and GenerativeAI;***
- Understand a range of models in your own primary field(s) of interest/study and –***by analogy and extension***– across the sciences;
- Demonstrate ability to perform simple *a priori* and *a posteriori* error analyses to address the fundamental question: **How do you know if it is right?**
- After reflection, you should be able to share your new knowledge through written and oral communications.

Computer Use in Class and Lab: Please use your laptop computer for every class and lab meeting. In specific cases, an iPad or many Android tablets may not be appropriate as they will not run some of the software environments we will use during the course. During the first lab meeting, we will work with you to load/test some of the necessary software we will use during the course.

Use of your computer, smartphone, or other device during class or lab time must be restricted to assigned course content and work and not for unauthorized web surfing, news checking, messaging or other social media or e-mail. Your focused attention is an essential component of your learning environment and for your contributions to class collaborative investigations and discussion.

Assessment: Your grade will be ***the grade that you earn*** by demonstrating the ability to interpret a variety of scientific models that you will run, modify and/or extend using a variety of computational tools. ***The work that will be assessed will be accomplished both in class, lab, and on your own time, including both individual and team assignments and projects.***

Besides class participation in discussion and presentations (10%) and lab explorations (40%), there will be written reflections and/or in-class quizzes (30%). There will be a final project (model plus paper) that will require a formal written presentation and in-class oral presentation (20%).

Final grades will be based on the following scale:

A: 91-100% B: 81-90% C: 71-80% D: 61-70% F: 0-60%

Note: "+" and "-" grades will reflect my judgment of your degree of class participation and/or improvement in class/lab work over the semester.

Academic Integrity: (Adapted, mostly copied, from A. Shiflet's 2014 Syllabus) The ***Wofford Honor Code*** requires students to maintain a high standard of individual honor and integrity. ***Work represented as your own must be your own***. You may not copy graded work, or models, or tests in any way from another person or from the Internet. All submitted work is to be pledged by you.

For some assignments you will work as a part of a team. In that case, these principles apply to a team as though it were an individual student. If doing work in a team, every member of the team should participate completely. It is a breach of the honor code to present work including the name of someone who did not fully participate in the project or to have work presented with your name when you did not fully participate in the project. ***You can always get my help on an assignment.*** Each student is responsible for reading and following the "Wofford Honor Code" at:

Wofford Honor Code

Generative AI Use: There *may* be times when the use of AI-generated text would be helpful and appropriate in this course, but you should obtain permission from the instructor for any use of Chat-GPT or other generative AI technologies. Students must cite any AI-generated material that informed their work (this includes in-text citations and/or use of quotations, and in your reference list). Using an AI tool to generate content without proper attribution qualifies as academic dishonesty.

Attendance: You are expected to attend every class and lab (see above), arriving ***on-time***. Do not expect classes to be recorded. If you know in advance (athletic or academic trips) that you cannot fulfill this expectation on a specific occasion, please inform me ***in advance***. *On the other hand,* ***if you become sick/contagious, please take care of yourself, and stay in bed and get better! Use the Wellness Center.*** Notify me when you can so we can make up what you missed. Otherwise-unexcused absences may not be eligible to make up lost work. False illness absences will be considered an honor code violation (See Point 7 in the Wofford honor Code).

Late Work: All assignments are due on or before the date/time announced. Unexcused late work will not be accepted.

Special Request: Please do not wear sunglasses, lacrosse helmets, other hats or caps, or have a hoodie pulled over your head. Please present yourself in a professional manner.

Mask Consideration: We are all in this together! If you choose to wear a mask, please be considerate of those who do not. The room is big enough for social distancing. If you choose not to wear a mask, please be considerate of those who do.

Accommodation: please let me know if you need any services as described: Wellness Center Accessibility Services