CS 3200: Introduction to Scientific Computation

Fall Semester 2022

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Office Hours: M 2:00-3:00 pm or by appt.

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Office Hours: M 11-Noon and Tu 4-5pm

Class Location & Time: WEB 1230, M/W 3:00 – 4:20 p.m.

Class Info

The class website will contain resources for the class including the syllabus, references, assignments, class notes, etc.

- **Class Website: https://my.eng.utah.edu/~cs3200/**

Class schedule (subject to change):

- https://my.eng.utah.edu/~cs3200/schedule.html

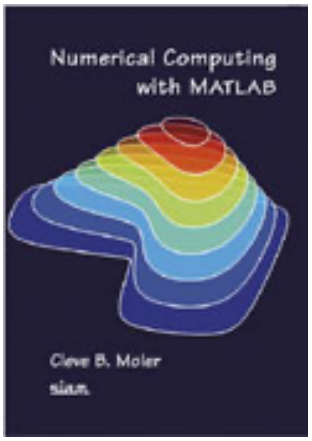
You will submit all your assignments using Canvas

- **Canvas: https://utah.instructure.com/**

If you have a question about the class or an assignment, please send it to:

- **CS 3200 Instructor Mailing List: teach-cs3200@sci.utah.edu**

Text



Unfortunately, there is not a textbook that covers all of the topics for the semester. However, we will use part of *Numerical Computing with MATLAB* by Cleve Moler during the course. The book is available for free on-line at: http://www.mathworks.com/moler/chapters.html.

Additional reading materials will be provided as PDF files from the class website. Several additional references can be found on the class website.

Software

We will primarily use Matlab and Python for homework assignments. Matlab is available for free from the campus Office of Software Licensing. Matlab is also available on the Engineering CADE lab computers: www.cade.utah.edu

Overview

CS 3200 serves as an introduction to several computational science and engineering techniques and tools, including modeling, simulation, and visualization. The goal is to create a course that will be useful to engineering and science undergraduates who are interested in learning more about problem solving using a computational approach. Basic knowledge of programming, matrix operations, and calculus is assumed. Topics we'll cover during the semester related to these areas including:

- **Modeling:** continuous, discrete, and statistical modeling of problems
- **Simulation:** solving linear and non-linear systems, interpolation & approximation, numerical differential equations
- **Visualization:** surface, scalar, and vector field visualization techniques

Objectives

Upon completion of this course, the student should be able to:

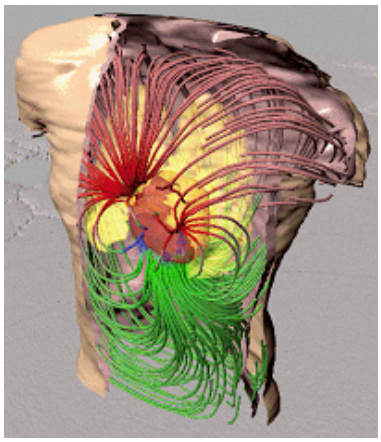
- Use polynomial interpolation to compute intermediate values in a data set for scientific computing and data science applications.
- Use numerical techniques for integration and differentiation to compute numerical approximations to integrals and differential equations.
- Solve systems of linear equations by using direct and iterative methods and understand when such procedures work and when they don't utilizing concepts such as the condition numbers.
- Solve nonlinear equations.
- Be aware of the challenges of using finite precision floating point arithmetic.
- Use common scalar and vector field scientific visualization techniques.

Grades

A final course grade will be computed from the homework (90%), in-class activities (10%), and extra credit opportunities (up to 5%). These values are subject to change.

Homework: Assignments will be handed out throughout the semester. Most homework will consist of computational implementations of the ideas discussed in lecture plus a written report describing your results. These assignments will be small in the number of lines of code but conceptually challenging. Homework may be discussed in small groups, but you MUST write your own code and report. Finally, you must disclose those whom you collaborate with.

In-Class Exercises: You will be assigned 10 in-class exercises, which you will have approximately 20 minutes to work on. You will not be graded on correctness but EFFORT. They will be graded on a scale of: 1% - attempted with effort, 0.5% - attempted with little effort, or 0% - not attempted. You must attend class to complete these activities. NO MAKEUPS!



Extra Credit: You can earn 1% extra credit (5% maximum) each time you attend a SCI Institute Distinguished Lecture, Visualization Seminar, or Image Analysis Seminar. To earn your credit, attend a lecture, and submit a 1-page report within 48 hours on canvas. The report should contain:

- *Your name*
- *The lecturer's name*
- *The lecture date and title*
- *One paragraph describing the problem being addressed*
- *One paragraph describing the proposed solution*
- *One paragraph describing the problem's relationship to the concepts covered in class*

Late Work

Assignments submitted late will receive a ZERO. Every student is allocated one (1) '*late pass*', which they may use on any assignment. A late pass gives the student one (1) extra week to turn in the assignment without penalty. Other exceptions to the late policy will only be made on a case-by-case basis for legitimate cause (unexpected visits to the hospital, etc.). Evidence of the cause is required (i.e. doctors note).

Academic Honesty

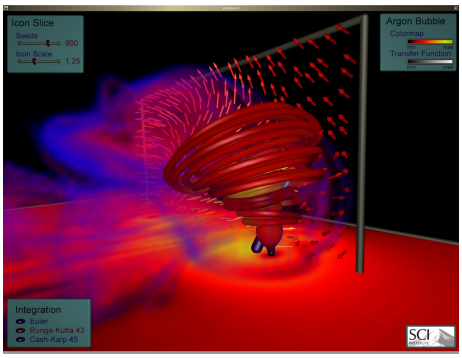
I am a strong believer in collaborative problem solving. Nevertheless, you must do your own work. It is perfectly acceptable to discuss any homework problem with your classmates, but YOU MUST COMPLETE THE ASSIGNMENT YOURSELF! You are also allowed to use Internet resources, but you need to cite any sources you use! If you are caught copying other students' work or not citing internet sources, on the first offense you will receive a zero for the assignment. On the second offense, you will fail the class and be reported to the Dean.

Please make sure that you read the School of Computing Cheating Policy:

https://handbook.cs.utah.edu/2022-2023/CS/Academics/misconduct.php

A.D.A. Statement

Reasonable accommodation is provided to students with known physical, sensory, cognitive, systemic, learning, & psychiatric disabilities. If you will need accommodations in the class, please contact the Center for Disability services - 162 Olpin Union Building, (801) 581-5020.



College of Engineering Guidelines

https://www.coe.utah.edu/semester-guidelines