Math 445/545: Numerical Analysis I

Spring 2020 Course Syllabus

Section 01: 4-5:30 MW in Maybank Hall 224

This syllabus covers course information and the expectations of the students throughout the course. I will notify students of any changes.

Professor: Dr. Daniel Poll
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Office: RSS 345
Office Hours: TBA

Course Description: This course is designed to introduce students to methods for computing accurate numerical solutions to various numerical problems. The course will cover topics in root-finding, interpolation, matrix decomposition algorithms, numerical solutions of differential equations, and their accuracy and stability.

Prerequisite: Graduate or consent of professor

Credit Hours: 3

Text: (Recommended) There is no required text for the course. The majority of the material will come from lecture notes and samples of code. However, if you are interested in some reference material, *Numerical Linear Algebra* by Trefethen and Bau and *Numerical Methods in Scientific Computing* by Dahlquist and Björck are good choices.

Software: (Required) Computational work and programming exercises will typically be done with Python version 3.6 with the packages NumPy, SciPy, and Matplotlib. We may also use additional packages as needed. However, you are welcome to use alternative software, such as MATLAB.

Installation of Python is most easily done by installing the Anaconda package:

`https://www.anaconda.com/download/`

This comes with Anaconda Navigator, which is a nice GUI to install your preferred applications. By default, this allows you to choose your Python environment (I recommend using 3.6) and comes pre-installed with the the IDE Spyder (where you will write your scripts) and the Jupyter Notebook application, which is useful for combining code with narrative text.

MATLAB is also provided for free through the university. Installation instructions can be found on the university website here:

`https://it.cofc.edu/computing/software/matlab/index.php`

In general, you will not need to download anything extra or import packages. There is also a live script option, which works similar to Jupyter Notebooks for presentations.

All needed software is available on the computers in Maybank Hall Rm 200.

Student Learning Outcomes: Upon completion of the course, students will be able to

- apply and implement various numerical methods to solve problems from root-finding, numerical linear algebra, and numerical differential equations.
- evaluate problem criteria such as accuracy and stability to determine optimal implementation of numerical solutions.
- present reports that includes an introduction of the problem to be solved, methods used to solve the problem, results interpretation of those results, and a discussion of future steps.

Lecture: Attendance is not required, but strongly encouraged. Further, the class is small enough that we can hold in-person lectures for the entire semester. However, if you have reason not to attend in-person this semester (such as a family member at high-risk), please let me know. Lectures can be presented through Zoom if needed

Homework: Homework will be assigned periodically through the semester. They will consist of problems that require written analysis and some programming. These problems are meant to be challenging enough that they will require some thought and possibly discussion with myself and your peers. Please do start on them early.

Exams: There will be a mid-semester exam and a final exam. Both exams will have an in-class and take-home component. *Graduate students will be required to answer some additional questions on the exams.*

Project: There will be a project due at the end of the semester. The topic is open-ended: if there's a particular topic or model you would like to use as a project, we can likely find suitable assessment criteria. I will also post some sample projects that students may choose from.

Drafts of project proposals will be due sometime in February. Work on the project will be split into multiple parts that will be combined at the end.

Grade Distribution: Homework assignments will account for 30%. The project will account for 30%. And, each exam will account for 20%, with roughly equal weight to the in-class and take-home portion. This is open for discussion. Letter grades will be assigned using this scale:

Letter grade:	A	B+	B	C+	C	D+	D
Minimum score:	90%	85%	80%	75%	68%	63%	58%

Resources: Resources such as video recordings, notes, and other helpful links will be posted on the course homepage on OAKS. Students can access OAKS here:

`https://lms.cofc.edu`

Absences: If you're absent during lecture, no reason is needed. Borrow the lecture notes from a friend, read the relevant sections, and bring any questions to me or your peers. If it is unavoidable for you to miss an exam, you should contact me (polldb@cofc.edu) as soon as possible.

Note: College of Charleston policy requires me to take roll during the first two weeks, until I determine that all of my students have attended at least once, and report the results to the College. Any student who has not attended class at least once during these two weeks will be dropped from this class by the registrar. These roll calls will not be used in the calculation of the remaining students' grades at the end of the semester.

Student Accommodations: The College will make reasonable accommodations for persons with documented disabilities. Students should apply for services at the Center for Disability Services/SNAP located on the first floor of the Lightsey Center, Suite 104. Students approved for accommodations are responsible for notifying me as soon as possible and for contacting me one week before accommodation is needed.

Basic Standards of Academic Integrity:
Registration at the College of Charleston requires adherence to the university's standards of academic integrity. These standards may be intuitively understood, and cannot in any case be listed exhaustively. The following examples represent some basic types of behavior that are unacceptable:

1. Cheating: using unauthorized notes, study aids, or information on an examination; altering a graded work after it has been returned, then submitting the work for regrading; **allowing another person to do one's work and submitting that work under one's own name**; submitting identical or similar papers for credit in more than one course without prior permission from the course instructors.

2. Plagiarism: submitting material that in part or whole is not entirely one's own work without attributing those same portions to their correct source.

The full official policy for academic integrity can be found at:

`http://deanofstudents.cofc.edu/honor-system/studenthandbook/`