Math 245: Numerical Methods and Mathematical Computing, Fall 2017

Classes meet: Monday, Wednesday and Friday, 1-1:50 pm in Maybank 200
Prerequisites: MATH 203 and MATH 220, or permission of the instructor
Corequisite: MATH 246
Text: **Numerical Analysis** (2nd ed.) by Timothy Sauer

Instructor: Brenton LeMesurier
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Office Hours: To be arranged.
For now I am available from 10–11am on Monday, Wednesday and Thursday, and immediately after each class

There is a site for this course in the College's Learning Management System OAKS at `https://lms.cofc.edu`. This will be used for you to submit your work on the projects, and for me to respond with comments, suggestions for revisions, and grading.

Course Objectives and Expected Student Outcomes

The main expectation of this course is that students learn methods for computing accurate numerical solutions to mathematical and scientific problems, and acquire an understanding of when and why particular methods work, and how reliable, accurate and efficient they are.

The first main topic is a review of Taylor polynomials, which are a basic tool in numerical computation because they allow the approximation of many functions by polynomials, which are easy to work with.

Then we consider general issues of how to describe and measure the accuracy of numerical solutions, and sources of inaccuracy such as rounding in arithmetic.

We will see methods for numerically solving problems such as nonlinear equations, systems of simultaneous equations, approximating functions by polynomials, fitting straight lines and simple curves to experimental data, and approximating derivatives and definite integrals: mainly from Chapters 1 to 5 of the textbook, but not all sections of each chapter. We will also look briefly at solving differential equations (Chapter 10), to preview an important topic that you are likely to see in later courses.

Undergraduate Mathematics Program Student Learning Outcomes

This course can be used to satisfy some requirements of the undergraduate mathematics degree program, for which there are also some standard objectives.

1. Using algebra, geometry, calculus and other track-appropriate sub-disciplines of mathematics, students will model phenomena in mathematical terms.
2. Using algebra, geometry, calculus and other track-appropriate sub-disciplines of mathematics, students will derive correct answers to challenging questions by applying the models from the previous Learning Outcome.
3. Students will write complete, grammatically and logically correct arguments to prove their conclusions.

These outcomes will be assessed on the tests and projects.

Computers and Software

No familiarity with this software or computer programming is assumed; that can be learnt in the co-requisite course Math 246: *Numerical Computing and Programming Laboratory*.

We will use the programming language Python 3 together with some add-on packages for scientific computing: Numpy and SciPy for numerical computing tools, and Matplotlib for graphics. This software is most easily accessed through the free integrated development environment Spyder. We will also occasionally use the IPython/Jupyter interactive notebook system (and more often in Math 246). That is most easily accessed through Anaconda, which also includes a version of Spyder: see http://www.continuum.io/downloads/ for some installation options.

All this software is available in the computer classroom Maybank 200, and can be easily downloaded and installed on any Windows, Mac OS, or Linux computer. This will be discussed more in MATH 246.

Aside: students who are very experienced with other computational software such as Matlab or Mathematica might be able use that instead for work in this course: if you are considering that, discuss it with me.

Graded Work: Assignments, Tests and Projects

There will be assignments every few weeks, involving a mixture of written and programming work; two programming projects; and two tests, which will be partly or entirely take-home.

Note that different homework assignments may have different point totals—your homework average is computed by taking the total number of points you have earned and dividing by the total number of possible points.

The second project will be one that you choose individually, with the option of customizing it to fit with topics from another course.

For all computer work, you will submit drafts for for my comments and then a final version, and we will discuss your work-in-progress to ensure that the final version is working right.

Grading Scheme

The total grade will be weighted an equal 20% on the assignment total, each project, and each test. The aggregate score guarantees at least the following letter grades: The aggregate score guarantees at least the following letter grades:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
90-100	87-89	84-86	80-83	77-79	74-76	70-73	67-79	64-66	60-63	57-59	0-56

Reading Assignments and Question Time

I will usually set reading at the end of each class, and start each class with time for questions on the reading, current assignments and such.

Class Attendance Policy

I will not check attendance, but you are expected to attend and you are responsible for knowing what happens in each class including assignments, information about test topics, and due dates. Thus if you miss a class, check for news, either from a classmate or from me: checking the course's section in OAKS at `https://lms.cofc.edu` should help.

Missing a test or a project or more than two assignments without adequate explanation may lead to a W/A: withdrawal due to absence. So if you miss any of these, you should contact me promptly to explain why.

Accommodations for Students with Disabilities

If you have a documented disability, please contact me during the first two weeks of class or as soon as you have been approved to receive accommodations, so that reasonable accommodations can be arranged. Approval for such accommodations is arranged through the Center for Disability Services: see
`http://disabilityservices.cofc.edu/accommodations/`

College of Charleston Honor Code and Academic Integrity

Lying, cheating, attempted cheating, and plagiarism are violations of our Honor Code that, when identified, are investigated. Each incident will be examined to determine the degree of deception involved.

Cases of suspected academic dishonesty will be reported directly to the Dean of Students. A student found responsible by the Honor Board for academic dishonesty will receive a XXF in the course, indicating failure of the course due to academic dishonesty. This grade will appear on the student's transcript for two years after which the student may petition for the XX to be expunged. The F is permanent. The student may also be placed on disciplinary probation, suspended (temporary removal) or expelled (permanent removal) from the College by the Honor Board.

Students should be aware that unauthorized collaboration – working together without permission – is a form of cheating. Unless the instructor specifies that students can work

together on an assignment, quiz and/or test, no collaboration during the completion of the assignment is permitted. Other forms of cheating include possessing or using an unauthorized study aid (which could include accessing information via a cell phone or computer), copying from others' exams, fabricating data, and giving unauthorized assistance.

Students can find the complete Honor Code and all related processes in the Student Handbook at `http://studentaffairs.cofc.edu/honor-system/studenthandbook/`

Some Important Dates and Times

Monday August 28	Last day to drop/add courses.
Monday September 4	Labor day — classes do meet.
Friday September 29	Test 1, proposed date.
October 16 & 17	Fall break — no classes.
Thursday October 26	Last day to withdraw with a grade of "W".
Friday November 17	Test 2, proposed date.
Wed. November 22 – Sun. November 26	Thanksgiving break — no classes.
Monday December 4	Last day of classes.
Friday December 15	Grades available on MyCharleston by 5pm.