

CSC 340 Scientific Computing

Fall 2020: August 19 – November 24
3 Credits

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Office: Zoom

Virtual Office Hours: MW 3:00-5:00 or by appointment

Class Location and Time:

Online - asynchronous

Course Description:

Introduction to the design, application, and performance of numerical algorithms fundamental to scientific computation. Topics may include error and error propagation, finding solutions to linear systems, matrix algebra, finding eigenvalues and eigenvectors, root finding, numerical integration, interpolation, optimization, digital signal processing, and curve fitting. Emphasizes relative merits and implementations of algorithms.

This class will consist of four main components:

- Class meetings will cover conceptual and practical material over the range of topics.
- Homework assignments will be used to reinforce mathematical and theoretical concepts from lectures.
- Programming assignments will provide practical experience implementing theories and algorithms.
- Tests will allow practice of concepts in a focused manner.

Languages and Libraries:

Familiarity with Python is required. The NumPy and OpenCV libraries will be used in programming assignments. There is no guarantee that all software and libraries used in this course will run on personal computers. Students may have to use university computers to complete assignments.

Prerequisites:

MAT 162 and (CSC 231 or CSC 221)

Recommended Text:

- *Applied Numerical Methods for Engineers – Using MATLAB and C* by Robert J. Schilling and Sandra L. Harris
- *Numerical Methods for Scientist and Engineers* by R. W Hamming
- *Numerical Methods in Engineering with Python 3* by Jaan Kiusalass

Note: The first two books are available used online at reduced prices. The third is available for free as an e-book through the UNCW library.

Grading:

Final letter grades will be assigned as follows:

	A: 93+	A-: 90-92
B+: 87-89	B: 83-86	B-: 80-82
C+: 77-79	C: 73-76	C-: 70-72
D+: 67-69	D-: 63-66	D-: 60-62
F: Less than 60		

Coursework will be used to compute final grades as follows:

Homework: 20%

Programming assignments: 60%

Tests: 10%

Final Exam: 10%

Homework assignments will cover the theoretical and mathematical material covered in lecture and in selected readings.

Programming assignments are an opportunity to practice implementing the algorithms and concepts covered in lecture and a chance to apply them to real-world problems.

Tests and final exam will cover theoretical and mathematical material and basic concepts from lectures, required readings, and programming assignments. Tests will be timed and open-note.

Course Policies:

- Strong programming and mathematical skills befitting the course's pre-requisites are expected. This is a difficult and time-consuming course. Plan carefully to complete projects in a timely manner.
- It is your responsibility to keep up with course material, deadlines, and test dates. Check Canvas regularly for new material, lectures, announcements, and deadlines. E-mails will be sent out at the beginning of each week highlighting what lectures should be watched and what assignments should be completed that week. Lectures will be pre-recorded for you to watch on your own schedule during the week.
- Only one late programming assignment/redo will be accepted over the course of the semester. All other assignments will receive a 0 if turned in late. In my experience, this helps keep students on track throughout the semester. The idea is that you can use this one "credit" if you get sick or have an emergency. Your one late/redo assignment just needs to be turned in by the last day of classes (November 24). Please indicate in the comments section of your assignment submission that you want to use your late credit.
- Missed tests can be made-up only under extreme conditions (medical, family reasons) that keep you away from school for an extended period. *Professor must be notified **prior** to test for a make-up test to be given **or** you must bring in proof of extenuating circumstances (doctor's note, prescription, etc.).* Tests can be taken in advance if you have a scheduling conflict for a job/internship interview.
- Academic integrity is expected on all coursework. Evidence of copying or sharing work on assignments will result in a zero for the assignment and will be reported to the university. The university may or may not decide to take further action.
- Office hours are times I set aside each week to help you. If you want to attend scheduled hours,

- you do not need to make an appointment. Just join the posted Zoom meeting.
- All lecture videos and digital resources are property of UNCW. You may not download and post them elsewhere.
 - This syllabus is subject to change with reasonable notice.

Student Learning Outcomes:

- Students develop knowledge of computer data representation and its relationship to computational error and error propagation.
- Students demonstrate knowledge of vector and matrix operations including addition, subtraction, transpose, multiplication, and inverses by implementing and applying algorithms for each.
- Students learn how to find and use eigenvectors and eigenvalues and students *implement* programs to find these.
- Students *implement* and learn to use signal processing algorithms.
- Students *implement* and learn to use programs to fit data using both linear and nonlinear functions.
- Students develop a knowledge of algorithm and implementation alternatives that enables them to choose appropriately.
- Students develop skills in writing technical reports that describe findings that arise from application of software that they develop.

Academic Integrity

University Policy on academic integrity will be followed for this course. Cheating will be taken very seriously, resulting in harsh penalties. Since the skills required in this class are also required in the next class, cheating in this class will seriously hamper your ability to pass the next class.

The University of North Carolina Wilmington is a community of high academic standards where academic integrity is valued. UNCW students are committed to honesty and truthfulness in academic inquiry and in the mastery of existing knowledge. This commitment begins when new students matriculate at UNCW, continues as they create work of the highest quality while part of the university community, and endures as a core value throughout their lives.

It is the responsibility of every faculty member, student, administrator and staff member of the university community to uphold and maintain the highest academic standards and integrity of the university. Any member of the university community who has reasonable grounds to believe that an infraction of the Honor Code has occurred has an obligation to report the alleged violation to the faculty member teaching the class who, in turn, must report the allegation to the Office of the Dean of Students. This obligation is a core value of the Honor Code, and must be fulfilled by each and every member of the university.

Special Needs

If you have a disability and need reasonable accommodation in this course, you should inform the instructor of this fact in writing within the first week of class or as soon as possible. If you have not already done so, you must register the Office of Disability Services in DePaolo Hall (ext. 2-3746) and obtain a copy of your Accommodation Letter. You should then arrange a meeting to make mutually agreeable arrangements based on the recommendations of the Accommodation Letter.

Title IX

UNCW takes all forms of interpersonal violence very seriously. When students disclose, first- or third-hand, to faculty or staff about sexual misconduct, domestic violence, dating violence and/or stalking, this information must be reported to the administration in order to ensure that students' rights are protected, appropriate resources are offered, and the need for further investigation is explored to maintain campus safety.

There are three confidential resources who do not need to report interpersonal violence: UNCW CARE, the Student Health Center, and the Counseling Center. If you want to speak to someone in confidence, these resources are available, including CARE's 24-hour crisis line (910-512-4821).

For more information, please visit www.uncw.edu/sexual_misconduct or www.uncw.edu/care.