

The University of North Carolina at Greensboro
CSC 427/627, MAT 423/623 Section 01 Spring 2020
NUMERICAL ANALYSIS AND COMPUTING / NUMERICAL METHODS

The value of an education in a liberal arts college is not the learning of many facts but the training of the mind to think something that cannot be learned from textbooks.

–Albert Einstein

Lecture: MWF 9:00 AM – 9:50 AM, Petty 007, 3 Credits.

Instructor:

Dr. Thomas Lewis

Petty 141

tllewis3@uncg.edu

Office Hours: TR 10:30 – 11:30 AM. I am also available by appointment.

Bulletin Description: Number systems and errors, solutions of non-linear and linear systems, interpolation, numerical differentiation and integration, solution of differential equations. Implementation of numerical methods using a high-level programming language.

Student Learning Outcomes: All students in the course will have the following student learning outcomes: Upon successful completion of this course, all students will be able to

1. explain the concepts of computational error, floating-point arithmetic, and asymptotic order.
2. justify various convergence and error results.
3. interpret various theoretical results and their applications.
4. implement the standard numerical techniques using a high-level programming language.

Graduate students enrolled in the course will have the additional student learning outcomes:

5. justify more complex convergence and error results.
6. design more sophisticated implementations of the methods covered by combining the various tools to design more advanced algorithms.

Required Textbook: James F. Epperson, *An Introduction to Numerical Methods and Analysis*, 2nd Edition. Wiley 2013. ISBN: 1118367596.

The library collaborated with the campus bookstore to be able to provide you access to both print and electronic versions of the textbook. You can access the book by clicking on the following

link and providing your UNCG spartan credentials: <https://ebookcentral.proquest.com/lib/uncg/detail.action?docID=1584988>

Prerequisites: A grade of at least C in MAT 293. Experience programming in FORTRAN, C++, Java, Matlab, or a similar language is expected.

Target Audience: This course is designed to introduce both undergraduate and graduate students in STEM areas to the field of numerical methods for scientific computing. The students will learn some of the mathematical justifications and implement the methods to gain hands-on exposure.

Course Objectives: The course will focus on chapters 1 – 5 in the textbook as well as select topics.

Course Website: Canvas (courses.uncg.edu/). Students are expected to frequently check both email and the course website for course updates, announcements, and posted assignments.

Important Dates:

First day of class	January 13
Last day to change schedules	January 17
MLK Holiday	January 20
Test 1	February 19
Spring Break	March 2 – 6
Last day to withdraw from a course without a grade of WF	March 9
Test 2	April 6
Spring Holiday	April 10
Last day of class	April 29
Reading Day	April 30
Final Exam	May 4

Grading Policy: Grades will be determined using the grading scales below. A student’s letter grade is a measure of his or her mastery of course material and fulfillment of course objectives.

Homework	10 %	Two Midterm Exams	25 %
Quizzes	10 %	Final Exam	25 %
Programming Assignments	30 %		

Undergraduate Grade Scale:

$93 \leq A \leq 100$	$73 \leq C < 77$
$90 \leq A- < 93$	$70 \leq C- < 73$
$87 \leq B+ < 90$	$67 \leq D+ < 70$
$83 \leq B < 87$	$63 \leq D < 67$
$80 \leq B- < 83$	$60 \leq D- < 63$
$77 \leq C+ < 80$	$0 \leq F < 60$

Graduate Grade Scale:

$92 \leq A \leq 100$	$80 \leq B- < 82$
$90 \leq A- < 92$	$77 \leq C+ < 80$
$87 \leq B+ < 90$	$70 \leq C < 77$
$82 \leq B < 87$	$67 \leq F < 70$

Homework: Homework will be assigned regularly throughout the semester. All of the homework problems will come from the corresponding sections in the textbook. Students are expected to read the textbook prior to the in-class lectures.

There will be regular short quizzes based on the homework. Students are encouraged to work together to complete all of the assigned homework problems so that they are prepared for the quizzes. Students will not be allowed to reference any materials during the quizzes.

Graduate students will have additional homework problems assigned that they are required to turn in at the same time as the quiz. These problems will also be graded. Late work will not be accepted.

Quizzes: There will be frequent (almost weekly) quizzes based on the assigned homework problems that are common to all students in the class. Solutions to all quizzes will be posted to help students study for the exams and learn from any mistakes.

Programming Assignments: Programming assignments will be assigned throughout the semester allowing students to implement the various numerical methods discussed in class. There will be several different programming assignments based on the material in chapter 2. Chapters 3, 4, and 5 will each have a more involved programming assignment that allow students to compare and combine the various methods in the chapter. Graduate students will have additional programming requirements for several of the assignments.

Exams: There will be two midterm exams and a final exam. The midterm exam dates will be announced in class.

Final Exam: The comprehensive final exam is Monday, May 4, from 8:00 – 11:00 AM. An unexcused missed exam will earn a grade of zero. The exam questions for the undergraduate students and the graduate students in the class will not necessarily be the same.

Attendance & Make-up Policy: Regular and punctual attendance is expected. Make-up quizzes and tests will be considered on an individual basis for rare and extreme circumstances and must be discussed with the instructor BEFORE the scheduled test.

Academic Accommodations: The University of North Carolina at Greensboro respects and welcomes students of all backgrounds and abilities. If you feel you will encounter any barriers to full participation in this course due to the impact of a disability, please contact the Office of Accessibility Resources and Services (OARS). The OARS staff can meet with you to discuss the barriers you are experiencing and explain the eligibility process for establishing academic accommodations. You can learn more about OARS by visiting their website at <https://ods.uncg.edu/> or by calling 336-334-5440 or visiting them in Suite 215, EUC. Adaptions or accommodations must be made prior to the first test.

Extra Help: Do not hesitate to come to my office during office hours or by appointment to discuss a homework problem or any aspect of the course. Also, feel free to ask questions via email.

Academic Integrity: All students are expected to abide by the University Academic Integrity

Policy as specified at <https://osrr.uncg.edu/academic-integrity/>. A report of all offenses will be sent to appropriate deans and handled in accordance with the Student Policy Handbook. More information can be found at Office of Student Rights and Responsibilities website <https://osrr.uncg.edu/>.

Copyright Policy: Selling or purchasing notes from classes for commercial gain is a violation of the UNCG Copyright Policy. Any student who sells notes taken in class for commercial gain, or who purchases notes taken by another student for commercial gain is in violation of this policy and, by extension, is committing a violation of the Student Code of Conduct (<https://sa.uncg.edu/handbook/student-code-of-conduct/>).

Discrimination and Harassment Policy: The UNCG policy on Discrimination and Harassment states that: *“UNCG is committed to equal opportunity in education and employment for all persons and will not tolerate any discrimination against or harassment of persons on the basis of race, color, religion, sex, sexual orientation, gender identity, national origin, political affiliation, genetic information, veteran status, disabling condition, or age.”* It is the duty of every member of the UNCG community to uphold this policy. As a faculty member, I reaffirm my stand against discrimination and harassment of any sort. Such behavior will not be tolerated among my students and in the classroom.

Health and Wellness: Your health impacts your learning. Throughout your time in college you may experience a range of health issues that can cause barriers to your learning. These might include physical ailments, illnesses, strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, or loss of motivation. Student Health Services and The Counseling Center can help with these or other issues you may be experiencing. You can learn about the free, confidential mental health services available on campus by calling 336-334-5874, visiting the website at <https://shs.uncg.edu/> or visiting the Anna M. Gove Student Health Center at 107 Gray Drive. Help is always available.

UNCG Cares Statement: UNCG cares about your success as a student. We recognize students often balance many challenging personal issues and demands. Please take advantage of the University resources designed to help. For assistance accessing these resources contact the Dean of Students Office at 336-334-5514 or Student Academic Services at 336-334-5730. The Counseling and Testing Center is available for mental health assistance at 336-334-5874.

Department of Computer Science Mission Statement: The Department of Computer Science supports the university mission of being a student-centered research university by fostering discovery and intellectual growth through the traditional activities of education, research, and service, with stated missions in each of these areas.

- *Education Mission:* To provide excellence in teaching and education, providing rigorous undergraduate and graduate programs that produce graduates who have the theoretical foundation and technical skills to become productive professionals and/or to contribute to research in computer science, and supporting general liberal education through courses for non-majors that promote critical thinking and skills for life in a technical and information-based society.
- *Research Mission:* To contribute to the creation and dissemination of ideas through research

and scholarly activities, such as publication of original research, presentations at scholarly meetings, and participation in externally funded research projects, in the context of a program which values the academic freedom of faculty to set their own research directions in basic or applied research.

- *Service Mission:* To support the university and computer science profession through participation in activities, committees, and policy making.

Department of Mathematics & Statistics Mission Statement: The mission of the Department of Mathematics and Statistics at the University of North Carolina at Greensboro is to provide intellectual leadership in the mathematical sciences that is of direct benefit to the State of North Carolina and that commands national and international respect for the quality of its educational programs and for its depth of scholarship. To achieve this mission, the Department has identified goals directed at achieving excellence in all three of the University's major functions - teaching, research and service. In particular, we are committed to offering well-rounded academic programs, which will provide our graduates with competitive job skills, to contribute to the advance of knowledge and techniques in Mathematics and Statistics through an active research program and to advance our role in providing high quality training in mathematics teacher education to supply the anticipated need for well-prepared, competent elementary and secondary school mathematics teachers.

Tentative Calendar: The following calendar is subject to change.

Week	Monday	Wednesday	Friday
1/13 – 1/17	Intro and 1.1	1.1	1.1, 1.2
1/20 – 1/24	<i>MLK Holiday</i>	1.2, 1.3	1.3, 1.5
1/27 – 1/31	1.5, 1.6	1.6, 2.1	2.1, 2.2
2/3 – 2/7	2.2, 2.3	2.3, 2.4	2.4, 2.5
2/10 – 2/14	2.5, 2.6	2.6, 2.7	2.7, 3.1
2/17 – 2/21	Review	Exam 1	3.1, 3.2
2/24 – 2/28	3.2, 3.3	3.3, 3.5	3.5, 3.6
3/2 – 3/6	<i>Spring Break</i>	<i>Spring Break</i>	<i>Spring Break</i>
3/9 – 3/13	3.6, 3.8	3.8, 3.9	3.9, 3.11
3/16 – 3/20	3.11, 4.1	4.1, 4.2	4.2, 4.3
3/23 – 3/27	4.3, 4.6	4.6, 4.7	4.7, 4.8
3/30 – 4/3	4.8	4.8	Review
4/6 – 4/10	Exam 2	5.1	<i>Spring Holiday</i>
4/13 – 4/17	5.2	5.3	5.4
4/20 – 4/24	5.5	5.5, 5.6	5.6
4/27 – 5/1	5.6	<i>Last Day</i>	
5/4 – 5/8	Final Exam		