University of Connecticut Fall 2021

CSE 3802/ ECE 3431
Numerical Methods in Scientific Computation

Dept. of Electrical and Computer Engineering DT

Instructor: David A. Tonn, Ph.D. Email : david.tonn@uconn.edu

Office Hours: Tuesdays 2:30-3:20 PM, ITE 140

Class Time: Mon/Wed, 3:30-4:45 PM, MCHU 305

Textbook: Burden, Faires, and Burden, Numerical Analysis, 10th Edition
(**or any recent edition**)

Pre-Requisites: CSE 1729; MATH 2110Q and 2410Q; MATH 2210Q, which may be taken concurrently; open only to students in the School of Engineering, Cognitive Science majors, and declared Computer Science and Cognitive Science minors.

Catalog Description: Introduction to the numerical algorithms fundamental to scientific computation. Equation solving, function approximation, integration, difference and differential equations, special computer techniques. Emphasis is placed on efficient use of computers to optimize speed and accuracy in numerical computations. Extensive digital computer usage for algorithm verification.

Grading Breakdown:

Midterm Quiz :	20 %
Programming Projects	50%
Final Exam :	30 %
Total :	100 %

Final Grade Calculation

Your final grade in this course will be computed by first computing your score on the programming projects. This score is found by summing the total number of points earned on the homework assignments, and then dividing that by the number of points available and multiplying by 100 to obtain a percentage. This percentage will be rounded to a whole number. Then, a total score for the course will be computed, using the homework and exam scores in the formula given above.

This score will be rounded to a whole number. Your grade will then be assigned using this score, according to the chart below. Note that there is no grade of "A+" available at UConn.

Note that all assignments and exams count toward your final grade – lowest scores are not dropped and there are no do-overs on exams or projects. Requests to have an exam or assignment count more or less than another shall not be considered.

Total score for the class	Letter Grade
93 or greater	A
90 to 92	A-
87 to 89	B+
84 to 86	B
80 to 83	B-
77 to 79	C+
74 to 76	C
70 to 73	C-
67 to 69	D+
64 to 66	D
60 to 63	D-
59 or lower	F

General Policies :

- Cheating and/or any other form of academic dishonesty will not be tolerated under any circumstances and will be dealt with in accordance with University policy. Everyone is expected to do their own work. DT has no objection to students sharing ideas on projects, but everyone must write their own code. Submitting someone else's code as your own is a form of plagiarism and will be treated as such. The projects are **not** group efforts.

- You are welcome to use any programming language that you wish. Preferred languages are C, C++, FORTRAN77, and Python. Matlab and Mathematica can be used for checking your work but the projects should be programmed in a high level language.

- All projects will be administered through HuskyCT. Details will be discussed when the first project is assigned.

Midterm Quiz :

The midterm quiz will be scheduled during either Week 7 or 8 of the semester. Details on the format of the quiz will be posted as we get closer to the exact date of the quiz.

Final Exam : The final exam will be cumulative and it will be 2 hours long. The final will be administered during Exam week per the schedule posted by the Registrar's Office.

- Per University policy, final exams must be taken at the time and place specified in the schedule issued by the Registrar's Office. Your instructor cannot administer the final

exam at any other date or time without written authorization from the Dean of Students.

Students are required to be available for their exam during the stated time. If you have a conflict with this time, you must visit the Dean of Students Office to discuss the possibility of rescheduling this exam.

Please note that vacations, previously purchased tickets or reservations, social events, misreading the exam schedule and over-sleeping are not viable reasons for missing a final exam. If you think that your situation warrants permission to reschedule, please contact the Dean of Students Office with any questions. Thank you in advance for your cooperation. (See also http://dos.uconn.edu/finals-rescheduling/)

Policy Against Discrimination, Harassment and Related Interpersonal Violence

The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate amorous relationships can undermine the University's mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate amorous relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University. Additionally, to protect the campus community, all non-confidential University employees (including faculty) are required to report sexual assaults, intimate partner violence, and/or stalking involving a student that they witness or are told about to the Office of Institutional Equity. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help.

Statement on Absences from Class Due to Religious Observances and Extra-Curricular Activities

Faculty and instructors are strongly encouraged to make reasonable accommodations in response to student requests to complete work missed by absence resulting from religious observances or participation in extra-curricular activities that enrich their experience, support their scholarly development, and benefit the university community. Examples include participation in scholarly presentations, performing arts, and intercollegiate sports, when the participation is at the request of, or coordinated by, a University official. Such accommodations should be made in ways that do not dilute or preclude the requirements or learning outcomes for the course. Students anticipating such a conflict should inform their instructor in writing within the first three weeks of the semester, and prior to the anticipated absence, and should take the initiative to work out with the instructor a schedule for making up missed work. For conflicts with final examinations, students should contact the Office of the Dean of Students. Faculty and instructors are also encouraged to respond when the Counseling Program for

Intercollegiate Athletes (CPIA) requests student progress reports. This will enable the counselors to give our students appropriate advice.

Center for Students with Disabilities

The University of Connecticut is committed to protecting the rights of individuals with disabilities and assuring that the learning environment is accessible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. Students who require accommodations should contact the Center for Students with Disabilities, Wilbur Cross Building Room 204, (860) 486-2020 or http://csd.uconn.edu/.

(Source : http://provost.uconn.edu/syllabi-references/)

Course Schedule

(Subject to change)

1. Introduction to Numerical Methods/Concepts (1.5 Weeks)
   - Errors, Convergence, Stability, etc.
   - Spigot Algorithms

2. Solution of equations of one variable/root finding (2.5 weeks)
   - Fixed Point Iteration, Newton's Method, Muller's Method, etc.

3. Interpolation and Approximation (2 weeks)
   - Linear Interpolation, Cubic Spline, higher order methods

4. Numerical Integration (2 weeks)
   - Simpson's Rule, Method of Exhaustion, Romberg, etc.

5. Initial Value Problems/ODEs (2 weeks)
   - Euler's Method, Predictor-Corrector Methods, Runge-Kutta 4^{th} Order, etc.

6. Partial Differential Equations (2 weeks)
   - Methods for Hyperbolic, Parabolic, Elliptic equations, FDTD Method

7. Matrix Methods (2 weeks)
   - Solving Linear Systems of Equations, Eigenvalues, Singular Value Decomp, etc.