CSE 4345 – Computational Methods
Fall 2019

Instructor: Darin Brezeale, ERB 648  
Office Hours: TuTh, 2:30pm–3:30pm (or anytime my door is open) 
Contact: darin.brezeale@uta.edu (best way to contact me)  
I don’t have a phone in my office, but in case of an emergency you can call the CSE department at 817-272-3785. 
Website: http://omega.uta.edu/~darin 
Section: 001: MoWe, 1:00pm–2:20pm, GS 233

Course Description: Introduction to numerical methods for solving problems in computer science and computer engineering. Topics include computer arithmetic, linear and nonlinear equations, eigenvalue problems, least squares, optimization, interpolation, and simulation. Prerequisite: C or better in each of the following: IE 3301 (Probability and Statistics), CSE 2320 (Data Structures and Algorithms), and either CSE 3380 or MATH 3330 (Linear Algebra).

Learning Outcomes:

1. understand pros and cons of various standard algorithms for calculating solutions to computational problems 
2. identify sources of errors in computations 
3. understand concepts of sensitivity, conditioning, and stability 
4. understand the differences between answers produced in an ideal world and what we can really produce 

Textbook: I will use the following books as my primary references:


The course website lists more resources.

Homework Policy: I’m a strong believer that the best way to learn math is by doing, so you should expect plenty of homework. Calculators will not be allowed on exams, so you probably should not become dependent on them when doing your homework. Using a calculator to check your work is fine; having the calculator do all of the work isn’t.

Grading Policy:

- There will be three exams plus weekly homework assignments. Your final grade will be calculated as \( \min(\text{homework average, exam average}) \) where the homework average is the arithmetic mean of the homework grades and the exam average is the arithmetic mean of the exam grades.
• Exams:
  - If your lowest exam grade is one of the first two exams, then I will replace that exam grade with the grade you receive on the final exam. This will only be applied to one exam (in case of a tie) and will not be applied if you receive a grade of zero on an exam due to cheating.

• Homework:
  1. Homework can be submitted late by 5 days (i.e., 120 hours). The cost is 25 points and is the same no matter when in the late period you finally submit the homework. The 25 points are deducted before the grading begins, so it is possible to lose 125 points. Note that the last assignment of the semester cannot be submitted late.
  2. A scanned copy of the written portion of homework doesn’t count as submitting on time.
  3. I never give extra credit work.
  4. No homework grades will be dropped.
  5. I am going to enforce readability of what you submit. The homework should have a clear structure (in my opinion) and the answer should be easy to identify.

• Final grades are based on the ranges of A: 88–100, B: 78–87, C: 68–77, D: 58–67, F: 0–57. I round to the nearest integer, so 87.4 is a B and 87.5 is an A.

• As someone taking an engineering course, I assume that you can keep up with the grades I provide to you and can calculate your current grade in the course. If you want me to calculate your average, tell you what you need to get a certain grade in the class, or tell you again what your grade on something was, then the cost is one point off of your overall course grade per request for this information.

Important Dates:

- Wednesday, August 21  
  first day of class
- Monday, September 2  
  Labor Day (holiday)
- Wednesday, October 2  
  exam 1
- Wednesday, October 23  
  exam 2
- Monday, November 25  
  exam 3

Institution Information UTA students are encouraged to review the below institutional policies and informational sections and reach out to the specific office with any questions. To view this institutional information, please visit the Institutional Information page (http://www.uta.edu/provost/administrative-forms/course-syllabus/syllabus-institutional-policies.php) which includes the following policies among others:

- Drop Policy
- Disability Accommodations
- Title IX Policy
- Academic Integrity
- Student Feedback Survey
- Final Exam Schedule

modified: 08/19/2019, 14:30:53
**Attendance:** At The University of Texas at Arlington, taking attendance is not required but attendance is a critical indicator in student success. Each faculty member is free to develop his or her own methods of evaluating students academic performance, which includes establishing course-specific policies on attendance. However, while UT Arlington does not require instructors to take attendance in their courses, the U.S. Department of Education requires that the University have a mechanism in place to mark when Federal Student Aid recipients “begin attendance in a course.” UT Arlington instructors will report when students begin attendance in a course as part of the final grading process. Specifically, when assigning a student a grade of F, faculty report the last date a student attended their class based on evidence such as a test, participation in a class project or presentation, or an engagement online via Blackboard. This date is reported to the Department of Education for federal financial aid recipients.

As the instructor of this section, I will not take attendance except when required to determine if you have attended the class. While attendance of the lectures is not required, you should not expect me to catch you up if you choose not to come to class nor is not attending the lectures necessarily good for your grade.

**Tentative Schedule** Note that this is subject to change, but here are the topics I intend to cover in their approximate order (the calendar on the course website gives more details).

<table>
<thead>
<tr>
<th>number of lectures</th>
<th>topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>introduction</td>
</tr>
<tr>
<td>1</td>
<td>error analysis</td>
</tr>
<tr>
<td>1</td>
<td>Python and NumPy</td>
</tr>
<tr>
<td>1</td>
<td>linear systems of equations</td>
</tr>
<tr>
<td>1</td>
<td>LU decomposition</td>
</tr>
<tr>
<td>2</td>
<td>linear least squares</td>
</tr>
<tr>
<td>2</td>
<td>eigenvalues and eigenvectors</td>
</tr>
<tr>
<td>2</td>
<td>singular value decomposition (SVD)</td>
</tr>
<tr>
<td>1</td>
<td>1D nonlinear equations (root-finding)</td>
</tr>
<tr>
<td>1</td>
<td>systems of nonlinear equations</td>
</tr>
<tr>
<td>2</td>
<td>unconstrained optimization</td>
</tr>
<tr>
<td>2</td>
<td>iterative linear solvers</td>
</tr>
<tr>
<td>4</td>
<td>interpolation</td>
</tr>
<tr>
<td>2</td>
<td>random numbers and Monte Carlo simulation</td>
</tr>
</tbody>
</table>

modified: 08/19/2019, 14:30:53