Course #: Math 5330 CRN 26866 / Math 6330 CRN 25980  
Course Title: Computational Methods of Linear Algebra  
Credit Hrs: 3  
Term: Spring 2024  
Course Meetings & Location: MW 10:30 am – 11:50 am, Classroom Building C201  
Prerequisite Courses: Math 3323 with a grade of at least C.  
Course Fee (if applicable): None  
Instructor: Dr. Peimeng Yin  
Office Location: Bell Hall 322  
Contact Info: Email: pyin@utep.edu  
Emergency Contact: (915)747-5761 (Math Department)  
Office Hours: MW: 1:00 pm – 2:00 pm, or by appointment  
Other References: [math.utep.edu/faculty/sewell/5330/5330h.htm](http://math.utep.edu/faculty/sewell/5330/5330h.htm)  
Course Website: Blackboard  
(No notes will be posted, please take down your notes during the lectures.)  
Course Objectives (Learning Outcomes):  
1. Gain a solid understanding of concepts and methodologies of numerical linear algebra including various factorizations, iterative methods and their analysis.  
2. Understand various matrix factorizations, such as LU decomposition, QR decomposition, and Householder decomposition, and their applications.  
3. Understand the numerical methods for eigenvalue, minimization problems.  
4. Gain experience in implementing and observing the numerical performance of the various numerical methods using Matlab.  
Course Activities/Assignments:  
**Homework:** Post on Blackboard **weekly**, due in the beginning of Wednesday class.  
**No late homework** will be accepted.  
Your homework should show all necessary work you used to solve problems, the reasoning and logic underlying all arguments should be clearly spelled out.  
Assignments involving computer programming must be done in MATLAB, and the codes along with the outputs should be attached to the homework.  
Assessment of Course Objectives: There will be two midterm exams and a final exam.  
They are closed-book exams, hence no books or notes are allowed.  
You can use a basic scientific calculator without graphing or programmable functions. More information will be provided as the exam dates approach.  
Midterm Exam I (introduction, linear system).  
Midterm Exam II (least squares problem, eigenvalue problems).  
Final Exam (comprehensive, but with emphasis on topics after Exam II).
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<td>0. Introduction</td>
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<td>• Special matrices</td>
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<td>• Vector and matrix norms</td>
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<td>• The computational complexity</td>
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<td>1. Systems of linear equations</td>
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<td>• Gaussian elimination and LU decomposition</td>
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<td>• Banded systems and sparse systems</td>
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<td>• Roundoff errors</td>
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<td>• Iterative methods</td>
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<td>• The Krylov-subspace methods</td>
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<td>2. Linear least squares problems</td>
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<td>• Orthogonal reduction</td>
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<td>• Householder transformations</td>
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<td>3. The eigenvalue problem</td>
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<td>• Symmetric matrices and General matrices</td>
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<td>• The power and inverse power methods</td>
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<td>• The generalized eigenvalue problem</td>
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<td>• The singular value decomposition (SVD)</td>
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<td>4. Linear programming</td>
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<td>• The simplex method</td>
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**Grading Policy:** 

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<tr>
<th>Grading Policy</th>
<th>Homework</th>
<th>30%</th>
<th>Exams (2 equally Weighted)</th>
<th>35%</th>
<th>Final Exam</th>
<th>25%</th>
<th>Instructor Assessment</th>
<th>10%</th>
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**Grading Scale:** 

- 90-100% → A
- 80-89% → B
- 70-79% → C
- 60-69% → D
- <60% → F

**Make-up Policy:** No make-up/alternate exam will be given. If you have an emergency on the exam day, you have to contact me immediately, preferably before the exam.

**Course Schedule:**

- **(Week 01)** 01/15: No class
- **(Week 02)** 01/22: Gaussian elimination
- **(Week 03)** 01/29: Banded systems
- **(Week 04)** 02/05: Roundoff Error
- **(Week 05)** 02/12: Iterative methods
- **(Week 06)** 02/19: Exam 1
- **(Week 07)** 02/26: Orthogonal Reduction
- **(Week 08)** 03/04: Eigenvalue problem
- **(Week 09)** Spring break, no classes
- **(Week 10)** 03/18: QR method
- **(Week 11)** 03/25: Power method
- **(Week 12)** 04/01: Generalized eigenvalue problem
- **(Week 13)** 04/08: Exam 2
- **(Week 14)** 04/15: Simplex method
- **(Week 15)** 04/22: Dual problem
- **(Week 16)** 04/29: Final exam Review
- **(Week 17)** 05/10: Final Exam, 10:00 am – 12:45 pm
Course Drop Policy: The Drop Date for this semester is **March 28, 2024.** No drops will be approved after this date.

Attendance Policy: It is student’s responsibility to attend every class. Students are expected to arrive for class on time and to remain for the class entire period.

Academic Integrity Policy: Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

AI Policy: Use of AI technologies or automated tools, particularly generative AI such as ChatGPT or DALL-E, is not allowed for assignments in this class. Each student is expected to use critical and creative thinking skills to complete tasks and not rely on computer-generated ideas. Any direct use of AI-generated materials submitted as your own work will be treated as plagiarism and reported to the Office of Student Conduct and Conflict Resolution (OSCCR).

Civility Statement: Please do not use cell phones or laptops during class. Cell phones should be set to silent or vibrate, and any calls should be taken outside of class. Please do not wear headsets or blue tooth devices during class.

Disability Statement: The University is committed to providing reasonable accommodations to students with documented disabilities. Students who become pregnant may also request reasonable accommodations, in accordance with state and federal laws and regulations and University policy. Accommodations that constitute undue hardship are not reasonable. To make a request, please register with the UTEP Center for Accommodations and Support Services (CASS). Contact CASS at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

Military Statement: If you are a military student with the potential of being called to military service and/or training during the semester, please contact me by the end of the first week of class.

Illness Precautions: Please stay home if you have symptoms of a communicable illness, such as COVID-19. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations.