Linear Algebra MATH 3311-002
Department of Mathematics and Statistics
Spring 2017 (01/18/2017 ~ 05/02/2017)

A. COURSE INFORMATION
Course number/section: MATH 3311-002
Class meeting time: MWF 11:00-11:50AM
Class location: CI-107
Course Website: bb9.tamucc.edu

B. INSTRUCTOR INFORMATION
Instructor: Harish Bhatt
Office location: EN 314A
Office hours: MW 2:00-3:00PM and TR 9:00-11:00 AM
Telephone: 361-825-3265
Email: harish.bhatt@tamucc.edu
Appointments: Students unable to see me during the office hours may request an appointment.

C. COURSE DESCRIPTION
Catalog Course Description
Fundamentals of linear algebra and matrix theory. Topics include vectors, matrix operations, linear transformations, fundamental properties of vector spaces, systems of linear equations, eigenvalues and eigenvectors. Applications.

D. PREREQUISITES/COREQUISITES
Prerequisites: Math 2413 (Calculus I)
Corequisites: None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
Required Textbook(s): Introduction to Linear Algebra, 4th Ed. By Gilbert Strang.
Reference Book(s): Linear Algebra, Jim Hefferon (The book is Freely available, including its source.)
Supplies: Paper and pen or pencil.
F. STUDENT LEARNING OUTCOMES AND ASSESSMENT

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the courses student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students will able to:

1. Make calculations as needed with vectors and matrices using addition, scalar multiplication, matrix multiplication and inner (dot) products.

2. Solve general linear systems of equations using inverses, the Gauss-Jordan method (from row operations to LDU factorization) and other methods.

3. Understand and apply concepts of vector spaces including defining properties, linear independence, spanning, basis, dimension and subspaces (especially null- and column-).

4. Understand and apply orthogonality to find projections, least square solutions and orthogonal bases.

5. Find eigenvalues and eigenvectors using determinants or other means as needed. If time permits, understand and apply the Spectral Theorem.

6. If time permits, understand and apply linear transformations.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

The course will be a combination of lectures, whole-class discussions, and individual investigations. All participants are expected to engage in group and whole class activities by contributing knowledge and thoughtful evaluation of others’ contributions.

H. MAJOR COURSE REQUIREMENT AND GRADING

In order to accomplish the learning outcomes of this course, the learner is required to:

- Attendance for this course is required.
- Participate in class activities.
- Read and study assignments.
- Solve assigned problem sets.
- Complete test, quizzes, homeworks, etc.
- Complete a comprehensive final exam.

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>FINAL GRADE</th>
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<tbody>
<tr>
<td>Quizzes/Homeworks</td>
<td>25%</td>
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<tr>
<td>Class Participation</td>
<td>5%</td>
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<tr>
<td>Midterm Exams</td>
<td>45%</td>
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<tr>
<td>Final Exam (comprehensive)</td>
<td>25%</td>
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**Quizzes/Homework:** Quizzes take place during the last ten minutes of class. Homework will be assigned each week and is due the next week.

**Class Participation:** Students are encouraged to form a group and actively participate in group discussion while solving assigned problems.

**Exams:** There will be total three midterm exams. Calculators and note card will be allowed unless otherwise instructed. Exam dates will be announced at least one week in advance, but a tentative exam scheduled is given. (Apple watch and cell phones are not allowed during exam).

**Final Exam:** The final will be comprehensive. If you do not take the final exam, you cannot pass the course.

**GRADING SCALE:**

- ≥90.0%   A,
- ≥80.0%   B,
- ≥70.0%   C,
- ≥60.0%   D,
- Below 60% F
### I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Topic to be Discussed (Subject to Revision)</th>
<th>Lecture Hours</th>
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<tbody>
<tr>
<td>Syllabus, Preliminary Concepts</td>
<td>[1]</td>
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<tr>
<td><strong>Chapter 1: Introduction to Vectors</strong></td>
<td>[3]</td>
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<tr>
<td>- Section 1.1: Vectors and linear combinations.</td>
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<td>- Section 1.2: Lengths and dot products.</td>
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<tr>
<td><strong>Chapter 2: Solving Linear Equations</strong></td>
<td>[11]</td>
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<tr>
<td>- Section 2.1: Vectors and linear equations.</td>
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<td>- Section 2.2: The idea of elimination.</td>
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<td>- Section 2.3: Elimination using matrices.</td>
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<td>- Section 2.4: Rules for matrix operations.</td>
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<td>- Section 2.5: Inverse matrix.</td>
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<td>- Section 2.6: Elimination=Factorization: A=LU.</td>
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<td>- Section 2.7: Transpose and permutations.</td>
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<tr>
<td><strong>Chapter 3: Vector Spaces and Subspaces</strong></td>
<td>[11]</td>
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<tr>
<td>- Section 3.1: Spaces of Vectors.</td>
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<td>- Section 3.2: The nullspace of A: Solving Ax = 0.</td>
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<td>- Section 3.3: The rank and the row reduced form.</td>
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<td>- Section 3.4: The complete solution to Ax = b.</td>
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<td>- Section 3.5: Independence, basis and dimension.</td>
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<td>- Section 3.6: Dimensions of the four subspaces.</td>
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<tr>
<td><strong>Chapter 4: Orthogonality</strong></td>
<td>[6]</td>
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<tr>
<td>- Section 4.1: Orthogonality of the four subspaces.</td>
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<td>- Section 4.2: Projections.</td>
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<td>- Section 4.3: Least squares approximations.</td>
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<td>- Section 4.4: Orthogonal bases and Gram-Schmidt.</td>
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<tr>
<td><strong>Chapter 6: Eigenvalues and Eigenvectors</strong></td>
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<tr>
<td>- Section 6.1: Introduction to eigenvalues.</td>
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<td>- Section 6.2: Diagonalizing a matrix.</td>
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<td>- Section 6.3: Applications to differential equations.</td>
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<td>- Section 6.4: Symmetric matrices.</td>
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<td>- Section 6.5: Positive definite matrices.</td>
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<td>- Section 6.6: Similar matrices.</td>
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EXAMS:

Test 1 (From chapters 1&2): February 17, 2017.


Test 3 (From sections 4.2- 6.6): April 26, 2017.

Final Exam (Comprehensive): 11:00 am-1:30 pm, May 05, 2017.

IMPORTANT DATES:

See: http://www.tamucc.edu/academics/calendar/2017_spr.html

- March 13-17, Monday-Friday (Spring Break)
- April 07, Friday, Last Day to drop a class.
- May 02, Tuesday: Last Day of Class.

Note: Changes in this course schedule may be necessary and will be announced to the class by the instructor.

J. COURSE POLICIES

Attendance/Tardiness
You are expected to attend every class session, and arrive on time. There is no make up for class activities; you need to be present to participate. All the absences will be considered “unexcused” unless you have an exceptional situation (e.g., documented illness, family situation), and you email the instructor about it.

Late Work and Make-up Exams
Late assignments will not be accepted, unless exceptional circumstances prevent you from completing them. Extension of deadlines will be at the instructor’s discretion. Late assignments may result in partial or total loss of credit. In the event of an excused absence for an exam, it is the student's responsibility to arrange for a time to make up the exam as soon as possible.
**Extra Credit**
Extra credit will be given on some assignments for completing advanced problems, but there will be no extra credit assignments given to students on an individual basis to improve a grade.

**Cell Phone Use**
Cell phone use is not allowed during class. If you need to take a call, please go outside the classroom.

**Laptop Use**
In general, you cannot use your laptops during class activities or exams. For special circumstances (e.g., presentations), or special needs, please talk with the instructor.

**Food in Class**
Refrain from bringing food to class. For special needs or occasions, please talk with the instructor.

**Missed Exam**
Exceptional circumstances (e.g., documented illness, family situations) may be considered at the instructor’s discretion. No credit will be awarded for work missed resulting from unexcused absences.

**Participation**
Participation in class discussion is important, and students that actively participate generally gain a better understanding of the material.

**K. COLLEGE AND UNIVERSITY POLICIES**

- **Academic Integrity (University)**
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- **Classroom/Professional Behavior**
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This
prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation **WILL NOT** automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar ([http://www.tamucc.edu/academics/calendar/](http://www.tamucc.edu/academics/calendar/)) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
  As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html), and the College of Science and Engineering Grade Appeals webpage at [http://sci.tamucc.edu/students/GradeAppeal.html](http://sci.tamucc.edu/students/GradeAppeal.html). For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **Disability Services**
  The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning
environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
  In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**
- **Academic Advising**
  The College of Science & Engineering requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

**GENERAL DISCLAIMER**

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.