Linear Algebra

**MATH 208A - Sp 2016 (4 Credits)**

**Instructor:** Tom St. George, Ph.D  
**E-mail:** tstgeorg@carrollu.edu  
**Phone:** 262-524-7142  
**Class:** TR 8 AM - 9:50 AM in Main 311  
**Office:** Math House 100  
**Office Hours:** 8-9am, 11am-Noon, 2-3pm MW or by appointment

**Prerequisite:** MAT 161 or MAT 206

**Textbook:** *Linear Algebra and Its Applications*, by David C. Lay (4th-Edition)

**Course Description:**
Linear Algebra is one of the most completely understood and widely used fields of mathematics. In fact, applications ranging from web search algorithms to GPS location computations to biological population modeling involve linear algebra. This course will comprise of learning the basic elements of linear algebra, which include but not limited to: vector spaces, linear transformations and matrices, systems of linear equations, vector and matrix equations, and applications.

**Intended Learning Outcomes:**
Upon successful completion of this course the student will be able to demonstrate:

- an understanding of linear algebra concepts and techniques;
- effective communication of mathematics through the ability of writing basic proofs;
- the ability to state important theorems learned and apply them;
- the ability to apply linear algebra concepts to applications.

**Course Policy:**

This course will be ran using a *flipped classroom* approach. Flipped Classroom implies that lectures will be conducted outside of class and homework will be done inside of class. There are many benefits of this approach:

- **Learn at your own pace** – Lectures will be done by video. You can stop, restart, or rewind videos in order to catch something that may ordinarily be missed in a typical in-class lecture;
- **Class is more engaging** – No longer will it become a sleeping event during the day. Instead, students actively discuss and work on homework problems with their peers;
- **Questions get answered faster** – Instead of waiting until the next day to get your questions answered about homework problems, they can be asked immediately in class. In addition, working with your peers through the homework becomes an added benefit to this approach.
This approach may be weird or unfavored to some. It is against the norm of being
*lectured at*, which students have become conditioned to understand. A flipped classroom
approach works best if the student comes to class prepared to learn. This means that
the student is required to watch the videos and read the text assignments PRIOR to
coming to class. In order to insure this happens, *Lecture Preps* will be given. (More on
those below.)
Technology has come a long way to allow us to attempt this approach. Let’s make the
most of it! Below are the policies regarding how your performance in the course will be
measured.

**Lecture Preps:** In order to insure you are watching the videos and reading the material,
online *lecture preps* will be given throughout the semester. The goal of these preps is
to get you to pay attention to certain concepts in the course material so that you are
prepared to work through the homework the next class period. The instructor may
reinforce the material by giving quick discussions over what was learned.

**Participation:** Every class period, a problem set will be assigned and you will be given
time to work on problem sets in class. It is expected that ALL students work and
maintain their solutions to problems assigned within a notebook that is designated for
this class.

Participation will be graded in a unique way. Instead of the instructor supplying the
solutions to the problem sets, the responsibility of supplying the solutions will be put
back on the students. The instructor will partition the class into groups. For each
problem set assigned, one group will be assigned to write neatly, accurately, and legibly
the solutions to the problem set. This role will be rotated through the groups, equally.

Solutions are to be submitted to the instructor by email, by hand, or placed in the
instructor’s mailbox (outside Math House 100) within 2 days from the day the problem
set is assigned. That is, Tuesday’s problem set is due on or before Thursday at 8am.
Thursday’s problem set is due on or before Saturday at 8am. All solutions are expected
to be *complete* by the stated times above. Complete implies that all solutions are accu-
rate, neat, and legible for other students to read. **A score of 0 or 1 will be given if**
all problems are completed and turned in on time. Inaccurate solutions will be
returned until it is completely accurate or the deadline has passed. All solutions will
be posted on Portal.

If group members are not being active in participating in the solution write-ups, it is
up to the instructor on whether participation points are merited.

**Attendance:** Flipped Classrooms work best if you attend. If you are intending on miss-
ing class due to an excused absence (sick with doctor’s note, extracurricular activities
sponsored by Carroll University, or a death in the family), you must contact the in-
structor. More than 3 unexcused absences will result in a zero for participation.

**In-class Quizzes:** Every Tuesday, you will be given a quiz over the previous week’s
material. This is to evaluate how well you have learned the material and prepare
you for exams. Missed quizzes due to excused absences are allowed as long as proper
notification of your absence occurs in advance. Make-up quizzes will not be given to
Group Project: At the end of the semester, groups determined by the instructor (may be different than problem set groups), will be required to pick a topic or application of linear algebra to present to the class via a Power Point presentation. The purpose of the project is to demonstrate your ability to communicate mathematics and your ability to research additional topics within Linear Algebra that interest you. Further information about this project will be provided later by the instructor.

Exams: There will be a total of four exams in this class: 3 Semester Exams and 1 Final Exam. The tentative dates for the semester exams are: Tuesday, February 21th, Tuesday, March 28nd, and Tuesday, April 25th. The final exam for this class is Wednesday, May 10th. Note that I do not have the power to move the final exam. Do not book any travel arrangements during this time! Make-ups for the three semester exams will only be allowed under EXTREME circumstances. Please notify me well in advance of such situations.

Grading Criteria:

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Participation</td>
<td>5%</td>
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<tr>
<td>In-Class Quizzes</td>
<td>10%</td>
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<tr>
<td>Lecture Prep</td>
<td>10%</td>
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<tr>
<td>Group Project</td>
<td>5%</td>
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<tr>
<td>Exams (3)</td>
<td>15% Each</td>
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<tr>
<td>Final Exam (Comprehensive)</td>
<td>25%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Grading Scale:

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<tr>
<th>Grade</th>
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<tr>
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<td>[92, 100]</td>
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<tr>
<td>AB</td>
<td>[88, 92)</td>
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<tr>
<td>B</td>
<td>[82, 88)</td>
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<td>BC</td>
<td>[78, 82)</td>
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<tr>
<td>C</td>
<td>[70, 78)</td>
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<tr>
<td>D</td>
<td>[60, 70)</td>
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<td>F</td>
<td>[0, 60)</td>
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Additional Resources:

Learning Commons:
Beyond my office hours, you may be able to find extra math help (free) in the Learning Commons housed in the lower level of the library. Seek out students that have had linear algebra before.

Academic Integrity: All work on assignments, quizzes, and tests is expected to be your own and represent your ability in course content. The Carroll University Academic Integrity Policy is located in your student handbook. Please familiarize yourself with this policy. If a student violates this policy in any way, the instructor or College reserves the right to impose a sanction of failure on the assignments/assessment or failure in the course.

Accommodation for Disabilities:
If you need accommodations for a documented disability, or are considering obtaining documentation, you should make an appointment with Martha Bledsoe, our disabilities coordinator, no later than the first week of class. She can be reached by calling 262-524-7335 or contacting her via e-mail at wyc@carrollu.edu.

Carroll Portal (LMS): This class will use the Carroll Portal for various purposes. Your grades will be posted there when available. Please keep track of your grades yourself as well. If you notice any errors, please let me know as soon as possible.
The instructor and the University reserve the right to modify, amend, or change the syllabus, course requirements, grading policy, etc., as needed. Students will be notified of any changes during the lecture periods.

Math 208 Tentative Schedule:

• Systems of Equations (1 week):
  – Gaussian Elimination;
  – Gauss-Jordan Elimination;

• Euclidean Space (2 weeks):
  – Vectors;
  – Linear Combinations;
  – Span;
  – Linear Independence;
  – Linear Transformations;

• Matrices (2 weeks):
  – Matrix Algebra;
  – Inverses;
  – Markov Chains;
  – Determinant and Its Properties

• Vector Spaces (2 weeks):
  – Vector Spaces and Subspaces
  – Nullspace, Row Space and Column Space;
  – Basis and Dimension;
  – Coordinate Systems and Change of Basis;

• Eigenvalues and Eigenvectors (1-2 weeks):
  – Eigenvalues and Eigenvectors;
  – Change of Basis;
  – Diagonalization;

• Orthogonality (2 weeks):
  – Inner Product and Orthogonality;
  – Orthogonal Sets;
  – Orthogonal Projections;
  – Gram-Schmidt Process;

• Projects (1 week)