MATH 264-APPLICATIONS IN LINEAR ALGEBRA
(CRN 23795)
Syllabus - Fall 2022

1 General Information

Instructor Information

Name: Rebin Muhammad **Office:** HT (High Technology and Science Center) / Room 223
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Office Hours:

You can come to my office at the following time, or send an e-mail to make an appointment.

Monday	**Tu**esday	**W**ednesday	**Th**ursday	**F**riday
12:30 pm - 1:30 pm	12:30 pm - 1:30 pm	12:30 pm - 2:30 pm	12:30 pm - 2:30 pm	12:30 pm - 2:30 pm

Class Meeting Times and Room:

Science Center 259

Tuesday	**Th**ursday
2:00 pm - 3:50 pm	2:00 pm - 3:50 pm

Student Success

I am committed to helping each and every one of you achieve your goals. I fundamentally believe that everyone is a math person and is capable of succeeding in this course. If there is something we could do differently that will help you succeed, please come talk to me. There are many services on campus to help you succeed. I enthusiastically support the mission of our Office of Student Disability Services; if you are registered with them, please come speak to me in office hours so I can ensure I am doing everything needed to enable your success.

Communication

In this class we are trying to build a sense of community, that is why I like to see students ask questions and others participate in answering, We will use Blackboard for general purposes, but your main way to communicate with me and your classmate is through a private discord channel that only students who take this class are allowed to join.

2 Course Information

Course Format

This class is taught by a method called team-based learning. You will be assigned to a team that you will work with on various activities in class each day. The course is divided into 5 modules.

- Before each module begins, you will be responsible for ensuring your own readiness for the module. A list of learning outcomes for the readiness assurance process is available in Blackboard and at the beginning of each chapter in the textbook that we will use; you should be able to do each of these things before coming to class on the first day of the module. Some of these readiness assurance outcomes are new material, some of these readiness assurance outcomes are topics from previous classes, and some are topics from earlier in this class. Along with these outcomes in Blackboard are some preparation resources (videos or reading material) to help you prepare.
- The first day of each module will be dedicated to the Readiness Assurance Process. The dates for these are located in the course calendar.
- On these days, you will first take an Individual Readiness Assurance Check. After submitting this, working with your teammates you will retake the same problems as the Team Readiness Assurance Check. These are designed to measure if you are prepared for the team activities on subsequent days.
- On the other class days, you will work with your teammates on a series of activities designed to guide you through discovering the course material.

How To Be Successful in This Course

Students who have been successful in this course in the past have told me that the following things were key to their success:

- **Work homework problems**. Just like your favorite sport, you do not learn mathematics by watching someone else do it, but by doing it yourself. You need to work on practice problems to learn. Resist the temptation to just watch videos or review your notes.
- **Use your teammates and classmates as a resource**. Ask questions on Blackboard. Ask your teammates questions during class. We are here to help each other learn.
- **Reassess early and often**. The grading system in this class offers you lots of flexibility. Don't wait until the end of the semester to try and demonstrate your learning of everything.
- **Complete the reflections**. These reflection assignments are designed to help you make sure you are progressing towards the grade you want.

Course Description

This course provides an introduction to linear algebra. Topics include systems of linear equations, matrices, Gaussian elimination, rank, linear independence, subspaces, basis, dimension, linear transformations, determinants, eigenvalues and eigenvectors, change of basis, diagonalization, the abstract concept of a vector space, and applications. Core Course.

Learning Outcomes

At the completion of this course, each student will be able to...

1. Work collaboratively on difficult mathematics problems
2. Solve systems of linear equations.
3. Determine whether or not a set with given operations is a vector space or a subspace of another vector space.
4. Determine properties of sets of vectors such as whether they are linearly independent, whether they span, and whether they are a basis of a given subspace.
5. Perform fundamental operations in the algebra of matrices, including multiplying and inverting matrices.
6. Use and apply algebraic properties of a linear transformation.
7. Determine geometric information about a linear transformation, including computing determinants, eigenvalues, and eigenvectors.
8. Using programming language (Python) fluently to solve linear algebra problems.

Topics

We will cover the topics outlined on the Course Standards sheet provided to you, in the order that they appear on that section.

Textbook and Supplies:

Linear Algebra for Team-Based Inquiry Learning by Steven Clontz and Drew Lewis. This textbook is **free**. You can find live version of this textbook in this link:

`https://stevenclontz.github.io/linear-algebra-tbil-2021/frontmatter.html`

or you can download PDF version for here:

`https://stevenclontz.github.io/linear-algebra-tbil-2021/pdf/main.pdf`

Standards Based Grading

This course is graded by a methodology called standards-based grading. Instead of receiving one percentage grade for an assessment, you will be assessed on whether or not you demonstrated excellence on individual learning standards. A list of these 24 standards is available in Blackboard. Your grade in the course will be based on how many of these standards you demonstrate excellence on. On each standard, you will demonstrate excellence on two separate occasions.

Feedback

On a written assessment, you will not receive a score or a percentage. For each standard on that assessment, you will be scored into one of three categories.

- **Demonstrated Excellence:** You successfully demonstrated the Excellence of that standard. Great job! Check off another box on your progress sheet.

- **Minor Revision Needed:** You have a minor mistake, unrelated to the standard being assessed. These usually fall into two main categories: arithmetic mistakes, and poor presentation (which are both usually symptoms of artificial time constraints rather than a lack of content knowledge). You should write out a complete solution to the problem and resubmit the assessment in Blackboard (you can leave the other questions blank). You must do this within a week of the original assessment.
- **Reassessment Needed:** You'll need to work on a new problem. See 'Reassessment' below for options.

Reassessment

You will have multiple opportunities to demonstrate your learning of each standard.

1. Each week we will have either a short assessment ("quiz"), covering up to 4 standards, or a long assessment ("exam"), covering all of the standards discussed so far. A detailed schedule listing exactly which day each standard appears on quizzes is posted on Blackboard.
2. Additionally, if you receive a "Reassessment needed" on a standard, you can work an on-demand reassessment through Blackboard. There are a few caveats to on-demand reassessments:
    - In order to reassess a single standard, you must have completed additional practice problems. Fill out a 'Reassessment Request Form' (linked in Blackboard).
    - Once you have done this, I will take a quick look at your practice problems; if there are no issues, I will assign a one question reassessment in Blackboard.
    - Note that there will be a small lag, as I want to look at your reassessment request and manually approve it. I'll try to do this each day, though if many people submit these (especially towards the end of the semester) I will only do this as fast as I can grade the reassessments.

Calculator Policy

Calculators of any sort may be used on quizzes or exams if desired.

Missed Coursework

Missed Coursework Each assignment will have a "due date" scheduled in Blackboard. Typically, assignments will also be open for some time afterwards (during this period Blackboard will mark them as 'late'). If you need a different due date for an assignment, fill out the 'Due Date Change Request Form' linked in Blackboard.

Because of the registrar's deadline for (and requirement that I submit) final grades, all work must be submitted by December 7 . If you need more time than that, come talk to me about an incomplete.

Grading

At the end of the semester, you will fill out a final reflection on your final that we will use to determine your course grade. Here are some general guidelines for what you should aim for over the course of the semester:

To earn a ...	... you should
A	Demonstrate excellence (twice) on 22 standards;
B	Demonstrate excellence (twice) on 20 standards;
C	Demonstrate excellence (twice) on 17 standards;
D	Demonstrate excellence (twice) on 15 standards;
F	Not t in the above categories.

Homework

The only way to learn mathematics is to do mathematics; thus, our class time is centered around students doing mathematics. Additionally, you will require practice outside of class; a list of suggested exercises corresponding to each standard is available in Blackboard.

I will neither collect nor grade homework, as past experience has not shown this to be a good use of instructor or student time. Instead, you should work as many problems as you need to. If you need feedback on your homework problems, bring them to my office hours and I will be happy to discuss them with you.

PREREQUISITE(S):

A grade of C or better in MATH 150 or MATH 181 or consent of the department. Assessment Level(s): ENGL 101/011 or ELAI 990, READ 120 or ELAR 980..

Linear Algebra Standards:

Module E: How can we solve systems of linear equations?

- LE1 - Linear systems, vector equations, and augmented matrices
- LE2 - Reduced row echelon form
- LE3 - Counting solutions for linear systems
- LE4 - Linear systems with infinitely-many solutions

Module V: What is a vector space?

- VS1 - Vector spaces
- VS2 - Linear combinations
- VS3 - Spanning sets
- VS4 - Subspaces
- VS5 - Linear independence
- VS6 - Basis identification
- VS7 - Basis of a subspace
- VS8 - Polynomial and matrix spaces
- VS9 - Homogeneous systems

Module A: How can we understand linear maps algebraically?

- AT1 - Linear maps
- AT2 - Standard matrices
- AT3 - Image and kernel
- AT4 - Injectivity and surjectivity

Module M: What algebraic structure do matrices have?

- MX1 - Multiplying matrices
- MX2 - Row operations as matrix multiplication

- MX3 - The inverse of a matrix

Module G: How can we understand linear maps geometrically?

- GT1 - Row operations and determinants
- GT2 - Determinants
- GT3 - Eigenvalues
- GT4 - Eigenvectors

Readiness Assurance

Before each module (chapter) begins, you will be responsible for ensuring your own readiness for the module. A list of learning outcomes for the readiness assurance is available in online or PDF (inside the textbook); you should be able to do each of these things before coming to class on the first day of the module. Some of these readiness assurance outcomes are new material, some of these readiness assurance outcomes are topics from previous classes, and some are topics from earlier in this class.

3 Course Policies

Attendance:

Exploration, collaboration, and communication in class are essential for this course. Therefore, regular attendance and active participation are mandatory in this course. You are expected to be on time and stay in a class or you will be counted absent unless there is an emergency.

All of this said I recognize that life happens. We get colds and the flu. Relatives need your help. When this happens, do what you need to do. I trust that you are an adult and will make the best choices that you can. I appreciate it if you can notify me in advance of an absence, if possible. In every case, please come talk to me afterward.

Makeup Exams:

Exams must be completed within the given time frames, unless prior arrangements have been made.

4 Evaluation and Grading

This course is graded by a methodology called standards based grading. Instead of receiving one percentage grade for an assessment, you will be assessed on whether or not you mastered individual learning standards. A list of these 25 standards is available in Blackboard. Your grade in the course will be based on how many of these standards you demonstrate mastery of. On each standard, you will have the opportunity to earn up to two checkmarks; the total number of checkmarks you earn will determine your grade (see below).

Reassessment

You will have multiple opportunities to demonstrate mastery of each standard. Your first opportunity will be on one of the daily quizzes.

- Each standard will show up on quizzes at least three (often four) times, beginning the class day after it is discussed in class. Usually, these four appearances will be in subsequent weeks, but this is not a strict rule. A detailed schedule listing exactly which day each standard appears on quizzes will be posted in Blackboard.
- There will be a midterm in class on , a semifinal assessment the last day of class, and the final exam. The midterm will be an opportunity to demonstrate mastery on any standard from the first three modules, while the semifinal and final exam will have every standard available.

5 Additional Information

Withdrawal and Refund Dates

It is the student's responsibility to drop a course. Non-attendance of classes or failure to pay does not constitute official withdrawal. It is recommended that faculty either specify the drop deadline date on the syllabus or provide the student with the following directions. To view specific drop deadlines, log into your MyMC account:

1. Click on "My Class Schedule" under Student Quick Links
2. Select the current term
3. Click on "View Drop Deadline Dates" at the bottom of the page"

Veteran's Services

If you are a veteran or on active or reserve status and you are interested in information regarding opportunities, programs and/or services, please visit the Combat2College website."

Academic Dishonesty:

Academic integrity is critical for students and instructors alike. Being responsible for your work, attendance, and conduct is everyone's duty. Every student is expected to adhere to the Montgomery College Student Code of Conduct. Academic Dishonesty, including dishonesty in assignments or examinations (cheating) and presenting the ideas or the writing of someone else as your own (plagiarism) will not be tolerated. All work must be done by you (or your group for group work assignments). You may use any help that you can find for ungraded work done outside of class, but keep in mind that the purpose of all work is to develop your ability to do such problems on your own. The quests and final exam must be your own work, completed without the aid of books, notes, calculators, phones, etc. Dishonesty will result in a zero on that work, possible failure in the class, and a report to the university judiciaries..

Additional Resources: Additional terms of the syllabus can be found at:

$$http://cms.montgomerycollege.edu/mcsyllabus/$$

Important Links for Students

Assessment Centers

The Montgomery College Assessment Centers provide PLACEMENT and ... TESTING includes Accuplacer and ESL Accuplacer assessment tests for ... http://www.montgomerycollege.edu/assessmentcenters —

MAPEL Center

This is where students can get tutoring and other resources:
https://www.montgomerycollege.edu/academics/support/learning-centers/mapel-center-germantown/index.html

Academic calendar.

When is Thanksgiving? When are midterm exams? When does Thanksgiving begin? http://cms.montgomerycollege.edu/edu/

ADA Information and Compliance:

http://cms.montgomerycollege.edu/edu/Department.aspx?id=53990 Alert Montgomery System. Sign up for Alert Montgomery the official emergency communications service for Montgomery County, MD. During a major crisis, emergency or severe weather event, Montgomery County officials can send event updates, warnings and instructions directly to you on any of your devices. https://member.everbridge.net/index/1332612387832009/login

Code of Conduct.

If you have questions regarding behavioral expectations:
https://www.montgomerycollege.edu/offices/student-affairs/student-rights-responsibilities.html

Counseling & Advising.

Academic advising and short term counseling.
https://www.montgomerycollege.edu/counseling-and-advising/

Disability Support Services.

If you are requesting a reasonable accommodation related to a disability:
https://www.montgomerycollege.edu/counseling-and-advising/disability-support-services/index.html

Forms:

graduation, involuntary withdraw, change of major, appeals.
https://www.montgomerycollege.edu/admissions-registration/student-resources/student-forms.html

Learning Centers and Academic Support Centers.

If you are a student who would benefit from tutoring and/or support in reading, writing languages, mathematics, Science, and Technology:
https://www.montgomerycollege.edu/academics/support/learning-centers/index.html

Safety, Security, & Emergency Operations Plan.

Contacts for security offices, Emergency guidelines & procedures, evacuations, Montgomery College Alert, Emergency Guidelines for Individuals with Disabilities,
https://www.montgomerycollege.edu/life-at-mc/public-safety/index.html

Sexual Harassment or Discrimination.

Office of Equity and Diversity.
https://www.montgomerycollege.edu/policies-and-procedures/title-ix/sexual-misconduct-policy-and-procedures.html

Syllabus Changes

While I try hard to stick to the plans laid out here, this syllabus is subject to change (due to pandemics, weather events like snow, etc.). Any changes made will reflect the spirit of this original syllabus, and will be updated on Blackboard.