Instructor: Dr. Jeff Morgan, jjmorgan@central.uh.edu.

Office Hours: By appointment.

Course Homepage: After January 10, access the page at http://www.math.uh.edu/~jmorgan/Math2331, and follow the instructions to access all of the course materials, discussion forum, course calendar, and other information.


Computational Software: I will make extensive use of the online matrix calculator (linked from the course homepage). I will also occasionally use Excel and Matlab. UH has a site license for Matlab and Office 365 (to access Excel). More information will be posted on the course homepage. Help videos will also be posted on the course homepage.

Prerequisite: Credit for or concurrent enrollment in MATH 1432.

Course Material: The material for the course is a subset of the material listed in the text above. More specifically, we will cover the sections below.

Course Description: Solutions of linear systems of equations, vector spaces and subspaces, orthogonality, determinants, linear transformations.

(1) Linear Equations in Linear Algebra
1.1 Systems of Linear Equations
1.2 Row Reduction and Solution Sets of Linear Systems
1.3 Vector Equations
1.4 The Matrix Equation Ax=b
1.5 Solution Sets of Linear Systems
1.7 Linear Independence
1.8 Introduction to Linear Transformations
1.9 The Matrix of a Linear Transformation
1.10 Applications

(2) Matrix Algebra
2.1 Matrix Operations
2.2 The Inverse of a Matrix
2.3 Characterizations of Invertible Matrices
2.8 Subspaces of \( \mathbb{R}^n \)
2.9 Dimension and Rank

(3) Determinants
3.1 Introduction to Determinants
3.2 Properties of Determinants
3.3 Cramer's Rule, Volume, and Linear Transformations

(4) Vector Spaces
4.1 Vector Spaces and Subspaces
4.2 Null Spaces, Column Spaces, and Linear Transformations
4.3 Linearly Independent Sets; Bases
4.4 Coordinate Systems
4.5 The Dimension of Vector Space
4.6 Rank

(5) Eigenvalues and Eigenvectors
5.1 Eigenvectors and Eigenvalues
5.2 The Characteristic Equation
5.3 Diagonalization
5.5 Complex Eigenvalues
5.6 Discrete Dynamical Systems

(6) Orthogonality and Symmetric Matrices
6.1 Inner Product, Length, and Orthogonality
6.2 Orthogonal Sets
6.3 Orthogonal Projections
6.4 The Gram-Schmidt Process
6.5 Least-Squares Problems

(7) Symmetric Matrices and Quadratic Forms
7.1 Diagonalization of Symmetric Matrices
7.2 Quadratic Forms
   Classification of critical points for functions of several variables

Course Calendar: A course calendar will list all of the assignments and due dates, testing dates, online meeting times and dates, help materials, videos, and practice exams.

Recorded Lectures: Lectures will be recorded and posted after the live online meeting on Thursday from 4-6pm. The first online live meeting will take place on Thursday, January
A link will be given on the course calendar to the online meeting room. Students who cannot attend the online live meeting can watch the recording (posted on the course calendar). Additional recordings and video help with the homework will also be posted on the course calendar.

**Discussion Forum Activity:** All students are expected to discuss the course material via the discussion forum. 10% of the final grade will be based upon discussion board activity, and questions are just as important as answers (correct or incorrect). All discussion forum questions will be answered within 24 hours.

**Additional Communication:** Students will receive emails from the instructor during each weekday of the course, reminding them of current material, upcoming topics, reading assignments, available help materials, and coming due dates. All of these emails will also be posted in a special thread within the discussion forum. Email can also be used to communicate with the instructor, although students are encouraged to use the discussion forum when the questions are not of a student specific nature.

**Electronic Homework:** FITB (Fill In The Blank) electronic homework will be assigned weekly. Students will have multiple attempts on the FITB homework, and the highest score will be used as the grade. Late FITBs can be submitted, with a penalty applied to the grade.

**Homework:** Written homework will be given every week during the semester, with the due dates noted on the course calendar. Students will submit their written homework by scanning and uploading their work. **Instructions will be given on the course calendar.**

**Exams:** A proctored midterm and final exam will be given on the UH campus. **We will work with students who are not in the Houston area to accommodate testing.** The dates and times of the exams will be announced later in the semester.

**Grades:**

Discussion Board Activity – 10%
Online Electronic Assignments (including FITB) - 15%
Written Homework - 15%
Midterm - 30%
Final Exam – 30%

90% and above - A
at least 80% and below 90% - B
at least 70% and below 80% - C
at least 60% and below 70% - D
below 60% - F

Whenever possible, and in accordance with 504/ADA guidelines, we will attempt to provide reasonable academic accommodations to students who request and require them.