湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Linear Algebra and Matrix Theory
Course Code	MATH 2401
Semester	Winter 2027
Course Length	4 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	MATH 1112 Calculus II

Course Description:

This course provides a comprehensive introduction to the fundamental concepts of linear algebra, balancing computational techniques with theoretical rigor. Students will explore the geometry and algebra of vectors, the properties of matrices, and the structure of vector spaces. Key areas of study include systems of linear equations, linear transformations, orthogonality, and spectral theory (eigenvalues/eigenvectors). The course emphasizes the development of mathematical reasoning and the ability to construct formal proofs.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical thinking skills** – Students will engage in creative and/or innovative thinking, and/or inquiry, analysis, evaluation, synthesis of information, organizing concepts, and constructing solutions.
- **Communication skills** – Students will demonstrate effective written, oral, and visual communication.
- **Teamwork** – Students will demonstrate the ability to work effectively with others to support a shared purpose or goal and consider different points of view.
- **Social responsibility** – Students will demonstrate intercultural competency and civic knowledge by engaging effectively in local, regional, national, and global communities.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Solve systems of linear equations using Gaussian elimination and interpret the geometry of solution sets;

- Perform matrix operations and apply the properties of determinants, traces, and inverses;
- Analyze the structure of vector spaces, including basis, dimension, and subspaces;
- Relate linear transformations to matrix representations and determine their kernel and image;
- Utilize inner products for projections and orthogonal decompositions;
- Calculate eigenvalues and eigenvectors to determine the diagonalizability of matrices.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:

Primary Text: *Linear Algebra and Its Applications (6th Edition)* by David C. Lay, Steven R. Lay, and Judi J. McDonald. Pearson.

Alternative Reference: *Introduction to Linear Algebra (6th Edition)* by Gilbert Strang. Wellesley-Cambridge Press.

Technology Requirements: Students are expected to be familiar with scientific computing environments such as R, MATLAB, or Python for numerical assignments.

Course Requirements:

Problem Sets (25%):
Regular assignments consisting of both computational exercises and theoretical proofs. These are designed to reinforce the linguistic and logical nature of mathematics.

Topic Quizzes (20%):
Short assessments conducted at the end of each major module to ensure mastery of foundational concepts like row reduction and vector space axioms.

Midterm Examination (25%):
A comprehensive exam covering systems of equations, matrix algebra, and the properties of bases.

Final Examination (30%):
A cumulative assessment with a focus on advanced topics, including orthogonality, eigenspaces, and diagonalization.

Assessments: Activity	**Percent Contribution**
Problem Sets	25%
Topic Quizzes	20%
Midterm Examination	25%
Final Examination	30%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	**Percentage of available points**

A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

MATH 2401 Schedule

Lecture	Topic	Readings
L1	Systems of Linear Equations	Section 1.1
L2	Row Reduction & Echelon Forms	Section 1.2
L3	Vector Equations & Combinations	Section 1.3
L4	Matrix Equation $Ax = b$	Section 1.4
L5	Solution Sets; Homogeneous Systems	Section 1.5
L6	Linear Independence; Problem Set 1 Due	Section 1.7
L7	Linear Transformations	Section 1.8
L8	Matrix of a Transformation	Section 1.9
Quiz	**Module Quiz 1: Linear Systems**	
L9	Matrix Operations & Inverses	Sections 2.1-2.2
L10	Characterizations of Invertibility	Section 2.3
L11	Determinants & Row Operations; Problem Set 2 Due	Sections 3.1-3.2
Quiz	**Module Quiz 2: Matrix Algebra**	
L12	Vector Spaces and Subspaces	Section 4.1
L13	Null, Column, & Row Spaces	Section 4.2
L14	Bases & Spanning Sets; Problem Set 3 Due	Section 4.3
L15	Coordinate Systems	Section 4.4
--	**Midterm Examination**	Covers L1-14
L16	Dimension and Rank	Sections 4.5-4.6
Quiz	**Module Quiz 3: Vector Spaces**	
L17	Eigenvectors and Eigenvalues; Problem Set 4 Due	Section 5.1
L18	The Characteristic Equation	Section 5.2
L19	Diagonalization & Similarity	Section 5.3
L20	Eigenvectors & Linear Transformations	Section 5.4
L21	Inner Product & Orthogonality	Section 6.1
L22	Orthogonal Sets & Projections; Problem Set 5 Due	Sections 6.2-6.3
L23	Gram-Schmidt & Least-Squares	Sections 6.4-6.5
Quiz	**Module Quiz 4: Spectral Theory**	
L24	Diagonalization of Symmetric Matrices	Section 7.1
L25	Singular Value Decomposition (SVD)	Section 7.4
--	**Final Examination**	Cumulative

Accommodation Statement

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or without the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations

All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates

All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work

The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.