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SAMPLE SYLLABUS
This document is published as an indication of what is typically taught in this course. Instructors have the responsibility of deciding on topics to be omitted, additional topics to be included and the emphasis, ordering and pacing of presentation.

Course Number: **MTH 309**

Course Title: **Introduction to Linear Algebra**

Credit Hours: **4**

Textbook: **D. Lay, S. Lay, J. McDonald *Linear Algebra and its Applications*, 3nd custom UB edition.**

3nd custom UB edition is the same as the standard 5th edition.

Prerequisites: MTH 142

Notes: While this is a core course required for all math majors, usually over 70% of students taking MTH 309 are engineering majors. The course should cover several applications of linear algebra in natural sciences, engineering and computer science. Students taking this course should be introduced to computer based tools for performing linear algebra computation (row reduction, matrix multiplication, singular value decomposition etc.). Homework assignments should include a selection of exercises marked [M] where computer based computations are necessary.

This schedule is written for 13 weeks of instruction. A typical semester has14 teaching weeks, thus some flexibility is built in.

Week	Sections	Topics
1	1.1 - 1.4	Systems of linear equations. Row reduction and echelon forms. Vector equations. The matrix equation Ax=b.
2	1.5, 1.7, 1.6, 1.10	Solution sets of linear systems. Linear independence of vectors. Applications of systems of linear equations and linear models.
3	1.8, 1.9, 2.1, 2.2	Introduction to linear transformations. Matrix of a linear transformation. Matrix operations. The inverse of a matrix.
4	2.3, 2.7, 2.8, 2.9	Characterizations of invertible matrices. Applications to computer graphics. Subspaces of R^n. Dimension and rank.
5	3.1 - 3.3	Introduction to determinants. Properties of determinants. Cramer's rule, volume, and linear transformations. **Midterm Exam 1**
6	4.1 - 4.3	Vector spaces and subspaces. Null spaces, column spaces, and linear transformations. Linearly independent sets, bases.
7	4.4 - 4.7	Coordinate systems. Dimension of a vector space. Rank. Change of basis.
8	4.8, 4.9, 5.1, 5.2	Applications to difference equations and Markov chains. Eigenvectors and eigenvalues. Characteristic equation.
9	5.3, 5.4, 5.6	Diagonalization. Eigenvectors and linear transformations. Discrete dynamical systems. **Midterm Exam 2**
10	5.8, 6.1, 6.2	Iterative estimates of eigenvalues. Inner product, length, orthogonality. Orthogonal sets.
11	6.3 - 6.5	Orthogonal projections. The Gram-Schmidt process. Least squares problems.
12	6.6, 7.1, 7.2	Applications to linear models. Diagonalization of symmetric matrices. Quadratic forms
13	7.4, 7.5	Singular value decomposition. Applications to image processing and statistics.