SOUTHERN UNIVERSITY and A&M COLLEGE
DEPARTMENT OF MATHEMATICS

MATH 433
LINEAR ALGEBRA

CATALOGUE DESCRIPTION: An advanced study of vector spaces, subspaces and dimensions; inner products; elementary matrices; the inverse of a matrix and rank of matrix; linear transformations; rank, nullity and inverse of linear transformations; eigenvalues and eigenvectors; similarity and Cayley-Hamilton Theorem. A good mixture of proofs and computations is given.

PREREQUISITES: Mathematics 233 or consent of the instructor.

REQUIRED TEXTBOOK: Elementary Linear Algebra, Howard Anton, John Wiley & Sons, 9^{th} Edition, 2005.

GOALS AND COURSE OBJECTIVES: At the end of the semester, the student should be able to

1. Solve system of linear equations using Gaussian Elimination and using Gauss- Jordan Elimination.
2. Verify vectospace axioms
3. Determine whether a given subset of a known vectorspace is a subspace.
4. Determine whether a given vector in R^3 can be expressed as a linear combination of given vectors in R^3 and find the linear combination, when it exists.
5. Prove that the set of all linear combinations of a set of vectors forms a minimal subspace.
6. Determine whether a set of vectors spans the entire vectorspace and find the equation of the spanning subspace.
7. Prove theorems relating the concepts of linear dependence and linear combinations.
8. Determine whether a given set of vectors is linearly independent.
9. Determine whether a given set of vectors forms a basis for the vectorspace.
10. Prove the unique representation theorem involving bases.
11. Find row space, column space and null space of a matrix.
12. Finding a linearly independent subset for a given set of vectors.
13. Prove the dimension theorem for matrices and apply the theorem.
14. Identify Inner product spaces and prove Cauchy-Schwarz Inequality.
15. Evaluate norm of a vector, angle between vectors and projections.
16. Determine whether a given set of vectors is orthogonal/orthonormal.

17. Find an orthogonal basis/orthonormal basis using Gram-Schmidt Process.
18. Find eigenvalues and eigenvectors.
19. Diagonalize a matrix by using the eigen vectors, when applicable.
20. Find orthogonal diagonalization of matrices, when applicable.

COURSE CONTENT:

1.2	Gaussian Elimination
1.4	Elementary Matrices and Finding Inverse of Matrices.
5.1	Real Vector Spaces
5.2	Subspaces
5.3	Linear Independence
5.4	Basis and Dimensions
5.5	Row Space, Column Space and Nullspace
5.6	Rank and Nullity
6.1	Inner products
6.2	Angle and orthogonality in Inner product Spaces
6.3	Orthonormal Bases; Gram-Schmidt Process
7.1	Eigenvalues, Eigenvectors
7.2	Diagonalization
8.1	General Linear Transformation
8.2	Kernel and Range
8.3	Inverse Linear Transformation.

EVALUATION OF GRADES: Course grade will be based on quizzes, homework assignments, three tests and a comprehensive final examination.

Quizzes and homework assignments are worth 100 points. Tests and the final examination are worth 100 points each. There will be no make up test for tests missed without prior permission.

(Total possible points 500.)

A:	450-500
B:	400-449
C:	350-399
D:	300-349

COURSE SCHEDULE:

Test 1: Sections 1.2, 5.1-5.3
Test 2: Sections 5.4-5.6
Test 3: Sections 6.1-6.4, 7.1

Final Exam: 5.1-5.6, 6.1-6.4, 7.1-7.3, 8.1-8.3

ACADEMIC DISHONESTY:

Adhere to honesty and integrity in work submitted for credit in this course and adheres to SUBR's Code of Conduct. (Refer to current Catalog.)

DISABILITY STATEMENT:

Students that are considered as having a disability are to provide the professor with a letter from the Department of Special Education stating the appropriate accommodations required of this course. If you have a documented disability, then please discuss it with personnel at 771-3950 in Room 125 of Blanks Hall.