MA 1043 - INTENSIVE MATRIX ALGEBRA (2-0)
Objectives

1. Be able to describe the nature of the solutions of a linear system (no solutions, one solution, infinitely many solutions), and explain why solutions fit only these descriptions.
2. Be able to write systems of linear equations in matrix form.
3. Be able to apply Gauss elimination (to row-echelon form) to determine whether a linear system has zero, one, or infinitely many solutions.
4. Be able to apply Gauss-Jordan elimination (to reduced row-echelon form) to find the general solution to a linear system (in parametric vector form).
5. Be able to compute the LU factorization of a square matrix using the Gauss factorization algorithm (with no pivoting). Be able to use the LU factorization to solve a linear system.
6. Be able to perform basic algebraic operations on matrices and vectors including addition, subtraction, scalar multiplication, transposition, and matrix multiplication.
7. Know the elementary algebraic properties of matrix operations (associativity, distributivity, non-commutativity of multiplication, etc.).
8. Perform algebraic operations on block matrices.
9. Calculate vector inner-products and norms, know the definition of orthogonality.
10. Know the basic law of determinants.
11. Be able to compute the determinant of a matrix.
12. Be able to compute the inverse of a nonsingular matrix.
13. Know what a linear combination is and be able to write vectors/matrices as linear combinations of other vectors/matrices.
14. Know the definition of a vector space and a subspace. Be able to check whether a given set with given operations is or is not a vector space. Be able to check whether a given subset of a vector space is or is not a subspace.
15. Know the definition of the terms linearly independent, linearly dependent, span, basis, dimension.
16. Know the definitions of the terms column space, row space, null space, rank, and nullity, and the relations between them (the fundamental theorem of linear algebra).
17. Know the definition of the eigenvalues and eigenvectors of a matrix. Be able to calculate, by hand, the eigenvalues and eigenvectors of small matrices.
18. Know that big ol' honkin' theorem about invertible matrices.