

Course Title and Code	MATH116 - Linear Algebra and Multivariate Calculus
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I. Course Identification and General Information:

Course Title	Linear Algebra and Multivariate Calculus	Course Code	MATH116	Pre-requisite	MATH115
Department	Computer Engineering	Course Level	4	Credit Hours	3 (3+0)

II. Course Description/Topics: The following course topics will be covered.

- Systems of linear equations, matrices, determinants, inverse of a matrix. Cramer's rule
- Vectors in two and three dimensions, scalar and vector products,
- Equations of lines and planes in space,
- Cylindrical and spherical coordinates
- Vector values functions, their limits continuity, derivatives and integrals
- Functions in two or three variables, partial derivatives ,differentials, chain rule,
- Directional derivatives, tangent planes and normal lines to the surfaces,
- Extrema of functions of several variables. Lagrange multipliers.
- Multiple integration: double and triple integrals; applications
- Vector fields; gradient, divergence, curl, and the del operator

III. Course Outcomes: Summary of the main learning outcomes for students enrolled in the course.

- Solve linear system of equations.
- Perform operations on matrices.
- Evaluate the inverse of a matrix.
- Describe the concept of vector, how to add vectors, and multiply them with a scalar.
- Perform the dot and cross product of vectors.
- Use the properties for the dot and cross product.
- Calculate angle between vectors.
- Explain the parametric form of a line and the equation of a plane, and by using these concepts be able to solve simple geometrical problems concerning planes and lines as e.g. the distance between lines, the intersection point between a line and a plane, the distance between a point and a plane, the projection of vectors on lines and planes.
- Demonstrate the basic theory of calculus of functions in several real variables;
- Evaluate partial derivatives and multiple integrals;(e.g. area and volume)
- Apply the knowledge to solve some practical problems, such as constrained optimization problems and other problems involving differentiation and integration of multivariable functions.

IV. Required Text:

- Calculus, by Howard Anton, © 2007, ISBN 0-471-15306-0, John Wiley Publishing.

V. References:

- Vector Calculus, Third Edition, by Susan Jane Colley, 2006, Pearson Prentice Hall.