<u>DETAILED COURSE DESCRIPTION:</u>
<u>Linear Algebra and Complex Analysis for Physicists (PHYS 301)</u>

Course Number PHYS 301

Course Title Linear Algebra and Complex Analysis for Physicists

Target Audience Sophomore level physics majors and minors, and majors in some engineering programs.

Prerequisites MATH 142 or 148

Catalog Description Introduces physics students to the basic concepts of linear algebra and complex analysis. Students will understand how to work with matrices and learn how to determine the eigenvalues and eigenvectors. Furthermore, they will be introduced to some of the important aspects of complex analysis as relevant to quantum mechanics such as the residue theorem.

Expected Previous Knowledge

> ***Concepts*** Understanding of vectors, complex numbers and multivariable integrals.
> ***Skills*** Able to calculate multivariable integrals

Course Objectives

After successfully completing this course, students should be able to: 1) determine the properties of a matrix (determinant, eigenvector and eigenvalues), and 3) use complex analysis as a tool to evaluate integrals and quantities relevant to quantum mechanics.

Sample Text

Weltner, John, Weber, Schuster, Grosjean: Mathematics for Physicists and Engineers
Boas: Mathematical Methods in the Physical Sciences

Minimum Material Covered

Linear algebra: Systems of Linear Equations, Matrices, Matrix Inverse, Gaussian Elimination; Determinants, Cofactor Expansion, Cramer's Rule; General Vector Spaces: Subspaces, Linear Independence, Basis, Dimension, Examples of Functions as Vectors; Linear Transformations and Matrices, Adjoint of a Linear Transformation; Euclidean Spaces: Rn Space, Inner Product, Vector Product; Inner Product Spaces: Orthogonality, Orthonormal Bases, Orthogonal Subspaces, Gram-Schmidt Process, Change of Basis; Orthogonal Transformations; Eigenvalues and Eigenvectors

Complex analysis: Definition of Complex Numbers (Cartesian and Polar Representations, Euler's Formula); Analytic Functions of a Complex Variable; Poles and Branch Cuts; Contour Integrals and the Residue Theorem