32051 Mathematical Methods in the Physical Sciences I (4)

Knowledge
Complex exponential function and Euler's formula. Hyperbolic trigonometric functions. Linear dependence and independence of vectors. Orthogonal matrices. Partial derivatives, total differentials, and multivariable Taylor expansions. Definition of double and triple integrals. Jacobian matrices and determinants.

Comprehension
Connection between linear transformations and matrices. Stucture of solution sets of linear algebraic systems of equations. Understanding the connection between multiple integrals and physical properties, such as center of mass and moment of inertia.

Application
Perform basic algebra and manipulations with complex numbers and functions. Basic manipulations with matrices, vectors, and determinants. Solve linear systems by elimination with augmented matrices. Evaluate iterated integrals in Cartesian, polar, cylindrical, and spherical coordinates.

Analysis
Manipulations with Euler's formula, such as deriving formulas for complex trigonometric functions. Perform change of order of integration in multiple integrals. Perform general change of variables in multiple integrals.

Synthesis
Formulate appropriate chain rules for various composite functions.

Evaluation
Be able to identify matrices associated with rotations, reflections, or both combined. Be able to judge when to use complex-variable techniques to simplify calculations (e.g., trigonometric series).

Class Activities
Lectures: development, exposition, examples, and illustrations. Hourly exams on each Chapter.

Out of Class Activities
Weekly written homework collection.