

**GG 312/OCN 312:****Geomathematics**

Fall 2008

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Student Learning Outcomes (SLOs): Students will learn the fundamentals of advanced scientific mathematics and why these methods are important to solving problems in the geosciences. Also Geology and Geophysics Department SLO #2: students can apply technical knowledge of relevant computer applications, laboratory methods, and field methods to solve real-world problems in geology and geophysics.

**Text**

The text is *Advanced Engineering Mathematics, 2nd Ed.* by Michael Greenberg which is available in the bookstore in the GG312 section.

**Topics****Introduction and review**

Calculus: derivatives and integrals

elementary functions: logs exponentials, trigonometric functions

Coordinate systems: Cartesian, polar, cylindrical, spherical

Infinite series: Taylor Series, Binomial Expansion

Functions of two or more variables: partial derivatives (Chapter 13)

Complex numbers, complex exponentials (Chapter 21)

**Ordinary differential equations (ODEs)**

(Chapters 1-3,6)

First order ODEs

Second order and higher order ODEs

Systems of coupled ODEs

Applications

Numerical methods (Euler's method, Mid-Point rule, Runge-Kutta)

**Matrices and linear algebra** (Chapters

8,10,11)

Matrix algebra

Systems of linear equations

Matrix inversion and solutions of a linear system

Eigenvalues and eigenvectors

Applications

**Vectors, Tensors, and Vector Calculus**

(Chapters 9,14-16)

Vectors and unit normals

Scalar (dot) and vector (cross) products

Coordinate transformations

Gradient, Divergence, Curl

Multidimensional integrals

Integral Theorems

Conservation laws: mass and momentum

Topics may also be added or deleted depending on the background and interests of class members.

**Examinations**

There will be one midterm and one final.

**Homework**

An assignment will be handed out each Friday, and assignments will be due the following Friday by 3 p.m.

**Grading**

50% Homework, 20% Midterm, 30% Final.

**Computing**

Matlab will be used for some assignments. If you do not already have a computer account with access to Matlab, see me.