Quantitative Methods (EAS 2655) Spring Term 2014

Schedule: MWF 10:05-10:55, ES&T L1116 Office Hours:

Instructors:
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TA: TBD

Attendance: Required *Class Participation grade is evaluated based on **attendance** and **contribution** to class discussions.

Course Overview:

In this course we will cover a wide range of useful quantitative methods with applications to Earth and Atmospheric Sciences. Specifically the course will cover concepts in basic statistics and probability, differential equations, and data processing. Lectures will be accompanied by in-class lab applications including Matlab computing and plotting techniques that apply to specific topics covered. Various examples of Matlab applications will be provided throughout the course.

Topics Covered

Statistics & Probability:

- Review of Probability - Empirical Distributions (quantiles, dispersion and symmetry)
- Discrete/Continuous Distributions
- Hypothesis Testing (sampling distribution, confidence intervals, test statistics)
- Ordinary Correlations
- Time series
- Statistical Forecasting (regressions)

Working with Data Sets:

- Graphical Summary Techniques (schematic plot, histograms, box plots)
- Contours and visual data analysis (plotting techniques)
- Correlation maps
- Linear Regression/Polynomial Regression
- Curve fitting
- Interpolations (non-uniform data sets)

Differential Equations:

Examine relevant differential equations often used in EAS (i.e., equations of motion, hydrostatic equilibrium, mass conservation, heat transfer, equation of state, etc), and using relevant examples work out analytic solutions where possible. Demonstrate the necessity for numeric solutions and introduce concepts for building and testing numeric

models:

- Quick review of Multivariable Calculus
- Ordinary Differential Equations
- Partial Differential Equations

General MATLAB Skills:

This should be considered mostly review, as students should be somewhat familiar with Matlab. Throughout the course they will have to be (or become) comfortable with using Matlab for:

- Reading in/Writing out data
- Direct computational manipulation of numbers, vectors and matrices
- Loops, nested loops, conditional statements (If/Then)
- Linear systems of equations
- Some linear algebra

Mid Term Examinations

There will be two equally weighted midterms. The first will be a 1 hour in-class exam that will cover material from the first half of the course, and the second will be a 1 hour exam during the regularly university scheduled final exam time covering the second half of the course material. Elements of Matlab **will not** be included.

Final Project

The final project will cover material discussed in class/readings and must include data analysis using Matlab routines. Student will be able to select topics from a provided list, and the project must be completed individually.