Course Number: MAR 514  
Course Title: Quantitative Methods for Multidisciplinary Marine Applications  
Instructors: Geoff Cowles  
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Class Location: AT&T Room 156  
Class Time: Tuesday/Thursday 10:30-11:45  
Office Hours: flexible: contact instructor, preferred days are T/R

Course Description: This course provides instruction, demonstration and exercises in quantitative methods critical to advanced studies in marine science. A wide range of subjects will be covered to provide an overview and build skills and familiarity with the course material. Content will be based on topics in calculus, function approximation, linear algebra, differential equations and statistics. The curriculum will emphasize application of these methods to problems in marine science including biological and oceanographic systems through classroom examples and homework content.

Course Objectives:  
1. Provide exposure and practice in fundamental quantitative methods  
2. Enhance skills in assessment and solution of mathematical problems  
3. Improve the ability to characterize, evaluate, and solve dynamical systems  
4. Introduce the students to quantitative software (Matlab or R)

Evaluation procedures:  
1. Weekly assignments based on material presented, evaluated based on approach, correctness of solution and, where relevant, interpretation (25%)  
2. Examinations, prelim 1 (25%), prelim 2 (25%) and final (project) (25%).  
3. Class participation can influence a grade +/- .  
4. Attendance at all lectures is the best way to understand topics and assignments, but is not required for evaluation.  
5. University policy on academic dishonesty, including plagiarism, applies.

Principle text:  

Course Website  
Lecture notes, homeworks, and an up to date schedule will be served from: 
[http://www.smast.umassd.edu/CMLAB/Courses/MAR514/Mar514.html](http://www.smast.umassd.edu/CMLAB/Courses/MAR514/Mar514.html)
Course Topics Outline

Unit 1: Calculus
- Derivatives – Tangent Lines, Limits, Continuity
- Derivatives of common functions, products and quotients
- Antiderivatives, Integrals, and Area under the curve
- Linearization and Taylor Series approximation
- Newton’s Method

Unit 2: Linear Algebra and Multivariate Calculus
- Lines in n-space, vectors, dot products
- Transformations and matrices
- Systems of linear equations – Gaussian elimination and matlab
- Eigenvectors and Eigenvalues – Matlab
- Discrete time population models: Leslie Matrices
- Partial Derivatives

Unit 3: Ordinary Differential Equations
- Classification and relation to dynamical systems
- Solution of linear equations, phase diagram
- Solution of coupled nonlinear systems: Matlab
- Stability and approximation in nonlinear systems