Capstone Course in Math and Statistics: MATH 560
Fall, 1997

- Professors

1. Prof. Bruce Bukiet
   518 Cullimore
   596-8392
   e-mail:*bukiet@shock.njit.edu*
   WWW homepage: http://cams.njit.edu/~bukiet
2. Dr. Bonnie K. Ray
   506 Cullimore
   642-4496
   e-mail: *borayx@m.njit.edu*
   WWW homepage: http://cams.njit.edu/~borayx
3. Prof. John Bechtold
   609 Cullimore
   596-3489
   e-mail:*jobech@saratoga.njit.edu*

- Class times: Tuesdays and Thursdays 1:00-2:25
  611 and 621 Cullimore

- The course will be taught in three modules. The first module, to be taught by Prof. Bukiet, will run from Sept. 2 through Sept. 30. Classes on Oct. 2 and Oct. 7 will have guest speakers presenting their research areas, to provide project ideas for the second semester. The second module, to be taught by Prof. Ray, will run from Oct. 9 through Nov. 6. The third module, to be taught by Prof. Bechtold, will run from Nov. 11 through the end of the semester. An exam will be given after each module. In addition a short presentation will be required concerning the project you will work on during the second semester. Each exam will count for 3/10 of your final grade. Class participation and the presentation will count for the remaining 1/10. The presentations will be made at the end of the semester. Brief outlines of the modules may be found below.

- The course will require the use of the SGIs in the Capstone lab for homework and projects. The following software is available on the machines: Splus (statistical software), Fortran and C compilers, xfig and xmgr (plotting software), Netscape, a text editor, other assorted built-in SGI programs. Other software may be provided by your professors. Reference manuals are located in the lab. The policy for use of the lab is outlined below.

Guidelines for Capstone Lab

1. Only students enrolled in the course are allowed access to the lab (no boyfriends/girlfriends, *etc.*).
2. The lab may be used only from 7:00am to 10:00pm Monday through Friday and from 9:00 to 5:00 on Saturday and Sunday.
3. "Web surfing" is permitted for course related purposes only (i.e. searching for references, software, etc.)

4. When you have finished working on a particular computer or you plan to take a long break, make sure that you terminate all of your processes and log out. Do not leave open windows, since those consume memory.

5. No eating or drinking is allowed in the lab.

6. All reference books must remain in the lab. Please do not take them home, even for a night.

Module Descriptions

1. Module 1: Mathematical Modeling of Mass-Spring and Pendulum Systems

    - 9/2: Introduction to the Course and Lab; Basics of Mathematical Modeling;
    - 9/4-11: Mass-Spring Systems, including simple harmonic motion, phase plane analysis, energy, friction and damping, multiple masses, numerics for ODEs.
    - 9/16-23: Pendulum, including linearization, non-dimensionalizing, stability.
    - 9/25: Review
    - 9/30: First Exam
    - 10/2 and 10/7: Presentations by Faculty

2. Module 2: Evaluation of Nonlinear Equations using Monte Carlo Simulation and Nonlinear Regression

    - 10/9: Review of Probability Distributions; Simulating Random Variables
    - 10/14: Statistical Estimation Techniques
    - 10/16: The Bootstrap Method
    - 10/23: Model Building: Galileo's Gravity and Motion Experiments
    - 10/25: Nonlinear least-squares estimation
    - 10/28: Statistical inference for nonlinear regression
    - 10/30: Nonparametric regression
    - 11/4: Review
    - 11/6: Second Exam

3. Module 3: Mathematical Modeling of Flame Propagation

    - 11/11:
    - 12/4: Third Exam
    - 12/9: Student Presentations