Math 473/573 - Intermediate Differential Equations

Fall, 1998

B. Bukiet

- **Text**: Elementary Differential Equations and Boundary Value Problems - Boyce and DiPrima
- **Supplementary Text**: Nonlinear Dynamics and Chaos - Strogatz
- **Times**: Class meets Thursdays 6:00-9:05PM
- **Office Hours**: Tuesday, Thursday 2:30-4:00PM and Thursday 5:30-6 pm
- **Office**: 518 Cullimore Hall
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- **Course Notes:**: available as needed at www.math.njit.edu/˜bukiet
- **Grading**: There will be 2 in-class examinations occurring approximately during the 6th and 11th weeks of the semester. Together, they will account for 50% of your grade. There will be no make-up exams without prior approval or doctor's note. The final exam will account for 30% of your grade. Fifteen percent of your grade will be based on class participation, homework and projects.
- **Course perspective: Filling in the foundations of a first course in ordinary differential equations and going beyond with new topics.**

Course Outline

Review of Elementary ODEs, filling in gaps and advanced material

- Existence and uniqueness for first order linear ODEs (2.2)
- Differences between linear and non-linear ODEs (2.4)
- Equilibrium points and stability (2.6)
- Picard iteration (2.11)
- First order DIFFERENCE equations (2.12)
- Higher order ODEs: fundamental solutions, existence and uniqueness (3.2)
- Abel's Theorem and Linear independence (3.3)
- Review of forced vibrations: beats, resonance (3.8 and 3.9)
- General Theory for Higher Order ODEs (4.1)
- Variation of Parameters for higher order ODEs (4.4)
- Series Solutions near a regular singular point (5.4,5.6,5.7,5.8)
- Euler equations (5.5)

- Bessel's Equation (5.9)
- Systems of First Order ODEs: fundamental matrices (7.1 and 7.4-7.9)
- Numerical methods for ODEs and Stability issues and Difference equations (possibly using Burden and Faires)
- Nonlinear Differential equations and stability: including phase plane, competing species, predator-prey (Chapter 9)
- Difference equations and Chaos
- Boundary Value Problems (11.1)
- Numerical methods for boundary value problems
- Sturm-Liouville problems (Chapter 11)