MATH 411 SPRING 2001

Ordinary Differential Equations

Schedule # 749025 TR 01:00-02:15 316 Boucke

Instructor: Alexander Alekseenko, 328 McAllister, 865-1984, alekseen@math.psu.edu

The course will be an introduction to ordinary differential equations. During the classes basic concepts of theory will be illustrated by great number of examples. The emphasis will be taken to practical skills of solving but still the essential theoretical questions will be outlined. The course aimed to provide a good navigation in modern theory and implementations of ordinary differential equations.

Text. Ray Redhefer *Differential equations: theory and applications.* Jones and Bartlett Publishers, Inc. (1991)

Grading. Your grade in the course will be based on the following: Homeworks - 30%, Midterm - 30%, Final Exam - 40%.

Homeworks. Homeworks will be assigned every 4-6 classes and due two or three weeks later.

Examinations. Both examinations will take place in a classroom with limited time. Books, notes, calculators, etc. will be allowed. The final exam will cover the entirety of material taught in the class.

Syllabus

1. Introduction. Analysis of function behaviour. Differential equation. Basic procedures. Examples of applications. Qualitative analysis of solution.
   4 classes [Chapter 2].

2. Linear equations. Basic properties. Characteristic equation. Properties of exponential function. Methods of solution.
   4 classes [Chapter 8].

3. Nonhomogeneous equations. Method of variation of parameters. Applications for linear equations.
   4 classes [Chapters 9, 10].

4. Series solutions. Legendre's equation. Bessel equation.
   4 classes [Chapters 12, 13].

5. Linear systems of equations. Systems with constant coefficients. Eigenvalues and eigenvectors.
   4 classes [Chapter 16].

6. Autonomous systems. Closed orbits. Stability. Poincare-Bendixon theorem. Lyapunov functions. Bifurcation. Applications from Ecology.
   4 classes [Chapter 20].

7. Laplace transform. Properties. Implementation.
   4 classes [Chapter 21]