Math 320, Lecture 2: Syllabus
Linear Algebra and Differential Equations
TR 11:00-12:15 in Van Vleck B239

Textbook: *Differential Equations and Linear Algebra*, 3rd Edition, Edwards and Penney, Prentice Hall.

Pre-requisite: Math 222.

Credit may not be received for both Math 320 and Math 340.

Professor: Leslie Smith, Departments of Mathematics and Engineering Physics, Office Hours in Van Vleck 825 TR 9:30-10:45 and Friday 11:00-12:00, lsmith@math.wisc.edu, http://www.math.wisc.edu/~lsmith.

Teaching Assistant: Qin Li

Exams: There will be two in-class exams: **Thursday October 6 and Tuesday, November 15.** Please let me know IMMEDIATELY if you have a conflict with these dates. Each exam is 25% of the final grade.

Final Exam: Thursday, December 22, 2:45 - 4:45 PM, 30% of grade.

Quizzes During Section Meetings: There will be an estimate of 6 quizzes, to be scheduled during section meetings on dates to be determined by the TA. Quizzes will be graded and will count for 5% of the overall grade. The lowest quiz score will be dropped. There will be no make-up quizzes.

Weekly Problem Sets: Homework will normally be due on Tuesday and is **due at the beginning of class**. Homework will be available on-line at www.math.wisc.edu/~lsmith approximately one week prior to the due date. Roughly 15 problems will be assigned each week (most of the time from the book, but not always).

Please write your name and section number clearly on each homework set, stapled please! The TA is not responsible for loose sheets of paper that are not stapled together.

Grading of Homework: The TA and a grader will grade a subset of the homework problems given out each week (with some points also given for completeness). The homework scores will count for 15% of the grade. The lowest homework score will be dropped.

Late Policy: Homework turned in after the beginning of class will be considered late and will be graded at 80% credit. Late homework will be accepted until 5 PM on the due date (no credit thereafter). NO EXCEPTIONS! The policy is intended to keep everyone as current as possible.

Late homework should be place in the TA's mailbox. Late homework placed anywhere else will not be accepted.

Calculators: Calculators and/or computer software may be used to help with homework problems but are not permitted during exams.

Course description: Differential equations are the fundamental tools that scientists and engineers use to model physical reality. The importance of differential equations to science and engineering cannot be over-emphasized. A distinct subject in its own right, linear algebra is a part of mathematics concerned with the structure inherent in mathematical systems. We shall study these subjects together for three reasons: (1) The viewpoint of linear algebra is immensely helpful in uncovering the order underlying the topic of differential equations; it helps us understand the "why" and not just the "how" of our calculations; (2) Linear algebra is essential to the theory of differential equations; (3) Linear algebra is crucial to the computer approximations which are often the only way to solve the most challenging differential equations.

Throughout this course, we will seek to answer the following basic questions:

- When does a differential equation have a solution? When is that solution unique?
- Can one construct the (unique) solution of a differential equation in terms of elementary functions? If not, can one approximate its solution numerically and/or understand it qualitatively?
- How does one choose the differential equation(s) used to model a physical system? What are the strengths and limitations of such models? Specifically, what is the significance of *linearity* in our models and applications?

Course outline: The course covers material in Chapters 1-9 of the text. The topics are listed below with corresponding chapter.

Chapter 1: First-Order ODEs (continuing from 221/222 with some review).

Chapter 2: Mathematical Models and Numerical Methods.

Chapter 3: Linear Systems and Matrices.

Chapter 4: Vectors Spaces.

Chapter 5: Higher-Order Linear ODEs.

Chapter 6: Eigenvalues and Eigenvectors (sections 6.1-6.2).

Chapter 7: Homogeneous Linear Systems of ODEs.

Chapter 8: Nonhomogeneous Linear Systems of ODEs (sections 8.1-8.2).

Chapter 9: Nonlinear Systems (sections 9.1-9.2, sections 9.3-9.4 if time permits).