Math 135: Ordinary Differential Equations

- Math 135: Course Outline

Catalog Description

135. Ordinary Differential Equations. Lecture, three hours; discussion, one hour. Requisites: courses 33A, 33B. Selected topics in differential equations. Laplace transforms, existence and uniqueness theorems, Fourier series, separation of variable solutions to partial differential equations, Sturm-Liouville theory, calculus of variations, two point boundary value problems, Green's functions. P/NP or letter grading.

General Information

Differential equations are of paramount importance in mathematics because they are equations whose solutions are functions - not numbers. Differential equations are thus widely used in mathematical models of systems where one wants to determine functional relationships. For example, the concentration of chemical reactants as a function of the time, the temperature on the surface of a heat shield as a function of position, or the size of a loan payment as a function of the interest rate. In fact, in nearly all of the courses in the physical sciences and engineering, and in many courses in the social sciences, differential equations play a fundamental role.

One of the goals of this course is to present solution techniques for differential equations that go beyond what is taught in 33B. In particular, the Laplace transform technique for solving linear differential equations is covered. This technique transforms the task of solving linear differential equations to one of solving algebraic problems. It is also a technique that can be used to solve differential equations containing generalized functions (e.g. discontinuous or Dirac delta functions). Other solution techniques include the method of Fourier series, the method of eigenfunction expansions and perturbation methods.

Another goal of this course is to introduce students to the theory of ordinary differential equations. A key part of this theory is the determination of the existence and uniqueness of solutions to differential equations. Just as it's a fact that not all algebraic equations have solutions, it's also a fact that not all differential equations have solutions. The theorems covered are especially useful, as they allow one to determine the existence and uniqueness of solutions without having to solve the differential equation.

Recent enrollment statistics for Math 135 (formerly Math 135B) are shown in the table below.

Recent Enrollment Statistics

Year	Fall	Winter	Spring
1993-1994	(no sections)	43	47
1994-1995	(no sections)	45	32
1995-1996	(no sections)	64	49
1996-1997	(no sections)	48	41
1997-1998	(no sections)	50	38
1998-1999	(no sections)	60	20
1999-2000	(no sections)	38	18
2000-2001	(no sections)	43	41
2001-2002	(no sections)	25	41

2002-2003	(no sections)	36	37
2003-2004	(no sections)	47	41