MATHEMATICS 2260
ORDINARY DIFFERENTIAL EQUATIONS I

In sciences and engineering, mathematical models are developed to aid in the understanding of physical phenomena. These models often yield an equation that contains some derivatives of an unknown function. Such an equation is referred to as a *differential equation*.

Differential equations arise in a variety of subject areas which include not only the physical sciences, but also such diverse fields as economics, medicine, psychology and operations research. Just to mention a few slightly unfamiliar situations which readily lead to differential equations, we list the following:

1. A bank paying interest on a savings account, compounded continuously.
2. Spread of an infectious disease by an individual infected with a certain virus in a community of *N* people. Assuming that the rate at which virus is transmitted throughout the population is proportional to the number of infected individuals and also to the number of persons not infected, a differential equation can be set up to predict the number of people infected after *t* days.
3. Cleaning up the Great Lakes: A simple mathematical model that can be used to determine the time it would take to clean up the Great Lakes can be developed using a multiple, compartmental analysis approach. In particular, we can view each Great Lake as a tank that contains a liquid in which is dissolved a particular pollutant (DDT, phosphorus, mercury, for example).

In solving such applied problems, one often uses qualitative, numerical and analytical techniques. In this introductory course, sufficient emphasis is placed on seeking analytical solutions of ordinary differential equations.

Text. One possibility is *Elementary Differential Equations and Boundary Value Problems* by Boyce and DiPrima. Lately, *Elementary Differential Equations with Boundary Value Problems* by William F. Trench has been made available, without charge, on line at:

http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_DIFF_EQNS_II.PDF

Marks. While the exact formula may vary from instructor to instructor, it is typical to assign 60% to the final examination and 40% to a combination of class tests and homework.

Calendar description. **2260 Ordinary Differential Equations I** examines direction fields, equations of first order and first degree, higher order linear equations, variation of parameters, methods of undetermined coefficients, Laplace transforms, systems of differential equations. Applications include vibratory motion, satellite and rocket motion, pursuit problems, population models and chemical kinetics.
Prerequisite: Mathematics 2000.
Note: Credit cannot be obtained for more than one of Mathematics 2260, Mathematics 3260, Applied Mathematics/Pure Mathematics 3260 and the former Engineering 3411.

Offered. Fall, Winter, Spring