Elementary Differential Equations—Math 256, Fall 2016

Textbook: *Elementary Differential Equations*, by William E. Boyce, Richard C. DiPrima, 10th edition.

Prerequisite: Math 253 or permission by instructor.

Course content: The main topics are first order equations, basic modeling problems, second order linear differential equations, and system of first order linear equations (Chapter 1, 2, 3, & 7 and part of Chapter 4). The first part of the course consists basically Chapter 1, 2 and 3, where first order equations and second order linear equations with constant coefficients are discussed, as well as several mathematical modeling and applications using simple first order and second order equations. The second part consists of system of first order (linear) equations, and very simple higher order linear equations with constant coefficients. The primary goal is to introduce ordinary differential equations, to learn very basic modeling and to solve various simplest type of differential equations.

Learning outcomes: Roughly speaking, students should demonstrate understanding of ordinary differential equations of first order and 2nd order; know how to solve basic first order and 2nd order (linear) ODEs, initial value problems and first order systems. Students are also supposed to know how to apply ideas of ODE in solving very basic model problems in other subjects, such as motion problems in physics, simple mortgage models etc. Important topics include

(1) Solve first order equations using appropriate techniques.
(2) Be able to model problems using differential equations.
(3) Understand initial value problem and the fundamental theorem of differential equations, existence and uniqueness.
(4) Solve second order linear equations with constant coefficients, and be able to understand the structure of general solutions of second order linear equations.
(5) Understand very basic linear algebra (matrix, eigenvalues and eigenvectors of square matrix), and be able to solve linear system of first order equations with constant coefficients using basic linear algebra.