

MATH 215 Term 2, 2012-2013
Elementary Differential Equations I

Section 202: 9:00a.m.-10:00a.m. MWF, Room: Buchanan A201

Instructor: Dr. Jingyi Chen, Math Annex 1212, phone 604-822-6695, email jychen@math.ubc.ca

Textbook: *Elementary Differential Equations and Boundary Value Problems*, 9th Edition, by W. Boyce and R. DiPrimaW.

Prerequisite: Calculus (MATH 101 or equivalent) and Linear Algebra (MATH 152 or equivalent).

Co-requisites (crucial): Multivariable Calculus (MATH 200 or 253).

Grading:

- Homework 10%, Midterm exams 20% $\times 2$, Final exam 50%
- There will be two midterm exams. The 1st midterm will be on February 4, 2013 (Monday) and the 2nd midterm will be on March 15, 2013 (Friday).

Policies:

- Homework sets will be assigned weekly and will be collected in class. Assignments and solutions will be posted on the course webpage (will be given from the instructors). A selection of the problems will be graded. No late homework accepted.
- There will be no make-up exams. Missing a midterm for a valid medical reason (the instructor must be notified as soon as possible and presented with a doctor's note immediately upon the student's return to UBC), the weighting for the final exam will be adjusted.

Topics:

- Introduction (Chapter 1): what is a differential equation (DE), order of a DE, linear and nonlinear DE, solution, general solution, particular solution, direction field.
- First order DE (Chapter 2): Solving basic 1st order DE: separable, linear and exact; modeling with DE, autonomous DE, existence and uniqueness of solutions (sections 2.1-2.6, 2.8).
- Second order ED (chapter 3): 2nd order linear homogeneous equations, fundamental set of solutions, Wronskian, constant coefficient linear homogeneous equations and characteristic equation, linear non-homogeneous equations (structure of solutions, method of undetermined coefficients, method of variation of parameters), applications (electrical circuits, mechanical vibrations). (sections 3.1-3.7).
- Laplace transform (Chapter 6): definition, examples, solution of initial value problem, discontinuous functions, systems of 1st order equations. (sections 6.1-6.5)
- Systems of first order linear equations (Chapter 7 + section 9.1): homogeneous case, repeated eigenvalues, non-homogeneous case: undetermined coefficients, variation of parameters, classification of linear systems (sections 7.5-7.7 (no matrix exponentials), 7.8-7.9, 9.1)
- Nonlinear systems (chapter 9): Conservative systems, fixed points, linear approximations to non-linear systems, local phase portraits, simple pendulum, competing species (sections 9.2-9.4).