UBC MATH 215/255, 2013W Term1
Elementary Differential Equations I/Ordinary Differential Equations

Pre-requisites: Math 101 (intgral calculus) or equivalent; Math 152 (linear algebra) or equivalent.

Co-requisite: Math 200 (multivariable calculus) or equivalent.

Text: Jiri Lebl, *Notes on Diffy Qs*, a free online text: http://www.jirka.org/diffyqs

Optional Text (hardcopy): Boyce & DiPrima, *Elementary Differential Equations and Boundary Value Problems* (9th. ed., or earlier)

Sections:

- **101**: MWF 8-9, MacLeod 202. Instructor: Emil Wiedmann

- **102**: MWF 9-10, LSK 200. Instructor: Yue-Xian Li

- **103**: MWF 1-2, LSK 200. Instructor: Stephen Gustafson

- **104**: MWF 1-2, BUCH A103. Instructor: Frederic Robert

- **105**: MWF 9-10, CHEM C126. Instructor: Wang Hung Tse

Homework Assignments: will be due weekly. Part of each assignment will be done online, through WeBWorK: https://webwork.elearning.ubc.ca/webwork2/ , and part part will be written and submitted in class. In-class quizzes may also be given.

Midterms: there will be two midterm exams, written in class (dates TBA).

Grading: your final grade will be based on your Term (homework/quizzes + midterms) Mark (50 %) and the Final Exam (50 %), which will be common to all sections.

Policies: missing an assignment, quiz, or midterm exam, except in case of a medical emergency (doctor's note required) or with the instructor's prior consent, will result in a mark of zero.

Tentative Schedule by Week (with suggested reading from the online text)

1. Introduction to ODEs: types of ODE, solutions (particular and general); slope/direction fields. Reading: 0.2,1.1-1.2.

2. Solving separable equations; solving linear equations by integrating factor; applications. Reading: 1.3,1.4 .

3. Autonomous equations; numerical solutions: Euler's method. Reading: 1.6-1.7.

4. Second order linear ODEs: homogeneous & inhomogeneous, superposition, linear independence, existence & uniqueness; Second order constant-coefficient ODEs (homogeneous): characteristic equation, real, double & complex roots. Reading: 2.1-2.2.

5. Inhomogeneous second-order linear ODE; methods of undetermined coefficients & variation of parameters; application to mechanical vibrations. Reading: 2.4-2.6.

6. Laplace transform: definition & properties. Reading: 6.1-6.3.

7. Laplace transform: application to solving ODE initial value problems. Reading: 6.4.

8. First-order linear systems: basic theory; constant-coefficient systems & review of matrices and eigenvalues. Reading: 3.1-3.3.

9. Solving first-order constant-coefficient systems: two-dimensional systems and their phase portraits; inhomogeneous systems. Reading: 3.4-3.5, 3.7.

10. Nonlinear systems: introduction and examples (eg. simple pendulum). Critical points and linearization. Reading: TBA .

11. Nonlinear systems: local phase portraits; stability. Reading: TBA.

12. Nonlinear systems: examples (competing species, ...). Reading: TBA .

13. Catch-up, and review.

Aug. 30, 2013