

## ColoState MATH 340 *Fall 2023 (CRN68775)*

### "Introduction to Ordinary Differential Equations"

*Often abbreviated as "Diff.Eq." or "ODEs"*

This course is for physics/chemistry/biology and engineering students.

#### Learning Goals

- Recognize types of ODEs: linear/nonlinear, 1st order, higher order;
- Solve 3 major types of 1st ODEs: linear (integrating factor), separable, exact;
- Applications (setup & interpretation) of 1st ODEs: Falling objects, population dynamics;
- Investigation of equilibrium and stability for 1st order autonomous ODEs;
- Using "dfield" package;
- Solve 2nd order linear homogeneous/NonHomo ODEs with constant coefficients;
- -- Characteristic eqn., undetermined coefficients, variation of parameters;
- -- Wronskian and Superposition Principle for 2nd order linear ODEs;
- -- Applications to vibrations and resonance problems;
- Higher order linear homogeneous/NonHomo ODEs with constant coefficients;
- 1st order linear systems of ODEs with constant coefficients:
  - -- Solutions and linearity; Using matrix eigenvalues; Fundamental solutions;
  - -- Applications;
  - -- Investigation of equilibrium and stability for 1st order planar ODE systems;
  - -- Using "pplane" to learn phase portrait;
- Using Laplace transform to solve 2nd order linear ODE initial value problems;
- Numerical methods (implicit Euler);
- Other topics.

#### Textbook

William E. Boyce, Richard C. DiPrima, Douglas B. Meade,  
Elementary Differential Equations and Boundary Value Problems,  
Wiley, 11th ed., **ISBN-13: 978-1-119-25600-7 (or ISBN-10: 1119256003)**

#### Teaching Mode

- Three large-class 50-minute lectures (Mon.Wed.Fri.) per week by Instructor;
- Several small-class (about 36 students) 50-minute recitations (Tue.) once per week by GTAs;
- Instructor and GTAs each offers 4 office hours per week in Calculus Center;
- Lecture/recitation notes available on CANVAS;
- Several homeworks and in-class quizzes;
- Lists of typical examples for learning & suggested problems for practices.

## **Testing**

- Two common exams in the 6th & 11th weeks;
- One final comprehensive exam.

## **Grading**

Homework/Projects/Quizzes: 30%;  
Midterm#1: 20%; Midterm#2: 20%; Final Exam 30%

## **Letter Grades**

A (100-90) B (89-80) C (79-70) D (69-60) F (<60)

## **Makeups**

We follow university policies but require legitimate excuses and documents.  
-- For quizzes, please contact your GTA;  
-- For Midterm & Final exams, please contact Prof. James Liu (thru email within CANVAS).

*Last modified by James Liu on Mon. 2023/09/11*