

MATH S3027
ORDINARY DIFFERENTIAL EQUATIONS
SECTION 2 - SUMMER 2019

407 MATHEMATICS BUILDING
MON/TUES/WEDS/THURS 4:30PM - 6:05PM

PEOPLE

Instructor: Henry Liu (hliu@math.columbia.edu)
Office hours: Fri 2:00 - 4:00pm in 307 Math (or appointment by email)
TA: Zhechi Cheng (zcheng@math.columbia.edu)
TA help room hours: Mon and Weds 2:00 - 4:00pm in 406 Math

TEXTBOOK

Boyce and DiPrima, *Elementary Differential Equations and Boundary Value Problems*, any edition. It will not be strictly necessary for the course, though we will roughly follow its order of presentation of topics.

PREREQUISITES

Calculus III and basic linear algebra. In particular, you should be comfortable with power series and their convergence properties, determinants, and eigenvalues/eigenvectors.

GRADING POLICY

The final grade will be based on assignments (25%), a midterm exam (30%), and a final exam (45%).

- (1) Midterm: **Jul 29**, in class.
- (2) Final exam: **Aug 15, 4:30pm - 7:20pm**, in **312 Math**.

There will be no make-up exams.

HOMEWORK

There will be two homework assignments per week, **due in class by the start of class on Mondays and Thursdays**. (You can also drop them off before the due date/time in the drop box on the 4th floor of the Math building.) Late homeworks will not be accepted unless accompanied by a note from a doctor or a dean documenting a medical or family emergency.

Grades will be posted on CourseWorks. The lowest homework grade will be dropped. You are encouraged to discuss the homework with other students but you must write your solutions individually, in your own words.

If you need help with your assignments or with the material of the course, you are encouraged to visit the 406 Math help room. You can drop by whenever the help room is open.

SCHEDULE

This is a *rough* schedule for each class. Section numbers refer to the Boyce and diPrima textbook. Some topics do not correspond to any section, and some topics which do correspond to a section may be covered differently in class than in the textbook.

#	Date	Material	Section(s)
1	Jul 08	Introduction , ODEs vs PDEs. First-order ODEs	§1
2	Jul 09	Constant coefficient linear equations, separable equations	§2.1, 2.2
3	Jul 10	Existence/uniqueness, autonomous systems, exactness	§2.8, 2.5, 2.6
4	Jul 11	Integrating factors, changes of variable	§2.6
5	Jul 15	Second-order linear ODEs , structure of solutions	§3.2
6	Jul 16	Homogeneous equations with constant coefficients	§3.1, 3.3, 3.4
7	Jul 17	Non-homogeneous equations, higher-order linear ODEs	§3.5, 4
8	Jul 18	Singularities and series solutions , power series review	§5.1
9	Jul 22	Solutions at ordinary points, regular singular points	§5.2, 5.3
10	Jul 23	Solutions at regular singular points	§5.4, 5.5
11	Jul 24	Frobenius method, irregular singular points	§5.5
12	Jul 25	Singularities at infinity. Review	§5.4 ex. 43
13	Jul 29	Midterm	
14	Jul 30	Laplace transform , solving IVPs	§6.1, 6.2
15	Jul 31	Inverse Laplace transform, examples and properties	§6.2
16	Aug 01	Step functions, piecewise continuous forcing functions	§6.3, 6.4
17	Aug 05	Impulsive forcing, convolution, impulse response	§6.5, 6.6
18	Aug 06	Systems of ODEs , linear algebra review	§7.1, 7.2, 7.3
19	Aug 07	Homogeneous systems with constant coefficients	§7.5, 7.6
20	Aug 08	Repeated eigenvalues, matrix exponentials	§7.7, 7.8
21	Aug 12	Non-homogeneous systems, phase plane	§7.9, 9.1
22	Aug 13	Autonomous systems, stability. Boundary value problems	§9.2, 10.1
23	Aug 14	Boundary conditions, Green's functions. Review	§10.1
24	Aug 15	Final exam	