MATH 39100K (32336) - **Methods of Differential Equations**

Spring, 2025 Tuesday, Thursday 8:00 – 9:15 am MR 02

Book: *Elementary Differential Equations and Boundary Value Problems*, 12th Edition, by William E. Boyce, Richard C. DiPrima and Douglas B. Meade [The 11th Edition or the 10th Edition or 9th Edition by Boyce and DiPrima are fine, are even preferred, but make sure that "Boundary Value Problems" is in the title.]

Chapter 2, first order equations: 2.2, 2.1, 2.6, 2.3, 2.9.
Chapter 3,4 higher order equations: 3.2, 3.1, 3.3, 3.4,
3.5, 3.6, 3.8, 3.9, 4.1, 4.2, 4.3.
Chapter 5 series solutions: 5.1, 5.2, 5.3, 5.4, 5.5, 5.6.
Chapter 6 Laplace transforms: 6.1, 6.2
Chapter 10 partial differential equations: 10.1, 10.2, 10.3, 10.4, 10.5

The classes will use slides that I have prepared. These slides will be posted on my website:

https://math.sci.ccny.cuny.edu/people?name=Ethan_Akin

Also posted there will be this class information document and the syllabus with the list of homework problems from the book. The due dates are recommendations as I will not be collecting homework, although I will go over problems in class.

Grading: There will be three in-class tests during the term. The term average, which will count for 60% of the grade, will be computed from these. The final exam will count the remaining 40% of the grade. You should be warned that there are no makeups. If you have missed work with a legitimate reason, the remaining work will simply be counted more heavily.

It is a good idea to work with others, collaborating on studying, doing homework and preparing for tests. On the internet you will find treatments of differential equations that you may find to be helpful, e.g. the Kahn

Academy. Of course, such collaboration and internet browsing during a test would be cheating. I hope that you will engage with the course in an honorable fashion.

Office Hours: Tuesdays 11:00am-1:00pm, Thursdays 11:00am – 12:00.
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COURSE LEARNING OUTCOMES

After taking this course, the student should be able to:	Contributes to Departmental Learning Outcome(s):
1. Solve a variety of first order differential equations selecting from a variety of techniques covered in the syllabus..	a. b, e2, g.
2. Likewise, solve a variety of second order differential equations, selecting from several techniques covered in the syllabus.	a, b, e2, g.
3. Be able to analyze certain physical problems (tank flow, compound interest, mechanical and electrical vibration), set up their determining differential equations , solve them using the techniques in 1. and 2. above, and use these solutions to answer questions about the physical system.	a, b, c, g.
4. Give series solutions (and approximations) for second order linear differential equations, both at ordinary points and at regular singular points.	a, b, g.
5. Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.	a, b, e1, e2, g.
6. Understand and be able to apply all the mathematical aspects that contribute to the solution of heat conduction of a rod problem with constant temperature boundary conditions (the method of separation of variables, the use of Fourier series, as well as the specific solution).	a, b, c, g.

7. Understand and be able to use various theoretical ideas and results that underlie the mathematics in this course covered in the syllabus (including various existence/uniqueness results, ideas of linear independence and the Wronskian, and convergence properties of Fourier series).	e1, e2, g.

COURSE ASSESSMENT TOOLS

1. The average of class examinations: 60% of grade
2. Comprehensive written final exam: 40% of grade.

DEPARTMENTAL LEARNING OUTCOMES

The mathematics department, in its varied courses, aims to teach students to

a. perform numeric and symbolic computations
b. construct and apply symbolic and graphical representations of functions
c. model real-life problems mathematically
d use technology appropriately to analyze mathematical problems
e. state (e1) and apply (e2) mathematical definitions and theorems
f. prove fundamental theorems
g. construct and present (generally in writing, but, occasionally, orally) a rigorous mathematical argument.