

MATH 3705C - Mathematical Methods I

Winter 2021

Instructor Dr. S. Melkonian (4279 HP, 520-2600 ext. 2126)

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Office Hours Online, by appointment

Textbook Mathematical Methods and Boundary Value Problems, 5th Edition, by Sam Melkonian
Hard copy at the Carleton University Bookstore
Ebook at <https://campusebookstore.com/EBooks/Book.aspx?ID=9689104>

Lectures Asynchronous, posted online, beginning January 11

Tutorials Live, online, Wednesdays 17:35 – 18:25, beginning January 27

Tests There will be four tests, to be held during the tutorial periods, on the following dates:

Test 1: Wednesday, February 3

Test 2: Wednesday, March 3

Test 3: Wednesday, March 24

Test 4: Wednesday, April 7

Marking Scheme

The best three out of the four tests will count for 45% and the final examination for 55% of the final grade.

There will be no make-up tests.

Topics and Timetable

1 The Laplace Transform, Lectures 1 – 5

1.1 Introduction

1.2 Further Properties and Initial-Value Problems

1.3 Convolutions and Generalized Functions

2 Series Solutions of Ordinary Differential Equations, Lectures 6 – 10

2.1 Basic Concepts

2.2 Solutions About Ordinary Points

2.3 Solutions About Regular Singular Points

- 2.3.1 Cauchy-Euler Equations
- 2.3.2 The General Equation $y''+p(x)y'+q(x)y=0$
- 2.3.3 Bessel's Equation

3 Fourier Series, Lectures 11 – 12

- 3.1 Periodic Functions
- 3.2 Functions Defined on Finite Intervals

4 Partial Differential Equations, Lectures 13 – 17

- 4.1 The Heat Equation
 - 4.1.1 The Bar with Zero Boundary Conditions
 - 4.1.2 The Bar with Nonzero Boundary Conditions
 - 4.1.3 The Bar with Insulated Ends
- 4.2 The Wave Equation
- 4.3 Laplace's Equation
 - 4.3.1 Solutions Within Rectangular Regions, Polynomial Solutions
 - 4.3.2 Regions with Circular Boundaries, Solutions Inside a Circle, Solutions Outside a Circle, Solutions Within an Annulus

5 Sturm-Liouville Problems, Lectures 18 – 21

- 5.1 Regular and Periodic Problems
 - 5.1.1 General Theory
- 5.2 Singular Problems
 - 5.2.1 Bessel's Equation
 - 5.2.2 The Vibrating Membrane

6 The Fourier Transform, Lectures 22 – 24

- 6.1 Fundamental Properties
- 6.2 Applications
 - 6.2.1 Partial Differential Equations, The Heat Equation on $(-\infty, \infty)$

Academic Accommodation

Pregnancy obligation

Contact me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>.

Religious obligation

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more details, visit the Equity Services website: <https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf>.

Academic accommodations for students with disabilities

If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. PMC website: <https://carleton.ca/pmc>.

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