

MATH 3705B - Mathematical Methods I

Fall 2022

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

E-mail melkonian@math.carleton.ca

Office Hours 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 In person, Wednesday and Friday 4:05 PM – 5:25 PM, beginning September 7.
In addition, online lectures will be posted on Brightspace.

Tutorials In person, Wednesday 5:35 PM – 6:25 PM, beginning September 21.

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

Test 1: Wednesday, September 28

Test 2: Wednesday, October 19

Test 3: Wednesday, November 16

Test 4: Wednesday, November 30

Marking Scheme

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

Notes

Non-graphic, non-programmable calculators are permitted.

There will be no makeup 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 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>.

Pregnancy or religious 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>.

It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are [a number of actions you can take](#) to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

Feeling sick? Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's [symptom reporting protocols](#).

Masks: Carleton has paused the [COVID-19 Mask Policy](#), but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in [cuScreen](#) as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the [University's COVID-19 website](#) and review the [Frequently Asked Questions \(FAQs\)](#). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

Last modified: August 15, 2022, 7:00 PM