MATH 3705C - Mathematical Methods I
Winter 2015

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Office Hours Tuesday and Thursday 12:00 – 1:00, or by appointment.

Textbook Mathematical Methods and Boundary Value Problems, Fourth Edition, by S. Melkonian.

Lectures Wednesday and Friday 10:05 – 11:25 in AT 102, beginning Monday, January 5, 2105

Tutorials Friday 14:35 – 15:25, beginning January 16th. During the tutorial sessions, a TA will be present to work out selected problems, to answer questions and to administer the tests.

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

Test 1: Fri., January 30
Test 2: Fri., February 13
Test 3: Fri., March 6
Test 4: Fri., March 20

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
There will be no make-up tests.
Non-graphic, non-programmable calculators are permitted during the tests and the final examination.
Students who wish to review their final examination paper must do so within three weeks of the examination period.

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 $(-\infty,\infty)$

Suggested Problems:

Section 1.1: 1-7

Section 1.2: 1-23

Section 1.3: 1-11

Section 2.1: 1-3

Section 2.2: 1-11

Section 2.3: 1-15

Section 3.1: 1-8

Section 3.2: 1-17

Section 4.1: 1-9

Section 4.2: 1-5

Section 4.3: 1-11

Section 5.1: 1-13

Section 5.2: 1-14

Section 6.1: 1-22

Section 6.2: 1-4

Pregnancy obligation: Write 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 see the Student Guide.

Religious obligation: Write 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 see the Student Guide.

Students with disabilities requiring academic accommodations in this course must register with the Paul Menton Centre for Students with Disabilities (PMC) for a formal evaluation of disability-related needs. Documented disabilities include but are not limited to mobility/physical impairments, specific Learning Disabilities (LD), psychiatric/psychological disabilities, sensory disabilities, Attention Deficit Hyperactivity Disorder (ADHD), and chronic medical conditions. Registered PMC students are required to contact the PMC every term to have a Letter of

Accommodation sent to the Instructor by their Coordinator. In addition, students are expected to confirm their need for accommodation with the Instructor no later than two weeks before the first assignment is due or the first in-class test/midterm. If you require accommodations only for formally scheduled exam(s) in this course, you must request accommodations by the official accommodation deadline published on the PMC website.