MATH1005A
Differential Equations and Infinite Series for Engineering or Physics

Term: Summer 2022
Instructor: Dr. Azita Montazeri
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Lectures: Tuesdays, Thursdays: 6:35-9:25pm . Classes begin July. 4, 2022
Tutorial: Tuesdays, Thursdays 5:35-6:25pm.
Office Hours: Tuesdays 4:30-5:30pm or by appointment

Textbook: Ordinary Differential Equations and Infinite Series, Second edition by Sam Melkonian. Hard copies available at the Carleton University Bookstore. ebook available from Nelson Education Ltd.

Prerequisites: i) MATH 1004; and ii) MATH 1104 (or MATH 1107), either previously or concurrently; or equivalents; or permission of the School. Restricted to students in the Faculty of Engineering, or in certain B.Sc. programs where specified.

Marking Scheme: The course will be made up to 3 parts

- Assignments ——————————- 20%
- Tests ——————————- 30%
- Final Exam ——————————— 50%

Assignments: There are two assignments will be posted on Brightspace and students need to upload the solutions on the following dates: **July 17 and August 7**.

Tests : Three tests (50 minutes each) are scheduled on the following dates: **July 19 , August 2 and August 11 in the tutorial hour**. No make-up, early, or delayed tests will be held.

The tutorials are mandatory, I highly recommend that you attend them in order to ask questions of your TA regarding the homework or related issues. During the tutorial sessions, a TA will be present to work out selected problems, to answer questions, and to administer the tests.

Final Exam: There will be a formally three hours final exam scheduled by university during August 19-25.

Academic Accommodation

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.

List of Topics

I. Ordinary Differential Equations

1. Introduction

1.1 Basic concepts

2. First-Order Equations

2.1 Separable Equations

2.1.1 Orthogonal Trajectories

2.2 Homogeneous equations

2.3 Linear equations

2.3.1 Bernoulli equations

2.4 Functions of Two Variables

2.4.1 Partial derivatives

2.4.2 The Chain Rule

2.5 Exact equations

2.5.1 Integrating Factors

3. Second-Order Equations

3.1 Basic Definitions

3.2 Linear Homogeneous Equations

3.2.1 Equations with Constant Coefficients

3.2.2 Cauchy-Euler Equations

3.3 Linear Nonhomogeneous Equations

3.3.1 The Method of Undetermined Coefficients

3.3.2 Variation of Parameters

5. Linear Systems (2×2 systems only)

5.1 Homogeneous Systems

5.1.1 General Theory

5.1.2 Systems with Constant Coefficients, Complex Eigenvalues, Generalized Eigenvectors

II. Infinite Series

6. Sequences and Series

6.1 Sequences

6.2 Series

6.2.1 The Integral Test, Approximations of Series

6.2.2 The Comparison Tests

6.2.3 Alternating Series, Approximations of Alternating Series

6.2.4 Absolute and Conditional Convergence

7. Taylor Series

7.1 Power Series

7.2 Representations of Functions by Power Series, The Binomial Series, Taylor Polynomials and Approximations

8. Fourier Series

8.1 Fourier Series of Periodic Functions

8.2 Fourier Series of Functions on Finite Intervals