MATH1005F
Differential Equations and Infinite Series for Engineering or Physics

Term: Fall 2021
Instructor: Dr. Zahra Montazeri
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Lectures: Tuesdays, Thursdays: Synchronous (Live lecture) 6:05-7:25pm through Zoom. These sessions will be recorded and posted on BrightSpace. Classes begin September 8, 2021
Tutorial: Thursdays 9:05-9:55pm. Tutorials will start September 17, 2021.
Office Hours: Tuesdays 7:30-8:00pm 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 ——————————————- 30%
- Tests ——————————————- 40%
- Final Exam ——————————————— 30%

Assignments: There are three assignments will be posted on Brightspace and students need to upload the solutions on the following dates (tentatively): **Oct. 2, Oct. 30 and Dec. 4**.

Tests : Two tests are scheduled on the following dates: **Oct.15 and Nov. 26** . They will be timed, but accessible for a 24 hours period. No make-up, early, or delayed tests will be held.

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 on selected problems, to answer questions.

MS-LAP Math Stats Learning Assistance Program supports first year mathematics courses. It helps students achieve their goals by providing learning support and solutions to homework questions through assistance videos, available on BrightSpace

Evaluation

- Scientific calculators and online calculators are permitted in this course, and it is worthwhile learning all functions they have to offer, however, direct copying of solutions of any kinda is not permitted (see below).
- Test(s) will be online, hosted on BrightSpace on the specified dates. They will be accessible for a 24 hours period, and will be timed. Please note that these dates may or may not coincide with scheduled lectures or tutorials. If the test is missed for valid reason, alternate arrangements will be made at the discretion of the Professor.
- Assignments are comprehensive: They are challenging, thorough, and encourage learning. You may seek outside assistance to solve problems, but direct copying of solutions of any kind is not permitted. Assignments must be submitted in **pdf format** - please familiarize yourself with scanning apps (e.g. CamScanner, etc.). Late submissions will not be accepted.

- All term grades must be resolved before the date of the final exam. Any changes after the fact will only be done at the discretion of the Professor.
- A 3-hour final examination will be held during the exam period, covering the entire course (e-proctoring software will NOT be used). The exam will be online, hosted on BrightSpace. The option of re-weighting any amount of the term towards the Final Exam is NOT available.

Conduct and Content Policies

- Zoom sessions will be held by the Professor on a weekly schedule . They will be recorded and posted on BrightSpace.
- Violations of Carleton's Integrity Policy will be dealt with in a formal fashion. All suspected incidents will be forwarded to The Office of The Dean of Science. Students are expected to be familiar the Academic Integrity Policy.
- Plagiarism is a specific matter of Academic Integrity. Plagiarism includes reproducing or paraphrasing portions of someone else's published or unpublished material, regardless of the source, and presenting these as one's own without proper citation or reference to the original source. In mathematics, an answer can not be plagiarized, but the presentation of its solution can! Thus, copying answers from fellow students, online posts, or online calculators (such as Wolfram, Symbolab, etc.) is strictly prohibited.
- All classroom teaching and learning activities (lectures and tutorials), and online content is COPYRIGHTED. Students are encouraged to use the notes and download any and all course materials for their own educational use. However, students are NOT PERMITTED to post or share files externally, or distribute content in any way without permission.

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