

MATH1005A
Differential Equations and Infinite Series for Engineering or Physics

Term: Winter 2020

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Lectures: Tuesdays, Thursdays 10:05-11:25am in Southam Hall THB. Classes begin Jan. 6, 2020

Tutorial: Thursdays 13:35-14:25. Tutorials will start Jan. 16, 2020.

Office Hours: Tuesdays 11:30- 12:30pm 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.

Calculators: Non-graphic, non-programmable calculators are permitted during the tests and the final examination.

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.

Four 50-minute tests have been scheduled during the tutorial hours on the following dates:

Jan. 30, Feb. 27, Mar. 12 and Mar. 26.

You are expected to take all of the tests. There will be no make up, early, or delayed tests. The best three out of four tests, which counts for 45% of your final grade.

A three-hour final exam will be scheduled during the official exam period (Apr. 13-25) at the end of the term. It will be based upon all of the material covered during the course.

EVALUATION

Your final grade will be calculated based 45% term mark and 55% final exam.

Academic Accommodations:

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.

Note: March 13, 2020 Last day to request Formal Examination Accommodation Forms for April examinations to the Paul Menton Centre for Students with Disabilities.

Review of Final Exams: If you wish to review your exam please email me to set up a convenient time to review the exam. Exams are only available for 3 weeks after the exam has been written. If you wish to review your exam after the three weeks, you must formally request to view your exam from Registrars office.

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