University of Toronto

Department of Mathematics

MAT244H1Y – Introduction to Ordinary Differential Equations

Syllabus

May - August 2024

Course Description

This is a 2nd year differential equations course. The depth of mathematics will be taught at a standard level accessible to 2nd-year undergraduate students who have a background in Calculus. The course will have an emphasis on computations. The topics covered in this course can be divided into four sections:

1. First order differential equations: Linear and Nonlinear equations.

2. Higher order linear differential equations: Characteristic Polynomial, Undetermined Coefficient Method, Variation of Parameters, Laplace Transform.

3. Systems of ordinary differential equations: Systems of 2 linear equations; Phase portraits; Systems of n linear equations; Linearization and stability; bifurcation analysis.

4. Second order equations with variable coefficients: Series solutions, Special Functions, Frobenius Method.

Lectures

There are two lecture sections:

Section	Instructor	Day/Time	Day/Time
LEC0101	David Knapik	Wed 09-11AM	Fri 09-10AM
LEC0201	José Palacios	Mon 09-11AM	Thu 09-10AM

To contact David, use the email address david.knapik@mail.utoronto.ca. To contact José, use the email address jose.palacios@utoronto.ca. Any email to the instructors should contain "MAT244" in the subject line. Please use your "@mail.utoronto.ca" or "@utoronto.ca" email address. You can usually expect a response within 48 hours. If the answer to your question is found in the syllabus, then you might **not** receive a response.

Tutorials

There are four tutorial sections, two in person and two online. Please attend the tutorial section that you have signed up for. Tutorials will begin the second week (week of May 13).

Section	Time	Room
TUT0101	Wed 12-1PM	BA2185
TUT0201	Thu 10-11AM	Online
TUT0301	Fri 9-10AM	Online
TUT0401	Fri 11AM-12PM	BA2175

Course Content

All course information will be made available on the **Quercus** page titled **MAT244H1 Y LEC0201**.

Textbooks

This course is based on two main references, the first of which is the one that will be used as a basis to prepare the lectures. The second is an additional reference that can be considered as an alternative reading material.

- (**Required**) W. Boyce, R.C. DiPrima, D.B Meade, *Elementary Differential Equations and Boundary Value Problems*, 11th edition, Wiley

- (**Optional**) James Brannan and William Boyce, *Differential Equations: an Introduction to Modern Methods & Applications*, 3rd edition, Wiley

Evaluation

The course will be evaluated through **7 assignments, 12 short quizzes, and 1 in-person final exam**. The **top 10** quiz marks make up **10%** of the final grade. The **assignments** are each worth **5%** of the final grade for a total of 35%, and the **final exam** will be **55%** of the final grade. **No aids will be allowed for any evaluations**.

- The weekly short quizzes will be given on Fridays online via Quercus. You will have 24 hours to complete the quiz, and no late submissions will be accepted.

- The 7 assignments will be submitted via Crowdmark. Late homework submissions will be penalized by a flat rate of -20% per day. Take this into account and do not upload your homework at the last minute. Exceptions to any of this due to required accommodations or unexpected circumstances will of course be taken into account and discussed on a case-by-case basis. Please write to the instructor in these situations.

- The in-person final exam will be held during the final assessment period in August 2024 and will be scheduled by the registrar. Information about the format will be provided during the semester.

Missed Term Work

Students who are absent from class for prolonged periods and who require consideration for missed academic work should contact the instructor and verify their absence(s) through either the Absence Declaration tool, Verification of Illness or Injury (VOI) form, College Registrar Letter, or Letter of Academic Accommodation from Accessibility Services, as appropriate to their situation. `https://www.artsci.utoronto.ca/current/academics/student-absences`

The absence declaration can be used once per term. Outside of the one time absence declaration use, students must adhere to the alternate processes for absences listed above, as well as the missed work policy as set out in this syllabus.

If you miss the final assessment, then you must inform your course Instructor within 72 hours of the test. No exceptions. If your request is approved, you may receive an accommodation. The accommodation to be used will be decided by your instructor. Some examples of accommodations may include: an oral exam, written make-up test, or a re-weighting of your assessments.

Schedule

Week of	Evaluation	Material to be covered
May 6		Separable equations, First order linear ODEs, Autonomous equations
May 13		Some nonlinear first order equations and the existence and uniqueness theorem
May 20	**Assignment 1**	Second order linear differential equations
May 27		Higher order linear differential equations
Jun 3	**Assignment 2**	Boundary Value Problems and nonlinear equations
Jun 10	**Assignment 3**	Laplace Transform
Jun 17		**Reading Break**
Jun 24		**Reading Break**
Jul 1	**Assignment 4**	Laplace Transform
Jul 8	**Assignment 5**	Systems of 2 first-order linear ODEs
Jul 15		Systems of n first order linear ODEs
Jul 22	**Assignment 6**	Nonlinear systems & Bifurcations
Jul 29		Series Solutions of Second Order Equations
Aug 5	**Assignment 7**	Series Solutions of Second Order Equations

<u>Note</u>: Due to the July 1 Canada Day holiday, lectures for section 0201 (José Palacios' section) will end on August 12.

Academic Integrity

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters (`https://governingcouncil.utoronto.ca/secretariat/policies/codebehaviour-academic-matters-july-1-2019`). If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, please reach out to your Course Instructor. Note that you are expected to seek out additional information on academic integrity from me or from other institutional resources (for example, the University of Toronto website on Academic Integrity `http://academicintegrity.utoronto.ca/`).

Accessibility

The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs.

Students with diverse learning styles and needs are welcome in this course. If you have a disability that may require accommodations, please feel free to approach your Course Instructor and/or the Accessibility Services office as soon as possible. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course. Link to Accessibility Services website: `https://studentlife.utoronto.ca/department/accessibility-services/`

Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Land Acknowledgement

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

Video Recording and Sharing (Download and Re-use Prohibited)

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor.

For questions about the recording and use of videos in which you appear, please contact your instructor.