

Math-263: Ordinary Differential Equations for Engineers, Fall 2020

Course Outline

- **Instructors:**

Prof A.R. Humphries, E-mail: tony.humphries@mcgill.ca

Lectures: Tues, Thurs, 1.00-2.30pm starting Thursday 3rd September.

Office Hours: Tues 2.30-3.30pm and Thurs 4.00-5.00pm, and by arrangement.

Zoom for all Humphries Sessions: [Meeting ID: 209 293 609 Passcode: 263362](#)

Prof D Jakobson, E-mail: dmitry.jakobson@mcgill.ca

Lectures: Prerecorded and posted on MyCourses

Live Problem Sessions: Wed, Fri, 10.30-11.30am starting Wednesday 2nd September.

Office Hours: Thurs 10.00-11.00am, and by appointment.

Zoom: Different links for different times. See MyCourses

Graduate TA: Pauline Lelandais

E-mail: pauline.lelandais@mcgill.ca

Office Hours: Weds 12.00-1.00pm.

Remote Learning Assistant: Sonia Boscenco

Sonia.Boscenco@mail.mcgill.ca

[For assistance with technical issues related to remote learning]

- **Tutorials:** One hour per week (start date: Wed 9th September).

- Wed 2:35-3:25 Jennifer Tram Su
- Fri 9:35-10:25 Marvin Li
- Fri 4:25-5:25 Allen Liu
- Mon 2:35-3:25 Adam Abouzahr

- **Prerequisites/Restrictions:** This course is only open to students in the Faculty of Engineering. Not open to students taking or having taken MATH-315 or MATH-325.

Co-requisite: MATH-262. This co-requisite also implies a background in vectors and matrices corresponding to MATH 133 or one of its CEGEP equivalents.

- **Syllabus**

First order ordinary differential equations (ODEs). Second and higher order linear ODEs. Series solutions at ordinary and regular singular points. Laplace transforms. Linear systems of differential equations with a short review of linear algebra.

- **Provisional Contents:**

1. First Order ODEs: introduction, definitions and geometrical interpretation; existence and uniqueness theorem; linear equations; separable equations; exact equations and integrating factors; applications.
2. Second and higher order linear ODEs: linear homogeneous equations, fundamental systems of solutions, Wronskians; Review of complex numbers; Constant coefficient equations and Cauchy-Euler equations; Inhomogeneous equations (undetermined coefficients and variation of parameters); reduction of order; applications.
3. Laplace Transforms: definition and properties; solution of initial value problems for constant coefficient equations; step functions, discontinuous and periodic forcing functions, impulse functions; convolutions; applications.
4. Series Solutions: Regular Points, Regular Singular Points and Frobenius method.

5. Linear Systems of ODEs: Review of linear Algebra, Solutions and stability.

6. Introduction to numerical methods and nonlinear differential equations. (Time permitting).

- **References:**

- There is no required textbook for this course. We will develop the required material in the lectures. So, I would not buy a book unless or until you decide that you need one.
- Recommended textbook

- *Elementary Differential Equations*, 10th edition, by W.E. Boyce and R.C. DiPrima, or *Elementary Differential Equations and Boundary Value Problems*, 10th edition, by W.E. Boyce and R.C. DiPrima.

The "with boundary value problems" version of the book contains two extra chapters of material, that are irrelevant to this course, but which form the basis of the second half of MATH-264.

Previous editions maybe cheaper and should be just as good. (There is also an 11th edition by Boyce, DiPrima and Meade, only available as an e-book or loose leaf). We will broadly follow the treatment in this book, not necessarily in order, and we certainly won't follow the book closely. The explanations and exercise in the book should provide a good supplement to the lectures and tutorials.

- Other textbooks. There are many other books that cover the same material. These include

- *Fundamentals of Differential Equations and Boundary Value Problems*, 7th edition or *Fundamentals of Differential Equations*, 9th edition by R.K. Nagle, E.B. Saff, and A.D. Snider. Prof Jakobson likes this book.
- *Differential Equations and Boundary Value Problems*, 9th edition, by D.G Zill (earlier editions by D.G Zill and W.S Wright.)
- *Elementary Differential Equations*, 6th edition, by C.H. Edwards and D.E. Penny.
- *Elementary Differential Equations*, by W.F. Trench. The pdf of this book is available online for free and legal [download](#).

Previous editions of any of these should be just as good. Most of these books come in two versions, just as Boyce and DiPrima does.

- **Assignments:** There will be weekly assignments. These will mainly be webwork assignments, but there will also be two written assignments.
- **Midterm:** There will be a 1.5 hour midterm exam, administered according to Faculty of Science procedures. These currently are online exam with double time plus 30 minutes within a 72 hour window. So, you'll have a 72 hour window within which to complete the midterm, and you choose your start time within this window. Once you start you have 3.5 hours to complete and upload your solutions. The midterm will be scheduled sometime in the second half of October.
- **Final Exam:** There will be a final 3 hour final exam during the final exam period, administered according to Faculty of Science procedures. These currently are online exam with double time plus 30 minutes within a 72 hour window. So, you'll have a 72 hour window within which to complete the exam, and you choose your start time within this window. Once you start you have 6.5 hours to complete and upload your solutions.
- **Assessment Scheme:** The better of [Final exam 40%, midterm 20%, webwork 30%, written assignments 10%] or [Final exam 60%, webwork 30%, written assignments 10%].
- **Academic Integrity**
The work you hand in should be your own effort; any collaboration must be acknowledged.

McGill University values academic integrity. Therefore all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures (see www.mcgill.ca/students/srr/honest/ for more information).

- **Copyright**

All instructor generated course materials (e.g., videos, handouts, notes, summaries, exam questions, etc.) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. I do not want to see any of this material reappear anywhere on the internet. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.

- **Language**

In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

- **Health and Wellness Resources at McGill**

Student well-being is a priority for the University. All of the McGill health and wellness resources have been integrated into a single Student Wellness Hub, your one-stop shop for everything related to your physical and mental health. If you need to access services or get more information, visit the Virtual Hub at mcgill.ca/wellness-hub or drop by the Brown Student Services Building. Within the faculty, you can also connect with the Local Wellness Advisor (to make an appointment, visit mcgill.ca/lwa).

- **Extraordinary Circumstances**

In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.
