MATH 3008– Ordinary Differential Equations (Honours)
Winter 2021

Instructor	Dr. David Amundsen
Email	dave@math.carleton.ca
Office Hours	Wednesday 10-11am or by appt.
Web page	http://mathstat.carleton.ca/∼dave/
Primary Text	*A Second Course in Elementary Differential Equations* Paul Waltman (Dover)
Supplemental Text	*An Introduction to Ordinary Differential Equations* E.A. Coddington (Dover)
Course Materials	All course materials and communications will be posted via CULearn.
Lectures	Monday and Wednesday 8:30-10:00, online via Zoom (will be recorded).
Tutorials	Wednesday 14:30-15:30 online, platform TBA (starting Jan. 20)
TA	TBA
Problem Sets	Assigned weekly.
Midterm∗	Wednesday, March 3.
Final∗	Cumulative exam during exam period.
Deferrals	Accommodations for missed term work or final exam will be made in accordance with University Policy and may include alternate formats.
Grading	Tutorial Work: 10 % Problem Sets: 10 % Midterm: 25 % Final: 55 %

∗- Please note that tests and examinations in this course will use a remote proctoring service provided by Scheduling and Examination Services. You can find more information at https://carleton.ca/ses/e-proctoring.

Accommodation Policies

- The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and **no later than two weeks before the first in-class scheduled test or exam requiring accommodation**. Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca/pmc) for the deadline to request accommodations for the formally-scheduled exam.

- Accommodations for other reasons such as religious obligation, or parental leave, will be done only in accordance with University policy. These policies are administered by the office of Equity Services.

Topics and Schedule

1. Review of Methods of Solution of ODEs (1 week)

   - Linear First Order Equations
   - Second Order Linear Equations
     - Homogeneous
       * Constant Coefficients
       * Reduction of Order
     - Independence of solutions and the Wronskian
     - Inhomogeneous
       * Undetermined Coefficients
       * Variation of Parameters

2. Existence and Uniqueness (3 weeks)

   - Weak form of first order ODEs
   - Lipschitz condition
   - Contraction Mapping Theorem
   - Local and Global Existence

3. Series Solutions of Second order Linear ODEs (3 weeks)

   - Classification of singular points
   - Construction and Convergence of Series Solutions around Ordinary Points (Taylor Series)
   - Construction and Convergence of Series Solutions around Regular Singular Points (Frobenius Series)
   - Classification of behaviour at infinity

4. Boundary Value Problems and Sturm-Liouville Theory (4 weeks)

   - Existence and Uniqueness for BVPs
   - Sturm Separation and Comparison Theorems
   - Inhomogeneous Boundary Value Problems
   - Special case: Fourier Series
   - Application to PDEs