Mathematics (MATH) 376

Ordinary Differential Equations (Revision 7)

Status:	Replaced with new revision, see the **course listing** for the current revision
Delivery mode:	**Individualized study online**
Credits:	3
Area of study:	Science
Prerequisites:	**MATH 265** , **MATH 266** and **MATH 270** or their equivalents.
Precluded:	None
Challenge:	MATH 376 is not available for challenge.
Faculty:	**Faculty of Science and Technology**

Notes:	**Mathematics Diagnostic Assessment** . This online test contains 70 questions that will help you assess your mathematical skills. Based on your score we will recommend which Athabasca University mathematics course you are likely ready to take successfully.

Overview

Mathematics 376 covers basic concepts, methods and techniques for solving ordinary Differential Equations (ODEs), and considers applications of ODEs in different areas.

Outline

Mathematics 376 consists of three main parts covering particular differential equations topics in 15 units. The *main objective* in each unit is to identify the corresponding type of equation or system of equations and to learn techniques for solving them.

Part I: First-order Differential Equations

- Unit 1: Introducing Ordinary Differential Equations
- Unit 2: Directly Integrable Ordinary Differential Equations Resolved in Terms of the Derivative
- Unit 3: Reduction to Separable Equations
- Unit 4: Reduction to Exact Equations: Integrating Factors
- Unit 5: First-order Equations not Resolved with Respect to the Derivative: Parametric Solutions
- Unit 6: Initial Value Problems for a Single First-order Differential Equation

Part II: Systems of Ordinary Differential Equations with Constant Coefficients

- Unit 7: The Basic Theory of Systems of Linear Ordinary Differential Equations
- Unit 8: Systems of Homogeneous Linear Ordinary Differential Equations with Constant Coefficients
- Unit 9: Particular Solutions for Nonhomogeneous Linear Ordinary Differential Equations
- Unit 10: Laplace Transforms
- Unit 11: Initial Value Problems from the Perspective of Laplace Transforms

Part III: Beyond Linear Equations with Constant Coefficients

- Unit 12: Some Cases of Reduction for Linear Ordinary Differential Equations
- Unit 13: Power Series Solutions to Ordinary Differential Equations with Analytic Coefficients
- Unit 14: Non-analytic Coefficients: The Method of Frobenius
- Unit 15: Autonomous Systems of Two Equations and Numeric Approximations to Solutions of Initial Value Problems for Systems of Ordinary Differential Equations

Learning outcomes

Upon successful completion of this course, you should be able to

- demonstrate understanding of the meaning of an ordinary differential equation (ODE), its order, its general solution, and its particular solution.
- recognize and solve different types of first-order ODEs, including separable, exact, homogeneous, linear and Bernoulli equations.
- solve simple applied initial value problems (IVPs) modelled with first-order ODEs, including population models, Newtonian mechanics problems, and heating and cooling problems.
- apply the methods of undetermined coefficients, variation of parameters, and Laplace transform, to solve systems of linear ODEs with constant coefficients, higher-order differential equations, homogeneous and nonhomogeneous equations, and IVPs for systems of first-order linear equations and single higher-order linear equations with constant coefficients.

- apply concepts of power series and reduction to linear ODEs to solve differential equations with variable coefficients, including Cauchy-Euler equations.
- demonstrate understanding of concepts related to phase plane analysis, such as autonomous systems, phase plane, critical (equilibrium) points, and their stability and classification.

Evaluation

To **receive credit** for *MATH 376*, you must achieve a grade of at least 50 percent on the final examination, and a course composite grade of at least **D (50 percent)** . The weighting of the composite grade is as follows:

Activity	Weight
Assignment 1 (Part I)	5%
Assignment 2 (Part II)	5%
Assignment 3 (Part III)	5%
Assignment 4	5%
Midterm Examination	30%
Final Examination	50%
Total	**100%**

To learn more about assignments and examinations, please refer to Athabasca University's **online Calendar** .

Materials

Digital course materials

Links to the following course materials will be made available in the course:

Nagle, R. K., Saff, E. B., & Snider, A. D. (2018). *Fundamentals of Differential Equations* (9th ed.). Pearson.

Maymeskul, V. (2018). *Student's Solutions Manual* (7th ed.). Pearson.

Nagle, R. K., Saff, E. B., & Snider, A. D. *Student Access Kit: MyLab Math for Fundamentals of Differential Equations.* Pearson MyLab.

Other Materials

The course materials include a *Study Guide* a *Course Orientation*.

Important links

- **Academic advising**
- **Program planning**
- **Request assistance**
- **Support services**

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery methods may vary from their individualized study counterparts.

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View **previous revision**