## DIFFERENTIAL EQUATIONS   MA4360

Departmental Syllabus

**TEXTBOOK**: **Differential Equations with Boundary Value Problems,** 8th Edition. by Zill and Wright, Brooks/Cole Publishing Company 2013. ISBN-13: **9781111827069**

*Prerequisite*:  Grade of C or higher in MA2320 Calculus II  and MA3160 Linear Algebra

**COURSE DESCRIPTION:** The course will cover the methods of solving first order differential equations including separation of variables, exact equations, linear equations and substitutions. Methods for higher order differential equations including homogeneous and non-homogeneous equations, reduction of order, undetermined coefficients, and variations of parameters. Systems of differential equations, Boundary value problems.  It will also introduce Laplace Transform. Applications in social sciences, physics, biology, medicine, chemistry, and engineering will be demonstrated.

**GOALS & OBJECTIVES:** To become proficient in solving ordinary differential equations and to study some of their applications.

**COURSE EVALUATION & GRADING**: Course grade will be based on midterm exams, quizzes, assignments, and Final Exam. The Final exam is **cumulative** and it counts at least **30**% of the course grade. The grading scale is as follows:

| **A** = [94, 100]<br>**A⁻** = [90, 93] | **B⁺** = [87, 89] | **C⁺** = [77, 79] | **D⁺** = [67, 69] | **F** = [0, 59] |
|---|---|---|---|---|
| | **B** = [84, 86] | **C** = [74, 76] | **D** = [64, 66] | |
| | **B⁻** = [80, 83] | **C⁻** = [70, 73] | **D⁻** = [60, 63] | |

**TUTORIAL:**  Drop-in tutorial is available in the Mathematics Learning Center

**ACCOMMODATIONS FOR STUDENTS WITH SPECIAL NEEDS:** If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact Stacey DeFelice, Director, The Office of Services for Students with Disabilities (OSSD), NAB, 2065, Phone: 516-628-5666, Fax (516) 876-3005, TTD: (516) 876-3083. E-mail: defelices@oldwestbury.edu. The office will help you determine if you qualify for accommodations and assist you with the process of accessing them. All support services are free and all contacts with the OSSD are strictly confidential.

## TOPICS TO BE COVERED

**TEXTBOOK**: **Differential Equations with Boundary Value Problems,** 8th Edition. by Zill and

Wright, Brooks/Cole Publishing Company 2013. ISBN-13: **9781111827069**


**1. INTRODUCTION TO DIFFERENTIAL EQUATIONS**
- 1.1     Definitions and Terminology
- 1.2     Initial-Value Problems
- 1.3     Differential Equations as Mathematical Models

**2. FIRST-ORDER DIFFERENTIAL EQUATIONS**
- 2.1     Solution Curves Without a Solution
- 2.2     Separable Variables
- 2.3     Linear Equations
- 2.4     Exact Equations and Integrating Factors
- 2.5     Solutions by Substitutions

**3. MODELING WITH FIRST-ORDER DIFFERENTIAL EQUATIONS**
- 3.1     Linear Models
- 3.2     Nonlinear Models
- 3.3     Modeling with Systems of First-Order Differential Equations

**4. HIGHER-ORDER DIFFERENTIAL EQUATIONS**
- 4.1     Preliminary Theory-Linear Equations
- 4.2     Reduction of Order
- 4.3     Homogeneous Linear Equations with Constant Coefficients
- 4.4     Undetermined Coefficients-Superposition Approach
- 4.5     Undetermined Coefficients-Annihilator Approach
- 4.6     Variation of Parameters
- 4.7     Cauchy-Euler Equation

**5. MODELING WITH HIGHER-ORDER DIFFERENTIAL EQUATIONS.**
- 5.1     Linear Models: Initial-Value Problems
- 5.2     Linear Models: Boundary-Value Problems
- 6.1     Solutions About Ordinary Points

**7. LAPLACE TRANSFORM.**
- 7.1     Definition of the Laplace Transform
- 7.2     Inverse Transform and Transforms of Derivatives
- 7.3     Operational Properties I
- 7.4     Operational Properties II

**8. SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS.**
- 8.1     Preliminary Theory
- 8.2     Homogeneous Linear Systems
- 8.3     Nonhomogeneous Linear Systems