Instructor: Dr. Andrew Koichi Greene

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Office Hours: M, W 11:15–12:15; T, Th 2:30–3:30; and by Appointment


Course Description: This course focuses on techniques of solving first- and second-order ordinary differential equations (ODE’s). Methods include separation of variables, variation of parameters and the Laplace Transform. Applications include linear and nonlinear models. Math 286 is a 3 credit course. Prerequisite: Calc III Math 285 (formerly 201) or Honors Calc III Math 287 (formerly 209) or permission of instructor.

This course meets three times per week. Most meetings are in a classroom setting; Tuesday meetings take place in a computer lab, where the computer algebra system Maple will be used to enhance and supplement the classroom material. Course announcements and resources are available on Moodle, https://lms.manhattan.edu/.

Attendance: Attendance is mandatory. Four or more unexcused absences must be reported to the dean of your school. If you are late, please notify the instructor at the end of the class.

Grading:

- Homework: 15%
- Quizzes: 10%
- Class Participation: 5%
- Midterm Exams: 45%
- Final Exam: 25%

Notes: Midterm grades are due Monday, October 15. They will not appear on your transcript. The last day to withdraw from a course with a W is Friday, October 26.

Homework: Homework will be assigned regularly and collect during class on Thursdays. It is important to keep up with these assignments in order to be successful in the class. Your lowest homework score will be dropped.

Labs and Quizzes: There will be either a lab or a quiz every week. You will be expected to use the computer algebra system Maple for the labs. Each lab and quiz will be weighted evenly toward your “Labs and Quizzes” grade. The lowest of your labs and quizzes will be dropped.

Exams: There will be three in-class midterm exams, which I will announce at least one week
beforehand in class. The final exam will be cumulative, and will be held on the day designated by
the Registrar’s Office.

**Extra Help:** You can always come to my office hours, however, please do not feel restricted to
those times. If you see that I’m in my office, feel free to stop by and ask questions. You can also
set up an appointment with me outside of scheduled office hours. There is also tutoring offered by
Pi Mu Epsilon; you can find the schedule posted on the wall in the Math and Computer Science
Department Office in RLC 201. Academic Support Services (Miguel 300) offers support to students
improving skills in college-wide core competencies: reading, composition, math and science.

**Make-Up Policy:** *No make-ups will be granted unless in the case of an emergency.* In such cases
you need to notify the instructor and provide proper documentation detailing the emergency in
order to receive permission to have a make-up.

**Special Accommodations:** Please notify me as soon as possible if you have commitments as an
athlete or other special needs.

**Calculators:** A graphing calculator without symbolic algebra capabilities may be used on exams.
However, the use of a symbolic calculator such as the TI-89 or TI-92 will not be allowed. I reserve
the right to check your calculator’s memory to look for anything that should not be there.

**Academic Integrity:** Note the school’s policy on academic integrity, which can be found in the
Student Handbook.

**Course Learning Outcomes for Math 286:**

- Understand how mathematical models give rise to differential equations.
- Solve first-order separable differential equations.
- Solve first-order linear equations.
- Solve first-order exact equations.
- Solve first-order homogeneous equations and Bernoulli equations.
- Understand what an integrating factor is.
- Formulate first-order equations arising from appropriate models.
- Distinguish between initial value problems and boundary value problems.
- Understand the form of a general solution of a second-order linear equation.
- Use reduction of order in solving second-order equations.
- Solve second-order homogeneous equations having constant coefficients.
- Use undetermined coefficients to solve nonhomogeneous equations.
- Use variation of parameters to solve nonhomogeneous equations.
- Solve Cauchy-Euler equations.
- Formulate higher-order equations that arise from appropriate models.
- Use the Laplace Transform to solve appropriate differential equations.
- Use numerical techniques to solve equations with the help of Maple.

Topics: The following is a rough list of what we will cover in this class. I might omit or add a section here or there, time permitting.

- Chapter 1: Introduction
  - 1.1 Definitions and Terminology
  - 1.2 Initial-Value Problems
  - 1.3 Differential Equations as Mathematical Models

- Chapter 2: First-Order Differential Equations
  - 2.1 Solution Curves Without a Solution
  - 2.2 Separable Variables
  - 2.3 Linear Equations
  - 2.4 Exact Equations
  - 2.5 Solutions by Substitutions
  - 2.6 A Numerical Method (optional)

- Chapter 3: Modeling with First-Order Differential Equations
  - 3.1 Linear Models
  - 3.2 Nonlinear Models
  - 3.3 Modeling with Systems of First-Order DE’s (optional)

- Chapter 4: Higher-Order Differential Equations
  - 4.1 Preliminary Theory
  - 4.2 Reduction of Order
  - 4.3 Homogeneous Equations with Constant Coefficients
  - 4.4 Undetermined Coefficients – Superposition Approach
  - 4.6 Variation of Parameters
  - 4.7 Cauchy-Euler Equation
  - 4.8 Solving Systems of Linear DE’s by Elimination (optional)

- Chapter 5: Modeling with Higher-Order DE’s
  - 5.1 Linear Models: Initial-Value Problems

- Chapter 6: Series Solutions of Linear Equations (if time permits)

- Chapter 7: The Laplace Transform
  - 7.1 Definition of the Laplace Transform
– 7.2 Inverse Transforms and Transforms of Derivatives
– 7.3 Operational Properties I
– 7.4 Operational Properties II

* Chapter 9: Numerical Solutions of Ordinary DE’s
  – 9.1 Euler Methods and Error Analysis
  – 9.2 Runge-Kutta Methods (Use Maple)

Good Luck!