

MIDDLESEX COUNTY COLLEGE  
EDISON, NJ  
MASTER SYLLABUS

**Course ID and Name:** MAT 234, Differential Equations

**Department:** Mathematics

**Prerequisites:** MAT-233 or approval of mathematics department chairperson.

**Co-requisites:** None

**Course Description:** An introduction to differential equations for students interested in mathematics and sciences – both physical and social sciences. Covers first-and second-order ordinary differential equations and systems of first-order equations, both linear and non-linear. Qualitative and numerical analysis are emphasized along with analytic techniques such as Laplace transforms and matrix methods. Applications and modeling of real phenomena are discussed throughout the course.

**General Education Status:** None

**Credits:** 4      **Lecture Hours:** 4      **Lab Hours:** 0

**Textbook(s) and Other Course Materials:**

Textbook:

Author: Dennis G. Zill

Title: A First Course in Differential Equations with Modeling Applications, 9th Edition

Publisher: Brooks/Cole, Cengage

**Student Learning Outcomes:**

Students in MAT 234 should be able to demonstrate the ability to do the following:

1. Demonstrate the mastery of solving first-order linear differential equations, second-order linear differential equations with constant coefficients, and systems of linear differential equations.
2. Apply differential equation theory to problems in physical science and engineering such as mechanics, growth and decay phenomenon, and harmonic motion.
3. Explain the theoretical background of differential equations in terms of linear algebra and solution spaces.
4. Use alternative mathematical methods to solve differential equations including numerical and graphical methods, linear systems and matrices, power series and Laplace Transforms.
5. Understand how the long-term behavior of solutions might be affected by small changes in parameters and/or initial conditions.
6. Translate quantifiable problems into mathematical terms and solve these problems using mathematical or statistical operations.
7. Construct graphs and charts, interpret them, and draw appropriate conclusions.

**Course Content Areas:**

1. Modeling
2. 1<sup>st</sup> order equations
  - a. Separation of variables
  - b. Linear equations, change of variables
3. Slope fields, phase line
4. Euler's method
5. Existence and Uniqueness Theorem
6. Second-order equations
  - a. Undetermined coefficients
  - b. Variation of parameters
  - c. Harmonic oscillator models
7. Power series solutions around ordinary points
8. Laplace transforms
  - a. Solving 1<sup>st</sup> and 2<sup>nd</sup> order equations
  - b. Discontinuous and impulse forcing
9. Systems: modeling & geometry
10. Special systems (example: predator/prey)
11. Linear systems
12. Straight-line solutions
13. Phase plane
14. Complex eigens, special cases
15. Non-linear systems
16. Qualitative analysis

**Policies:**Disability Support

Students with disabilities, whether physical, learning or psychological, who believe that they may need accommodations in this class, are encouraged to contact Disability Services as soon as possible to ensure that the accommodations are implemented. Please meet with the Disability Services staff in Edison Hall, Room 100, (732) 906-2546.

Code of Student Conduct

To foster a productive learning environment, the College requires that all students adhere to the Code of Student Conduct which is published in the college catalog and website.