ROWAN UNIVERSITY
Department of Mathematics

Syllabus

MATH 01.231 - Ordinary Differential Equations

CATALOG DESCRIPTION:

MATH 01.231 Ordinary Differential Equations, 3 s.h.
Prerequisites: MATH 01230 (Calculus III) and MATH 01210 (Linear Algebra) with a C- or better in both courses

Ordinary differential equations are equations involving the derivatives of an unknown function with one independent variable. This course is mainly about the methods for the solution of such equations. The focus of attention is on the methods applicable to a class of equations, and also on those specialized for an individual equation with important applications. Topics included are: the solutions of nth order equations, particularly the solutions to the first and higher order linear differential equations, series solutions, Laplace Transform solutions, and numerical solutions. Applications to physics, engineering or other field are a substantial component of this course too. Students can be asked to use computers and/or graphing calculators as an aid in solving equations.

OBJECTIVES:

In few areas of college mathematics is the interaction of science and mathematics so marked as in the study of differential equations. The purpose of this course is to introduce the student not only to the theoretical aspects of differential equations, including the establishment of existence of solutions, but also to techniques for obtaining solutions for the various types of ordinary differential equations.

CONTENT:

1.0 Equations of Order One

- 1.1 The isoclines of an equation
- 1.2 An existence theorem
- 1.3 Separation of variables
- 1.4 Homogeneous functions
- 1.5 Equations with homogeneous coefficients
- 1.6 Exact equations
- 1.7 The linear equation of order one

2.0 Elementary Applications

- 2.1 Velocity of escape from the earth
- 2.2 Orthogonal trajectories

3.0 Linear Differential Equations

- 3.1 The general linear equation
- 3.2 Linear independence
- 3.3 An existence and uniqueness theorem
- 3.4 The Wronskian

9.0 System of Differential Equations

9.1 Systems and Techniques
9.2 Applications

10.0 Numerical Techniques

10.1 Euler-Cauchy Method
10.2 Adams-Bashforth Method
10.3 Runge-Kutta Method
10.4 Milne's Method
10.5 The Method of Successive Approximations

TEXTS:

Boyce, William E., DiPrima, Richard ELEMENTARY DIFFERENTIAL EQUATIONS AND BOUNDARY PROBLEMS, 8th ed., Wiley & Sons Inc., New York.

Zill, Dennis A FIRST COURSE IN DIFFERENTIAL EQUATIONS with modeling applications, 10th ed., Brooks/Cole, London, 1997.

Borrelli, Robert L., and Coleman, Courtney S. DIFFERENTIAL EQUATIONS A Modeling Perspective, Wiley & Sons Inc., New York, 1998.

Blanchard, Paul, Devaney, Robert L., and Hall, Glen R. DIFFERENTIAL EQUATIONS, Brooks/Cole, Pacific Grove, 1998.

Edited: 04/2021