

Ordinary Differential Equations TCSU MATH 240

A. Description

The course is an introduction to ordinary differential equations including both quantitative and qualitative methods as well as applications from a variety of disciplines. Introduces the theoretical aspects of differential equations, including establishing when solution(s) exist and techniques for obtaining solutions, including, series solutions, and singular points, Laplace transforms and linear systems.

B. Recommended Preparation

Three semesters of calculus for science, mathematics, and engineering.

C. Prerequisites

Multivariable Calculus

D. Minimum Unit Requirement

3 semester units

E. Course Topics

1. Solutions of ordinary differential equations
2. Separation of variables
3. Equations with homogeneous coefficients
4. Nonlinear differential equations
5. Exact equations, Euler's method
6. Existence and uniqueness
7. Applications
8. Second order linear differential equations
9. Fundamental solutions, independence, Wronskian
10. Complex and repeated eigenvalues
11. Nonhomogeneous equations
12. Application: The harmonic oscillator
13. Variation of parameters
14. Higher order linear equations
15. Systems of Ordinary differential equations
16. Matrices
17. Solving linear systems of ordinary differential equations by diagonalization
18. Complex eigenvalues and fundamental matrices
19. Phase plane

F. Student Learning Outcomes

Upon successful completion of the course, students will be able to:

1. Create and analyze mathematical models based on ordinary differential equations;

2. Determine the type of a given differential equation, determine the existence of a solution and if a solution can be obtained, select the appropriate analytical technique for finding the solution;
3. Utilize technology tools to find geometric, graphical and numeric techniques for the analysis of solutions; and
4. Solve Linear Systems of equations using eigenvalues and eigenvectors.