

Course Outline for MATH 2343, Differential Equations

MATH 2343 Differential Equations (3 units)

Prerequisite: MATH 206 or [MATH 1151](#); and one of the following: MATH 143, [MATH 1262](#), [MATH 1263](#), or DATA/[MATH 1265](#).

First-order differential equations. Second-order and higher-order linear differential equations. Mathematical models, systems of differential equations, Laplace transforms, series solutions, matrix methods for linear systems. 3 lectures. Formerly MATH 242.

Course Learning Objectives	
1	Utilize the language and elementary theory of ordinary differential equations.
2	Apply the Existence and Uniqueness Theorems for ordinary differential equations.
3	Solve and analyze first-order separable, linear, and exact differential equations including the use of integrating factors, substitution methods, and transformations.
4	Formulate, solve, and analyze the results of mathematical models of elementary physical problems in engineering, physics, and other applied areas.
5	Solve and analyze second-order and higher-order linear homogeneous and nonhomogeneous differential equations.
6	Solve and analyze systems of first-order linear differential equations.
7	Define the Laplace transform, prove elementary properties of the Laplace transform, and use the Laplace transform to solve initial value problems with various forcing terms.
8	Use power series to construct solutions of differential equations about an ordinary point.

Expanded Course Content

Textbooks, materials, and/or other resources
Text to be chosen by the instructor. Possible textbooks include: • William E. Boyce and Richard C. DiPrima, Differential Equations and Boundary Value Problems • R. Kent Nagle, Edward B. Saff, and Arthur David Snider, Fundamentals of Differential Equations • This sample course outline follows the textbook William E. Boyce and Richard C. DiPrima, Differential Equations and Boundary Value Problems

Week	Readings	Topics of Discussion
1	Sections 1.1 – 1.4, 2.1	Introduction to differential equations, first-order linear equations, method of integrating factors
2	Sections 2.3, 2.4	Modeling with first order equations, differences between linear and nonlinear equations
3	Sections 2.6, 2.8	Exact equations and integrating factors, the Existence and Uniqueness Theorem
4	Sections 3.1, 3.2	Homogeneous equations with constant coefficients, solutions of linear homogeneous equations
5	Sections 3.3, 3.4	Complex roots of the characteristic equation, repeated roots, reduction of order
6	Sections 3.5, 3.6	Nonhomogeneous equations: method of undetermined coefficients, variation of parameters
7	Sections 3.7, 4.1, 4.2	Mechanical and electrical vibrations, higher-order linear equations
8	Sections 5.1, 5.2	Series solutions near an ordinary point
9	Section 5.3	Series solutions near an ordinary point
10	Sections 6.1, 6.2	Definition and properties of the Laplace transform, solutions of initial value problems
11	Sections 6.3, 6.4	Step functions, differential equations with discontinuous forcing functions
12	Sections 6.5, 6.6	Impulse functions, the convolution integral
13	Sections 7.1, 7.4	Systems of first-order linear equations
14	Sections 7.6, 7.7, 7.8	Complex eigenvalues, fundamental matrices, repeated eigenvalues
15	Sections 7.9, 9.1, 9.2	Nonhomogeneous linear systems, The phase plane, autonomous systems, and stability

Method of Assessment

The possible methods of assessment are written individual examinations, quizzes, in-class worksheets or presentations, projects, and homework. All exams are to be proctored in-person, and one or more midterms and a cumulative final exam are required.

Instructional Mode

The instructional mode for this class is face-to-face. This designation means that the essential academic standards of the course require in-class student engagement, and thus remote instruction is not appropriate.