

MATH 204 Differential Equations (Semester I-1435/36)

(3+1) credit-hours.

Prerequisite: 201M or 203M: Language of instruction: English

Various types of first order differential equations and their applications. Linear equations of higher order. Systems of linear equations with constant coefficients, Power series methods for solving second order equations with polynomial coefficients. Fourier series, Fourier series for even and odd functions. Complex Fourier series, Fourier integral.

References:

1. *Differential equations with boundary value problems: by Dennis G. Zill and Michael R Cullen (Seventh or sixth edition)*
2. *Differential Equations by Prof. Dr. Said Mesloub, Prof. Dr. Damlakhi Mostafa, and Dr. Khawaja Zafar Elahi.*

Weekly Course Details

1. Definition of a Differential equation, Classification of Differential equations, type of solutions.
2. Initial value problems. Existence and uniqueness theorem, Separable equations (Separable variables).
3. Equations with homogeneous coefficients, Exact Equations
4. Integrating factors, general form of a linear equation and Equations with linear coefficients
5. Bernoulli equation.
6. Applications, Linear Models: Orthogonal trajectories, Growth and decay, Newton's Law of Cooling.
7. Higher order Differential equations. Linear Differential equations: Existence-Uniqueness Theorem, Linearly (independent solutions, dependent solutions), Wronskian. Reduction of order Method.
8. Homogeneous linear Differential equations with constant coefficients. Undetermined coefficient method.
9. Cauchy-Euler Equation Variation of parameters.
10. Series solutions of Linear Equations.
11. Solving systems of Linear Equations by Elimination.
12. Orthogonal Functions and Fourier series.
13. Fourier cosine and sine series, Complex Fourier series.
14. Fourier Integral.
15. Revision