

Course Title Linear Algebra & Differential Equations	Course Code MATH-120	Credit Hours 3 – 0
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Text Book:

- Dennis G. Zill and Michael Cullen, Differential Equations (3rd Edition)

Reference Books:

- E. Kreyszig, Advanced Engineering Mathematics, 9th ed.
- Glyn James, Modern Engineering Mathematics.

Course Objectives:

- Apply foundational concepts of Linear Algebra and Differential Equations to engineer practical solutions.

Course Outline:

- Basic Concepts. Matrix Addition. Scalar Multiplication Matrix Multiplication , Linear Systems of Equations. Gauss Elimination.
- Solution of Linear Systems: Existence, Uniqueness, General Form ,Inverse of a Matrix. Gauss-Jordan Elimination.
- Vector Spaces, Sub Spaces and Linear Transformations
- Linear dependence, linear independence, spanning set, basis • Eigenvalues and Eigenvectors
- Separable Variables.
- Homogeneous Equations.
- Exact Equations and Integrating Factors. • Linear Equations.
- Equations of Bernoulli, Ricatti and Clairaut.
- Applications of Linear and Non-Linear First Order ODEs.
- Linear Differential Equations of Higher Order: Preliminary Theory, Initial and Boundary Value Problems, Linear Dependence and Linear Independence.
- Homogeneous Linear Equations with constant coefficients.
- Non-Homogeneous Linear Equations with constant coefficients: Undetermined Coefficients, Variation of Parameters.
- Non-Homogeneous Linear Equations with Variable Coefficients: Cauchy-Euler Equation.
- Laplace Transform: Laplace Transform and Inverse Transform
- Unit step function, Dirac delta function
- Solution of 1st and higher order initial value problem using Laplace Transform

Description	Percentage Weightage (%)
Assignments	05-10%
Quizzes	10-15%
Mid Semester Exams	30-40%
End Semester ASSESSMENTS Exam	40-50%