

Course Title	Course Code	Credit Hours
Linear Algebra and Ordinary Differential Equations	MATH-121	3-0

Textbook:

- Dennis G. Zill, and Michael Cullen, "Differential Equations with Boundary-Value Problems", Cengage Learning

Reference Book:

- EASA Part-66 Category B1 Maintenance License Module 1, "Mathematics"

Course Objectives:

This course aims to make students familiar with:

- Foundational concepts of Linear Algebra and Differential Equations
- Application of linear algebra and differential equations' concepts 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,
- Linear Equations
- Exact Equations and Integrating Factors
- 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 and Inverse Transform
- Unit step Function, Dirac Delta Function
- Solution of First and Higher Order Initial Value Problem using Laplace
Transform