Course Title	Course Code	Credit Hours
Numerical Methods	MATH-352	2-1

Textbooks:

- R. L. Burden, and J. D. Faires, “Numerical Analysis”, InternationalThomson Publishing
- Erwin Kreyszig, “Advanced Engineering Mathematics”, John Wiley & Sons

Reference Books/Materials:

- Steven, C. Chapra, and Raymond P. Canale, “Numerical Methods for Engineers”, McGraw Hill
- D. G. Zill, and W. S. Wright, “Advanced Engineering Mathematics”, Jones & Bartlett Learning
- Ron Larson, and David C. Falvo, “Elementary Linear Algebra”, Brooks/Cole
- EASA Part-66 Category B1 Maintenance License Module 1, “Mathematics”

Course Objective:

This course aims to help students to learn use of numerical analysis, algorithms and computational methods to solve mathematical problems, approximate solutions to equations, and analyze complex systems where exact analytical solutions are challenging or impractical to obtain.

Course Outline:

- Mathematical Preliminaries: Round-off Error and Computer Arithmetic
- Iterative Methods for the Solutions of Non-Linear Equations (Convergence Analysis):
    - Bisection Method, Fixed-Point Method
    - Newton-Raphson Method, Secant Method, Regula - Falsi Method.
- Interpolation:
    - Introduction, Lagrange Interpolation, Newton’s Divided Difference Interpolation
    - Forward Difference and Backward Difference Interpolations
    - Introduction to Cubic Spline Interpolation

    - Clamped Cubic Spline Interpolation and Natural Spline Interpolation.
- Numerical Differentiation
- Numerical Integration: Elements of Numerical Integration, Rectangular, Trapezoidal, Simpson's Rule and Implementation of Numerical Algorithms on MATLAB.
- Numerical Methods in Linear Algebra:
    - LU Factorization, Doolittle's, Croute's and Cholesky's Methods
    - Iterative Methods for Systems of Equations, Jacobi's Method, Gauss-Seidel Method
    - Evaluation of Eigenvalues by Iteration: Power Method.
- Solution of 1^{st} and 2^{nd} Order Ordinary Differential Equations
- Introduction to Euler Method, Heun's Method, Runge-Kutta Methods
- Solution of Higher Order IVPs
- Solution of Elliptic Partial Differential Equations
- Solution of Parabolic PDEs: Crank-Nicolson Method,