

**B.Tech II Year II Semester****NUMERICAL TECHNIQUES AND FOURIER TRANSFORMS (NTFT)****Course Code: 21MA301BS****L/T/P/C 3/0/0/3****Course Objectives:**

- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data.
- This topic deals with methods to find roots of an equation and solving a differential equation.
- The numerical methods are important because finding an analytical procedure to solve an equation may not be always available.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required.
- Indeed, any periodic and non-periodic function can be best analyzed in one way by Fourier series and transforms methods.

**Course Outcomes:**

- After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation.
- Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- Helps in phase transformation, Phase change and attenuation of coefficients in acoustics.

**UNIT– I:**

**Solution of Algebraic and Transcendental Equations and Linear system of equations:** Introduction– Graphical interpretation of solution of equations

The Bisection Method–The Method of False Position–The Iteration Method–Newton-Raphson Method.

Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method) Jacobi's and Gauss-Seidel Iteration method

**UNIT– II:****Numerical Differentiation, Integration:**

Numerical differentiation:

Numerical integration - Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8$  Rule Generalized Quadrature.

**UNIT-III****Numerical solutions of First order differential equations:**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method –Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods Predictor –corrector methods (Milne's Method and Adams-Bashforth method only).

**UNIT-IV****Fourier series**

Definition of periodic function. Fourier expansion of periodic functions in a given interval of length  $2\pi$   
 Determination of Fourier coefficients–Fourier series of even and odd functions–Fourier series in arbitrary interval–even and odd periodic continuation–Half-range Fourier sine and cosine expansions.

**UNIT-V****Fourier Transforms:**

Fourier integral theorem–Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms–Finite Fourier transforms.

**TEXT BOOKS:**

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

**REFERENCE BOOKS:**

1. Mathematical Methods by T.K.V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematical Methods by G. Shankar Rao, I.K. International Publications, N. Delhi
4. Advanced Engineering Mathematics, Michael Green Second Edition. Pearson Education.