

# B.TECH SEM-V



## OPTIONAL SUBJECT ENGINEERING MATHEMATICS-IV

### TEACHING SCHEME:

Theory: 04 Hours / Week

### CREDITS ALLOTTED:

Theory : 04 Credits

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### Course Pre-requisites:

The Students should have knowledge of

1. Determinants
2. Matrices
3. Differentiation
4. Integration of functions
5. Differential equation

### Course Objectives:

The course aims at making the students familiar about the most basic numerical methods and

concepts like error estimation helpful in various fields of engineering and can be used to simulate the results of various numerical methods.

### Course Outcomes:

The student should be able to

1. derive appropriate numerical methods to solve algebraic and transcendental equations
2. evaluate the accuracy of common numerical methods.
3. develop appropriate numerical methods to solve a difference equation.
4. be familiar with numerical interpolation and approximation of functions, numerical integration and differentiation.
5. be familiar with numerical solution of ordinary differential equations.
6. To compute Numerical Solution of Partial Differential Equations.

## UNIT - I

### **Numerical solutions of algebraic and transcendental equations (08 Hours)**

Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method.

## UNIT - II

### **Solution of system of linear algebraic equation (08 Hours)**

Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel and Gauss Jacobi's iterative method.

## UNIT - III

### **Difference equation and Solution of difference equations (08 Hours)**

Definition of difference equations, formation of difference equation. Solution of Homogeneous and non-homogeneous difference equation with constant and variable coefficients using Boole's operator method and generating functions. Simultaneous difference equation.

## UNIT - IV

### **Interpolation and Numerical differentiation and integration (08 Hours)**

Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences. Curve fitting: Method of least squares. Straight line, Second degree, parabola, Exponential curve.

Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule.

## UNIT - V

### **Numerical solution of first order ordinary**

#### **differential equation**

**(08 Hours)**

Solution by Euler's method, Euler' Modified method, Taylor's series, Runge-kutta method, Milne's Predictors and Correctors method.

## UNIT - VI

### **Numerical Solution of Partial Differential Equations (08 Hours)**

Classification of second order partial differential equations, Solution of Laplace's, Poisson's, heat and wave equations by finite difference methods, Use of method of characteristics for solution of initial and boundary value problems.

### **Assignments:**

- 1) Numerical Problems on algebraic and transcendental equations.
- 2) Numerical problems on system of linear algebraic equations.
- 3) Numerical Problems on difference equations using Boole's operator method.
- 4) Numerical Problems on simultaneous difference equation.
- 5) Numerical Problems on Curve fitting.
- 6) Numerical Problems on numerical integration.
- 7) Problems on numerical solution of first order ordinary differential equation.
- 8) Problems on numerical solution Partial Differential Equations.
- 9) Collect and solve question number 3 and 4 from recent three question paper of BVU.
- 10) Collect and solve question number 5 and 6 from recent three question paper of BVU.

These are minimum assignments recommended by the University and the faculty has choice to design and add few more assignments.

### **Text Books:**

1. Gupta P.P.& Malik G.S., Calculus of Finite Differences and Numerical Analysis, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
2. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 12/e, 2006.

### **Reference Books:**

1. Francis J. Scheid, Schaum's Outline of Numerical Analysis, McGraw-Hill, New York, 1989.
2. S. S. Sastry, Engineering Mathematics, Vol I, II Prentice Hall Publication, 3/e, 2004.
3. C.Ray Wylie & Louis C. Barretle, Advanced Engineering Mathematics, Tata McGraw Hill Publishing Co Ltd., 6/e, 2003.

### **Syllabus for Unit Test:**

Unit Test -1      UNIT – I,II,III

Unit Test -2      UNIT – IV,V,VI