**B.Sc. THIRD YEAR MATHEMATICS SYLLABUS**

**SEMESTER – VI, PAPER – VII-(B)**

**ELECTIVE–VII-(B); NUMERICAL ANALYSIS**

***UNIT- I:* Errors in Numerical computations :**

 Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

***UNIT – II:* Solution of Algebraic and Transcendental Equations**:

The bisection method, The iteration method, The method of false position, Newton Raphson method, Generalized Newton Raphson method. Muller’s Method

***UNIT – III: Interpolation - I***

**Interpolation :** Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of Differences Tables, Differences of a polynomial

***UNIT – IV: Interpolation - II***

Newton’s formulae for interpolation. Central Difference Interpolation Formulae, Gauss’s central difference formulae, Stirling’s central difference formula, Bessel’s Formula, Everett’s Formula.

***UNIT – V : Interpolation - III***

Interpolation with unevenly spaced points, Lagrange’s formula, Error in Lagrange’s formula, Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences Relation between divided differences and central differences, Newton’s general interpolation Formula, Inverse interpolation.

**Outcomes:**

* They can able to Analyse Data such as population increase or decrease in few methods i.e, Newton’s Divided Difference Formula, Central Differences Formula, Bessel’s Formula, Bisecting Methods etc.,
* They will have a complete knowledge about how to Analyse given data by using Scientific Calculator.
* They go through an important topic called as Interpolation.

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**SEMESTER – VI: PAPER – VIII-B-1**

**CLUSTER ELECTIVE – VIII-B-1: ADVANCED NUMERICAL ANALYSIS**

***Unit – I :* Curve Fitting:**

 Least – Squares curve fitting procedures, fitting a straight line, nonlinear curve fitting, Curve fitting by a sum of exponentials.

***UNIT- II :*Numerical Differentiation:**

 Derivatives using Newton’s forward difference formula, Newton’s backward difference formula, Derivatives using central difference formula, stirling’s interpolation formula, Newton’s divided difference formula, Maximum and minimum values of a tabulated function.

***UNIT- III :*  Numerical Integration:**

 General quadrature formula on errors, Trapozoidal rule, Simpson’s 1/3 – rule, Simpson’s 3/8 – rule, and Weddle’s rules, Euler – Maclaurin3 Formula of summation and quadrature, The Euler transformation.

***UNIT – IV:* Solutions of simultaneous Linear Systems of Equations:**

Solution of linear systems – Direct methods, Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method ,Method of factorization, Solution of Tridiagonal Systems,. Iterative methods. Jacobi’s method, Gauss-siedal method.

***UNIT – V :*Numerical solution of ordinary differential equations:**

 Introduction, Solution by Taylor’s Series, Picard’s method of successive approximations, Euler’s method, Modified Euler’s method, Runge – Kutta methods.

**Outcomes:**

* Students are able to find the solutions of the Linear system of equations.
* They can analyse Data by using Curve Fitting Method, Simpson’s 3/8th Rule, Guass Jordan Method.
* They can find out the maximum and minimum values of a tabulated function.

**B.Sc. THIRD YEAR MATHEMATICS SYLLABUS**

**SEMESTER – VI: PAPER – VIII—B-2**

**CLUSTER ELECTIVE – VIII-B-2: SPECIAL FUNCTIONS**

***Unit – I :(HERMITE POLYNOMIAL)***

Hermite Differential Equations, Solutions of Hermitic Equation, Hermite’s polynomials, Generating function, Other forms of Hermite Polynomial, To find first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.

***Unit – II :(LAGUERRE POLYNOMIALS-I):***

***Laguerre’s*** differential equation, Solution of Laguerre’s equation, Laguerre polynomials, Generating function, other forms for Laguerre Polynomials, To find first few Laguerre Polynomials, Orthogonal property of the Laguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation.

 ***Unit – III:(LEGENDER’S EQUATION)***

Definition, Solution of Legender’s Equation, Definition of Pn(x) and Qn(x), General solution of Legender’s Equation (derivations not required) To show that Pn(x) is the coefficient of h^n in the expansion of (1-2xh+h^2)^-1/2, Orthogonal properties of Legender’s Equation, Recurrence formula, Rodrigues formula ,

***Unit – IV:(BESSEL’S EQUATION):***

Definition, Solution of Bessel’s General Differential Equations, General solution of Bessel’s Equation, Integration of Bessel’s equation in series for n=0, Definition of Jn(x), Recurrence formulae for Jn(x), Generating function for Jn(x).

***Unit – V:(BETA And GAMMA FUNCTIONS):***

Euler’s Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions, Another form of Beta Function, Relation between Beta and Gamma Functions, Other Transformation.

**Outcomes:**

* In this paper, students will go through the new topics.
* They learn about the Laguerre’s differential equation, Laguerre’s polynomial, Legender’s equation, Bessel’s Equation.

Also Beta and Gamma Functions, their elememtary properties, relation between them,and other transformations are known to the