A.P. State Council of Higher Education Semester-wise Revised Syllabus under CBCS, 2020-21

Course Code:

Four-year B.A. /B.Sc. (Hons) Domain Subject: MATHEMATICS IV Year B.A./B.Sc.(Hons)– Semester – V

Max Marks: 100

(15h)

Course-6A: Numerical Methods

(Skill Enhancement Course (Elective), 5 credits)

1. Learning Outcomes:

Students after successful completion of the course will be able to

- 1. understand the subject of various numerical methods that are used to obtain approximate solutions
- 2. Understand various finite difference concepts and interpolation methods.
- 3. Work out numerical differentiation and integration whenever and wherever routine methods are not applicable.
- 4. Find numerical solutions of ordinary differential equations by using various numerical methods.
- 5. Analyze and evaluate the accuracy of numerical methods.
- II. Syllabus : (Hours: Teaching: 75 (incl. unit tests etc. 05), Training: 15)

Unit – 1: Finite Differences and Interpolation with Equal intervals (15h)

- 1. Introduction, Forward differences, Backward differences, Central Differences, Symbolic relations, nth Differences of Some functions,
- 2. Advancing Difference formula, Differences of Factorial Polynomial, Summation of Series.
- 3. Newton's formulae for interpolation. Central Difference Interpolation Formulae.

Unit – 2: Interpolation with Equal and Unequal intervals

- 1. Gauss's Forward interpolation formulae, Gauss's backward interpolation formulae, Stirling's formula, Bessel's formula.
- 2. Interpolation with unevenly spaced points, divided differences and properties, Newton's divided differences formula.
- 3. Lagrange's interpolation formula, Lagrange's Inverse interpolation formula.

Unit – 3: Numerical Differentiation (15h)

- 1. Derivatives using Newton's forward difference formula, Newton's back ward difference formula,
- 2. Derivatives using central difference formula, Stirling's interpolation formula,
- 3. Newton's divided difference formula, Maximum and minimum values of a tabulated function.

Unit – 4: Numerical Integration (15h)

- 1. General quadrature formula one errors, Trapezoidal rule,
- 2. Simpson's 1/3- rule, Simpson's 3/8 rule, and Weddle's rules,
- 3. Euler McLaurin Formula of summation and quadrature, The Euler transformation.

Unit – 5: Numerical solution of ordinary differential equations (15h)

- 1. Introduction, Solution by Taylor's Series,
- 2. Picard's method of successive approximations,
- 3. Euler's method, Modified Euler's method, Runge Kutta methods.

III. References:

- 1. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi-110001, 2006.
- 2. P.Kandasamy, K.Thilagavathy, Calculus of Finite Differences and Numerical Analysis.

S. Chand & Company, Pvt. Ltd., Ram Nagar, New Delhi-110055.

- 3. R.Gupta, Numerical Analysis, Laxmi Publications (P) Ltd., New Delhi.
- 4. H.C Saxena, Finite Differences and Numerical Analysis, S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.
- 5. S.Ranganatham, Dr.M.V.S.S.N.Prasad, Dr.V.Ramesh Babu, Numerical Analysis,

S. Chand & Company Pvt. Ltd., Ram Nagar, New Delhi-110055.

6. Web resources suggested by the teacher and college librarian including reading material.