

UNIVERSITY OF MADRAS
B.Sc. DEGREE COURSE IN PHYSICS
SYLLABUS WITH EFFECT FROM 2020-2021

BPS-DSE1A

ELECTIVE-I(A): NUMERICAL METHODS

Lecture: 60 Hours

Tutorial: 15 Hours

Credits:4

Course Objectives:

To study the computational techniques involved in different mathematical manipulation.

Learning Outcomes:

On completion of the course the students will be able to

- Solve simultaneous equations using method of triangularisation
- Find the inverse of a matrix using Gauss Jordan Method
- Solve Algebraic, Transcendental and Differential Equation using different methods
- To fit a curve for the given data using principles of least squares
- Integrate the functions using different rules like Simpsons 1/3 rule

UNIT I: SIMULTANEOUS LINEAR ALGEBRAIC EQUATIONS (12 Hours)

Method of Triangularisation - Gauss elimination method - Inverse of a matrix - Gauss- Jordan method

UNIT II : NUMERICAL SOLUTION OF ALGEBRAIC, TRANSCENDENTAL AND DIFFERENTIAL EQUATION (12 Hours)

Bisection method – Regula falsi method - Newton - Raphson method - - Horner's method - Solution of ordinary differential equation - Euler's method.

UNIT III : INTERPOLATION (12 Hours)

Finite differences – Operators Δ , ∇ , D – Relation between operators –Linear interpolation – Interpolation with equal intervals – Newton forward interpolation formula –Newton backward interpolation formula.

UNIT IV: CURVE FITTING (12 Hours)

Principles of least squares - fitting a straight line - linear regression - fitting an exponential curve.

UNIT V: NUMERICAL INTEGRATION (12 Hours)

Trapezoidal Rule - Simpson's 1/3 rule and 3/8 rule - Applications - Weddle's rule

Books for Study:

1. Numerical methods, M.K.Venkatraman, National Publishing Company, (1990).
2. Numerical methods, V. Rajaraman, Prentice - Hall India Pvt. Ltd., (2003).
3. Numerical methods, P. Kandasamy, K. Thilagavathy and K. Gunavathy, S. Chand & Co. (2002).

Books for References:

1. Numerical methods for Scientific and Engineering computation , Jain Iyenger and Jain, New Age International (P) Ltd.,(2004).
2. Numerical methods,S.S.Sastry, Prentice Hall of India Pvt. Ltd., NewDelhi(2003).

Web Site

1. <http://www.sst.ph.ic.ac.uk/angur/lectures/compphys/compphys.html>.