

CURRICULAM PLAN OF Ms. VARSHA

FOR ODD SEMESTER 2023-24

B.Sc (H) DSE -2nd YEAR

PAPER-Numerical Analysis (1 PERIODS/WEEK)

LEARNING OBJECTIVES

The main objective of this course is to introduce the students to the field of numerical analysis enabling them to solve a wide range of physics problems. The skills developed during the course will prepare them not only for doing fundamental and applied research but also for a wide variety of careers.

LEARNING OUTCOMES

After completing this course, student will be able to,

- Analyze a physics problem, establish the mathematical model and determine the appropriate numerical techniques to solve it.
- Derive numerical methods for various mathematical tasks such as solution of non-linear algebraic and transcendental equations, system of linear equations, interpolation, least square fitting, numerical differentiation, numerical integration, eigen value problems and solution of initial value and boundary value problems.
- Analyse and evaluate the accuracy of the numerical methods learned.
- In the laboratory course, the students will learn to implement these numerical methods in Python/C++/Scilab and develop codes to solve various physics problems and analyze the results.

CONTENTS	ALLOCATION OF LECTURES	MONTH WISE SCHEDULE FOLLOWED	TUTORIAL/ASSIGNMENT/PRESENTATION ETC
Unit – IV Numerical Integration: Newton Cotes quadrature methods. Derivation of Trapezoidal and Simpson (1/3 and 3/8) rules from Lagrange interpolating polynomial.	5 Lectures	18 th August- 30 th August 1 st September – 30 th September	Syllabus Overview Reference books Building concepts Problem solving Derivations and Numericals

Error and degree of precision of a quadrature formula. Composite formulae for Trapezoidal and Simpson methods. Gauss Quadrature methods.			
Legendre, Laguerre and Hermite quadrature methods.	2 Lectures	1 st week of October- 2 nd week of October	Related Problems and assignments Student's difficulties
Unit – V Initial and Boundary Value Problems: Solution of initial value problems by Euler, modified Euler and Runge Kutta (RK) methods. Local and global errors,	6 Lectures	3 rd – 4 th week of October 1 st November – 30 th November	Derivations and Numericals Class test on unit end Discussion of Important questions Home Register Checking Class Test Revision Session Assignment given for IA Home exam paper discussion
comparison of errors in the Euler and RK methods.	1 Lecture	1 st week of December	Discussion of last year papers and clarification of doubts Revision of Syllabus Home register Checking

References:

Essential Readings:

- 1) Applied numerical analysis, Cutis F. Gerald and P. O. Wheatley, Pearson Education, India (2007).
- 2) Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
- 3) Introduction to Numerical Analysis, S. S. Sastry, 5th Edn., 2012, PHI Learning Pvt. Ltd.

4) Elementary Numerical analysis, K. E. Atkinson, 3rd Edn., 2007, Wiley India Edition.

Additional Readings:

1) Numerical Recipes: The art of scientific computing, William H. Press, Saul A. Teukolsky and William Vetterling, Cambridge University Press; 3rd edition (2007), ISBN-13 : 978- 0521880688 .

2) Applied numerical analysis, Curtis F. Gerald and P. O. Wheatley, Pearson Education, India (2007).

3) Numerical methods for scientific and engineering computation, M. K. Jain, S. R. K. Iyenger, New age Publishers (2012).