FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION

Program : Bachelor in Science *(Degree/Honors)*	Semester - VI	Session: 2024-2025

1	**Course Code**	**PHSE-04 T**		
2	**Course Title**	**Numerical Methods and C Programming**		
3	**Course Type**	**Discipline Specific Elective**		
4	**Pre-requisite(if,any)**	***As per Program***		
5	**Course Learning. Outcomes(CLO)**	At the end of this course, the students will be able to: ➢ Analyse the convergence of solutions to numerical methods.Understand the principles of Gaussian elimination, pivoting, and iterative methods to solve linear systems ➢ Use interpolation methods, Perform numerical differentiation and integration using Newton-Cotes formulae ➢ Explain the roles of compilers, interpreters, and operating systems, Learn the basics of C programming		
6	**Credit Value**	**3 Credits**	***Credit = 15 Hours -learning & Observation***	
7	**Total Marks**	**Max. Marks : 100**		**Min Passing Marks:40**

PART -B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	Methods for determination of zeroes of linear and nonlinear algebraic equations and transcendental equations, convergence of solutions. Solution of simultaneous linear equations, Gaussian elimination, pivoting, iterative method, matrix inversion, Finite differences, interpolation with equally spaced and unevenly spaced points, curve fitting, polynomial least squares and cubic spline fitting. Numerical differentiation and integration, Newton-Cotes formulae, error estimates, Gauss method.	**13**
II	Numerical solution of ordinary differential equations, Euler and Runga-Kutta methods, Solution of related problems, Predictor-corrector method, Solution of related problems, Elementary ideas of solutions of partial differential equations	**10**
III	Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing. Character set, constants, (numeric string) variables (numeric string) rules for arithmetic expressions and hierarchy of operators, rational expressions, logical expressions, and operators, library functions. Identifiers, qualifiers, define statements, value Initialized variables, operators, and expressions. Operator precedence and associativity. scanf with specifier, search set arrangements and suppression Character, format specifier for scanf. Control structure, if statement, if else statement, multiway decision, compound statement.	**10**
IV	Loops: for loop, while loop, do while loop, break statement, compound statement continue statement, go to statement, Function - function main, function accepting more than one parameter, user defined and library function concept associatively with functions, function parameter, return value, recursion comparison. Arrays, strings, multidimensional array, array of strings function in string	**12**

Keywords	Transcendental equations, Ordinary differential equations, Numerical integration, Numerical differentiation, Flow charts, C - Statement.

Signature of Convener & Members (CBoS):

10/6/24

PART–C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Numerical Methods for Scientists and Engineers by R. W. Hamming
2. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale
3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, and R. K. Jain
4. Programming in ANSI C by E. Balagurusamy
5. Let Us C" by Yashavant Kanetkar
6. Numerical Methods and Programming by P. B. Patil and U. P. Verma
7. Numerical Methods with Programs in C by T. Veerarajan and T. Ramachandran
8. Numerical Methods by B S Grewal

Reference Books Recommended –

1. Sastry: Introductory Methods of Numerical Analysis
2. Rajaraman: Numerical Analysis
3. Numerical Methods by Dr. P. Kandasamy, Dr. K Thilagavathy, Dr. K. Gunvanthi
4. Fundamentals of Numerical Methods by Rajeev K Bansal

Online Resources–

e-Resources / e-books and e-learning portals

1. Numerical methods https://archive.nptel.ac.in/courses/111/107/111107105/
2. Numerical analysis https://archive.nptel.ac.in/courses/111/101/111101165/
3. Numerical Methods for Engineers https://archive.nptel.ac.in/courses/127/106/127106019/
4. Introduction to Numerical Methods https://nptel.ac.in/courses/105105043

PART-D:ASSESSMENT ANDEVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks: **100 Marks**

Continuous Internal Assessment (CIA): **30 Marks**

End Semester Exam (ESE): **70 Marks**

Continuous Internal Assessment (CIA): **(By Course Teacher)**	Internal Test / Quiz-(2): Assignment/Seminar- Total Marks -	**20 +20** **10** **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	**Two section – A & B** Section A: **Q1**. Objective – **10 x1= 10** Mark; **Q2**. Short answer type- **5x4 = 20 Marks** Section B: Descriptive answer type qts.,**1out of 2** from each unit- **4 x 10=40 Marks**		

Name and Signature of Convener & Members of CBoS:

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PART-A: INTRODUCTION				
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2	**Course Title**	**Numerical Methods and C Programming**		
3	**Course Type**	**Discipline Specific Elective**		
4	**Pre-requisite** (if, any)	**As per Program**		
5	**Course Learning. Outcomes(CLO)**	At the end of this course, the students will be able to: ➢ Get experimental Knowledge of computational methods in physics ➢ Learn C language ➢ Use C programming to solve various equations ➢ Perform Interpolation and curve fittings through various tools.		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks:50**		**Min Passing Marks:20**

PART -B: CONTENT OF THE COURSE		
Total No. of learning-Training/performance Periods- 30 Periods (30 Hours)		
Module	**Topics (Course Contents)** **At least 10 of the following or related Experiments**	**No. of Period**
Lab./ Experiment Contents of Course	Any 8 program from the list given below or similar program. 1. To solve Simultaneous Linear equation by Gauss Elimination Method 2. To calculate the root of Transcendental equation by Newton-Raphsons Method 3. Solving the system of Linear simultaneous equation by Gauss-Serdel Method 4. Numerical Integration by Simposon's 1/3 rule 5. Solving simultaneous Linear equation by Gauss-Jordan method 6. Solution of differential equation by Euler's Method 7. To invert a given Matrix by Gauss-Jordan Method 8. Solution of differential equation by Runge-Kutte Method 9. To fit the given data in straight line by Linear Regression Method (a) Write a program to find the largest of n number of series. (b) To calculate the standard deviation of a given set of data 10. To write a program to compute the complex roots of a given polynomial of Nth degree by Graffe's method 11. To write a program to compute the Eigen Values a given Matrix 12. To integrate a given function by (a) Trapezoidal method or by (b) Gauss quadrature 13. To find solutions of first order, ordinary differential equation by Taylor method	**30**
Keywords	Gauss Elimination, Newton-Raphson, Numerical Integration, Euler's Method, Runge-Kutta, Linear Regression, Eigenvalues, Differential Equations	

Signature of Convener & Members (CBoS):

PART–C: LEARNING RESOURCES

Text Books, Reference Books and Others

Text Books Recommended –

1. Introductory Methods of Numerical Analysis: Sastry:
2. Numerical Analysis : Rajaraman
3. Numerical methods : Antia
4. Numerical Methods by Dr. P. Kandasamy, Dr. K Thilagavathy, Dr. K. Gunvanthi
5. Fundamentals of Numerical Methods by Rajeev K Bansal
6. Numerical Methods in Engineering & Science: with Programs in C, C++, and MATLAB by B S Grewal
7. Raja Raman: FORTRAN programming

Reference Books Recommended –

1. Numerical Methods: Problems and Solutions by M.K. Jain, S. R. K. Iyengar, and R. K. Jain
2. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, and R. K. Jain
3. Numerical Methods: Principles, Analysis, and Algorithms by A. Singaravelu
4. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale

Online Resources–

e-Resources / e-books and e-learning portals

1. Numerical methods https://archive.nptel.ac.in/courses/111/107/111107105/
2. Numerical analysis https://archive.nptel.ac.in/courses/111/101/111101165/
3. Numerical Methods for Engineers https://archive.nptel.ac.in/courses/127/106/127106019/
4. Introduction to Numerical Methods https://nptel.ac.in/courses/105105043

PART-D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	**50 Marks**
Continuous Internal Assessment (CIA):	**15 Marks**
End Semester Exam (ESE):	**35 Marks**

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	**10 & 10**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **15** Marks
	Assignment/Seminar +Attendance-	**05**	
	Total Marks -	**15**	
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools& technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**		**Managed by Course teacher as per lab. status**

Name and Signature of Convener &Members of CBoS:

10/6/17