Name of School/ Department: School of Computer Sciences and information Technology	
Name of Program: B.Sc. CS	**Branch/ Specialization: B.Sc. CS**

COURSE PLAN

Name of Course	Course Code	Semester	Credits	Contact Hours	L	+	T	+	P	=	Total
Numerical Methods	BCS-208	4th	3	40	3	+	0	+	0	=	3
		Name of the Faculty Member			Designation				Employee ID		
		Priyavada			Assistant Professor				2715		
Academic Year		Email ID			Mobile Number: 7678661451						
2023-2024		priyavada@lingayasvidyapeeth.edu.in									

Prerequisite Course: Vector operation and system of linear equations

Teacher Centric Approach

TC1: Chalk and Talk, TC2: PPT, TC3: Video Lectures TC4: Blended learning

Learner Centric Approach:

LC1: Assignment. LC2: Mini project. LC3: Quiz/Class test. LC 4: Seminar on recent trends.

LC5: Group Task. LC6: Others

Name of School/ Department: School of computer sciences and information Technology	
Name of Program: B.Sc. CS	**Branch/ Specialization: BCA**

VISION:

Department of Mathematics committed to promote interdisciplinary Mathematical Science and research for attracting young talented students to contribute effectively in augmenting the national pool of human resource who are responsible citizens, sincere professional service and have deep respect for life.

MISSION:

1. To provide excellent knowledge of Mathematical sciences for suitable career and groom them for National recognition
2. To train the students for interdisciplinary applications and research.
3. To prepare our undergraduate and postgraduate students to understand the mathematical model to apply in other disciplinary approach.
4. To explore applications of mathematics and statistics and engage in collaborative research in an interdisciplinary environment.

PROGRAM OUTCOMES:

PO1: Apply the technique of mathematics and its approach in the solution of different Mathematical Problem.
PO2: Identify, formulate, and analyze complex problems reaching substantiated conclusions using mathematical model and its solution approach.
PO3: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of numerical data to provide valid conclusions.
PO4: Students develop critical thinking skills to identify, analyze and solve problems of their core areas using modern tools.
PO5: Students develop lifelong learning skills with interdisciplinary approach towards sustainable development.
PO6: Ability to communicate effectively the comprehended scientific data and knowledge, write effective reports, design documentation and make effective presentations.
PO7: Apply ethical, moral and social values in personal and professional life leading to highly cultured and civilized society.
PO8: Ability to work effectively as an individual or as a member or Team leader in diverse teams and in multidisciplinary environment.

PROGRAM SPECIFIC OUTCOMES:

PSO01: Students acquire knowledge of traditional and modern techniques of solving algebraic, transcendental equations, system of linear differential and integral equations, which have applications in many disciplines.
PSO02: The students attain sound knowledge in the areas of Mechanics, Thermal Physics, Waves and oscillations, optics, electromagnetism, modern physics, solid-state physics for pursing higher education and research.

COURSE DESCRIPTION:

1) Derive appropriate numerical methods to solve algebraic and transcendental equations
2) Develop appropriate numerical methods to approximate a function

COURSE OUTCOMES:

SNO	DESCRIPTION	PO (1…8) MAPPING	PSO (1,2) MAPPING
CO1	Understand the concept of error and approximation	PO1	PSO1
CO2	Students will learn about the solution of simultaneous linear equation	PO3	PSO1
CO3	Students will understand interpolation and curve fitting	PO5	PSO2
CO4	Students will learn numerical differentiation and integration	PO7,	PSO2
CO5	Define the concept of numerical solution of ODE and PDE	PO2	PSO2
COURSE OVERALL PO/PSO MAPPING:			

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH: 3; MEDIUM: 2; LOW: 1**):**

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2
CO1	3	3	3	2	2	1	1	1	1	-
CO2	2	3	2	1	1	1	2	2	1	-
CO3	2	1	1		1	1	1	1	1	-
CO4	2	2	1	1	1	2	2	1	-	-
CO5	2	1	1	2	1	1	1	1	1	

SYLLABUS:

UNIT	DETAILS	Contact Hours
1	**ERRORS AND APPROXIMATIONS, SOLUTION OF NON LINEAR EQUATIONS:** Introduction to numbers and their accuracy; absolute, relative and percentage errors. Bisection method; Regular falsi method; secant method; fixed point iteration method; Newton- Raphson method; convergence criteria of methods	08
2	**SOLUTION OF SIMULTANEOUS LINEAR EQUATIONS:** Gauss elimination method; Gauss-Jordan method; UV factorization method; Jacobi's iteration method; Gauss- Seidal iteration method	08
3	**INTERPOLATION AND CURVE FITTING:** Introduction to interpolation; Newton's forward and backward interpolation formulae; Gauss's forward and backward interpolation formulae; Stirling formula; Lagrange interpolation; Newton's divided difference formula; Principle of least squares; curve fitting	08
4	**NUMERICAL DIFFERENTIATION AND INTEGRATION**:Numerical differentiation formulae: differentiation by using forward interpolation formula; backward interpolation formula; Stirlling formula; Newton-Cotes formula for numerical integration:	08

	Trapezoidal rule; Simpson's rules; Boole's rule and Weddle's rule; Romberg' method	
5	**NUMERICAL SOLUTION OF ORDINARY AND PARTIAL DIFFERENTIAL EQUATION:** Taylor series method; Euler method; Euler modified method; Runge kutta method; Milne's predictor -corrector method; Adams-Bash forth method for finding solution of differential equation	08
	Total Contact Hours	**40**

COURSE COMPLETION PLAN

Total Class room sessions	**40**
Total Quizzes	**3**
Total Test	**4**
Total Assignment	**2**

One Session = 50 Minutes

EVALUATION & GRADING

- Students will be evaluated based on the following stages.
- Internal Assessment = 40%
- End Semester Examination = 60%

INTERNAL ASSESSMENT: Internal Assessment shall be done based on the following:

Sl. No.	Description	% of Weightage out of 40 marks
1	Class Tests and Quizzes	

2	Assignments (Problems/Presentations)	15%
3	Mid Sessional tests	25%
4	Attendance and conduct in the class	60%

DETAILED SESSION PLAN

Lecture session/ Number	Topics to be covered	Teacher Centric Approach	Learner Centric Approach	T1/R1	Relevance with POs and PSOs
1	Numbers and accuracy	TC1, TC2	LC1, LC3.	T1/R1	PO1
2	Absolute error	TC1	LC1, LC3.	T1/R1	PO4
3	Relative error	TC1, TC2	LC1, LC3.	T1/R1	PO1,PSO1
4	Percentage error	TC1	LC1, LC3.	T1/R1	PO4,PSO2
5	Bisection method	TC1, TC2	LC1, LC3.	T1/R1	PO2, PSO2
6	Regular falsi method	TC1, TC2	LC1, LC3.	T1/R1	PO4
7	Secant method	TC1	LC1, LC3.	T1/R1	PO1,PSO1
8	Fixed point iteration	TC1, TC2	LC1, LC3.	T1/R1	PO2,PSO2
9	Newton Raphson method	TC1	LC1, LC3.	T1/R1/W1	PO4,PSO1
10	Convergence criteria	TC1, TC2	LC1, LC3.	T1/R1	PO1,PSO1
11	Gauss elimination method	TC1	LC1, LC3.	T1/R1	PO1

12	Gauss Jordan method	TC1	LC1, LC3.	T1/R1	PO4,PSO2
13	UV factorization method	TC1	LC1, LC3.	T1/R1	PO3
14	Jacobi iteration method	TC1	LC1, LC3.	T2/R2	PO2,PSO2
15	Gauss seidal iteration method	TC1, TC2	LC1, LC3.	T1/R1	PO2,PSO1
16	Interpolation	TC1	LC1, LC3.	T1/R1	PO1,PSO1
17	Newton forward interpolation	TC1	LC1, LC3.	T2/R1/W2	PO3,PSO2
18	Newton backward interpolation	TC1	LC1, LC3.	T1/R1	PO1
19	Gauss forward interpolation	TC1	LC1, LC3.	T1/R1	PO4,PSO1
20	Gauss backward interpolation	TC1	LC1, LC3.	T1/R1	PO3
21	Stirling formula	TC1	LC1, LC3.	T2/R2	PO3,PSO1
22	Lagrange interpolation	TC1	LC1, LC3.	T1/R1	PO2
23	Newton divided difference	TC1, TC2	LC1, LC3.	T1/R1	PO4,PSO1
24	Principle of least square	TC1	LC1, LC3.	T1/R1	PO2,PSO1
25	Curve fitting	TC1	LC1, LC3.	T1/R1/W1	PO3,PSO1
26	Numerical differentiation	TC1, TC2	LC1, LC3.	T1/R2/W2	PO1
27	Differentiation by forward interpolation	TC1	LC1, LC3.	T1/R1	PO4,PSO3
28	Differentiation by backward	TC1, TC2	LC1, LC3.	T1/R1	PO1,PSO1

29	Newton cotes formula	TC1	LC1, LC3.	T2/R1/W3	PO2
30	Numerical integration	TC1	LC1, LC3.	T1/R1	PO1
31	Trapezoidal rule	TC1	LC1, LC3.	T1/R1	PO4,PSO2
32	Simpson rule	TC1	LC1, LC3.	T1/R1	PO1
33	Boole's rule	TC1	LC1, LC3.	T3/R1/W2	PO4,PSO1
34	Weddle rule	TC1	LC1, LC3.	T1/R1	PO3,PSO1
35	Romberg method	TC1, TC2	LC1, LC3.	T1/R1	PO2
36	Taylor series method	TC1	LC1, LC3.	T1/R1	PO4,PSO1
37	Euler method	TC1, TC2	LC1, LC3.	T1/R1	PO3
38	RK method	TC1	LC1, LC3.	T1/R1	PO4,PSO1
39	Modified Euler method	TC1	LC1, LC3.	T1/R1/W3	PO1
40	P-C methods	TC1, TC2	LC1, LC3.	T1/R1	PO2,PSO2

REFERENCES:

Text Book	T1	**Grewal, B. S., "Numerical methods in Engineering and Science**
Reference Book	**R1**	1) M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 6th Ed., New age International Publisher, India, 2007
	R2	Sastry, S.S.," " Introductory Methods of Numerical Analysis

	R3	**1)** Curtis F “Applied Numerical Analysis”.
Web based materials	**W1**	1) Brian Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.

Faculty: Mrs. Priyavada **HOD: Prof Ritu Arun Sindhu**