ARSD College, University of Delhi

Lesson Plan

Course Name : B.Sc. (P) Computer science						
Semester	**Course Code**	**Course Title**	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Credit (C)**
II	42357618	Numerical Methods	4			6
Teacher/Instructor(s)		Rajpal Rajbhar				
Session		2022-23				

Course Objective: The goal of this paper is to acquaint students for the study of certain algorithms that uses numerical approximation for the problems of mathematical analysis. Also, the use of Computer Algebra Systems (CAS) by which the intractable problems can be solved both numerically and analytically.

Course Learning Outcomes: After completion of this course, students will be able to find the consequences of finite precision and the inherent limits of numerical methods. Appropriate numerical methods to solve algebraic and transcendental equations. Solve first order initial value problems of ordinary differential equations numerically using Euler methods.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	Errors and Roots of Transcendental and Polynomial Equations	1-2	Floating point representation and computer arithmetic Significant digits
		3-4	Errors: Round off error, Local truncation error, Global truncation error
		5-8	Order of a method, Convergence and terminal conditions.
		9-10	Bisection method
		11-12	Secant method
		13-14	Regula−Falsi method
		15-16	Newton−Raphson method
2.	Algebraic Linear Systems and Interpolation	17-18	Gaussian elimination method (with row pivoting), Gauss−Jordan method;
		19-20	Iterative methods: Jacobi method, Gauss−Seidel

			method.
		21-24	Interpolation: Lagrange form, and Newton form
		25-28	Finite difference operators
		29-32	Gregory−Newton forward and backward difference interpolations
		33-34	Piecewise polynomial interpolation:
		35-36	Linear and quadratic.
3.	Numerical Differentiation, Integration and ODE	37-38	Numerical differentiation
		39-40	First and second order derivatives,
		41-44	Richardson extrapolation method
		45-46	Numerical integration: Trapezoidal rule
		47-48	Simpson's rule
		49-50	Ordinary differential equations
		51-52	Euler's method
		53-54	Modified Euler's methods
		55	Heun's method
		56	Midpoint method

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment • Quiz • Class Test • Attendance • Assignment		25
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	**Contents**	**Contact Hours**
1	Floating point representation and computer arithmetic, Significant digits; Errors: Roundoff error, Local truncation error, Global truncation error; Order of a method, Convergence and terminal conditions; Bisection method, Secant method, Regula−Falsi method, Newton−Raphson method	16
2	Gaussian elimination method (with row pivoting), Gauss−Jordan method; Iterative methods: Jacobi method, Gauss−Seidel method; Interpolation: Lagrange form, Newton form, Finite difference operators, Gregory−Newton forward and backward difference interpolations, Piecewise polynomial interpolation (Linear and quadratic).	20
3	Numerical differentiation: First and second order derivatives, Richardson extrapolation method; Numerical integration: Trapezoidal rule, Simpson's rule; Ordinary differential equation: Euler's method, Modified Euler's methods (Heun's and midpoint)	20

	Total	**56**

Suggested Books:

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1	Chapra, Steven C. (2018). Applied numerical Methods with MATLAB for Engineers and Scientists (4th ed.). McGraw-Hill Education.	2018
2	Fausett, Laurene V. (2009). Applied numerical Analysis Using MATLAB. Pearson. India.	2009
3	Jain, M. K., Iyengar, S. R. K., & Jain R. K. (2012) numerical Methods for Scientific and Engineering Computation (6th ed.). New Age International Publishers. Delhi.	2012
4	Bradie, Brian (2006). A Friendly Introduction to numerical Analysis. Pearson Education India. Dorling Kindersley (India) Pvt. Ltd. Third Impression, 2011	2011

Mode of Evaluation:	Internal Assessment / End Semester Exam

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