

NATIONAL INSTITUTE OF TECHNOLOGY, JAMSHEDPUR, JHARKHAND-831014

Department of Mathematics

Course Hand out for M. Sc, 2nd (EVEN/SPRING) Semester, 2019 Batch, Session: 2019-20

Course No.: MA3202 Credit: 4 Course Title.: Numerical Analysis

Instructor-in-charge: Dr. Hari Shankar Prasad Date: 06 -01-2020

Course Description

Unit : 1

Numerical solution of algebraic and transcendental equations (Root finding for nonlinear equations): Newton-Raphson method, Secant method, Fixed-Point iteration method, Regula-Falsi method and their convergence.

Unit : 2

Finite differences and Interpolating polynomials: Difference operators, Relation between operators, Forward, Backward and Central differences. Polynomial interpolation: Newton Forward and Backward difference interpolations. Interpolation with unequal intervals: Lagrange's interpolations, Newton Divided difference interpolation. Linear, Quadratic and Cubic spline interpolation.

Unit: 3

Numerical differentiation and Integration: Newton-Cotes quadrature formula, open and closed type-Trapezoidal rule, Simpson's rules and Weddle rules. Gaussian quadrature.

Unit: 4

System of linear and nonlinear algebraic equations: Gauss elimination method, Jacobi method, Gauss-Seidel method, Newton's method for system of nonlinear equations.

Unit: 5

Numerical methods for determining eigen-values and eigen-vectors. Power Method, Householder method, QR Algorithm.

Scope

- # To provide good fundamental concepts of numerical methods to solve scientific problems.
- # To make proficient in computer oriented numerical techniques.

Objective

- At the end of this course, the students will be able to understand the importance and effectiveness of computer oriented numerical methods.
- At the end of this course, the students will be able to apply the Numerical Techniques, effectively, in solving various kind of scientific problems.

Text Books

T1: Grewal, B.S. and Grewal, J.S., "Numerical Methods in Engineering and Science with Programs in Fortran C, C++, and Matlab, 11th Edition, Khanna Publishers, Delhi, 2017

Reference Books

R1: Jain, M.K., Iyengar, S.R.K. and Jain, R.K., "Numerical Methods for Scientific and Engineering Computation", 4th Edition, New Age International (P) limited, Publishers, New Delhi, 2003.

R2: Numerical Analysis: R. L. Burden and D. J. Faires, Brooks/Cole, Cengage Learning, Boston, 9th Edi. 2011.

Course Plan

Lecture No.	Learning objectives	Topics to be covered	Refer to Chap., See(Book) to be checked
1-7	Solution of algebraic and transcendental equations	Fixed-Point iteration method, Newton-Raphson method, Secant method, Regula-Falsi method and their convergence.	2(T1), 2(R1), 2(R2)
8-17	Finite differences and Interpolation polynomials	Difference operators and relation between operators, Forward, Backward and Central difference tables. Polynomial interpolation: Newton Forward and Backward difference interpolations. Interpolation with unequal intervals: Lagrange's interpolations, Newton Divided difference interpolation. Linear, Quadratic and cubic spline interpolation.	6-7(T1), 4(R1), 3(R2)
18-27	Numerical differentiation and Integration	Numerical differentiation, open and closed type-Newton-Cotes quadrature, Trapezoidal rule, Simpson's 1/3 rd and 3/8 th rules, and Weddle rules. Gaussian quadrature.	8(T1), 5(R1), 4(R2)
28-34	System of linear and nonlinear algebraic equations	Gauss elimination method, Jacobi method, Gauss-Seidel method, Newton's method for system of nonlinear equations.	3(T1), 2&3(R1), 6,7&10(R2)
35-43	Numerical methods for Eigen value problems.	Numerical methods for determining eigen-values and eigen-vectors. Power Method, Inverse Power Method, Householder method, QR Algorithm.	4(T1), 3(R1), 9(R2)

Evaluation Scheme

Sl. No.	Evaluation Component	Duration	Max. Marks	Date & Time	Nature of the Component
1	Mid Term	2 Hrs	30		Closed Book
3	End Term	3 Hrs	50		Closed Book
4	Assignment		5		Take Home

5	Attendance and Punctuality in class		5		
5	Class Test/Reports/Project/Seminar		10		Closed Book

Chamber consultation hour: Friday: 5-6 pm

Notices: All notices regarding the course will be displayed only on the Department of the Mathematics notice board.

Instructor In-charge (MA3202)