COURSEPLAN

NAME OF THE DEPARTMENT: MATHEMATICS

NAME OF THE FACULTY: Dr. RCL Das

Prof Shekhar Suman

Dr. Kandarp Vidyasagar

ACADEMIC SESSION: 2021-2024

YEAR: 2023

PROGRAMME: B.SC.

SEMESTER: 6

COURSE TYPE: Core

COURSE: Numerical Analysis

COURSE CODE: C-14

TOTAL CREDIT: 6 (5+1)

PROGRAMME OUTCOMES (POs):

Student will be able:

PO1: Develop in-depth knowledge of Numerical analysis, Numerical differentiation and integration, solution to differential equations and several other branches of mathematics. This also leads to study of related areas like computer science and statistics.

PO2: Analyze intrinsic beauty which can be utilizedfor solving real life problems throughthe use of mathematical modelling, cryptography and coding.

PO3: Apply knowledge of mathematical science in understanding and skills to identify the difficult/unsolved problems in mathematics.Realize the given scientific data critically and systematically and to do research so that to get the ability to draw the objective conclusions.

PO4: Understandlogically question assertions, to recognize patterns and to distinguish between essential and irrelevant aspects of problems. They also share ideas and insights while seeking and benefitting from knowledge and insight of others. This helps them to learn behave responsibly in a rapidly changing interdependent society.

PO5: This programme will also help students to enhance their employability for government jobs, jobs in banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

PO6: Design solutions for complex scientific problems and design processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, legal, constitutional and environmental considerations.

PO7: Demonstrate fundamental systematic knowledge of mathematics and its applications in engineering, science, technology and mathematical sciences. It should also enhance the subject specific knowledge and help in creating jobs in various sectors.

PO8: Demonstrate knowledgeand understanding ofthe scientific principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO9: Communicate effectively on complex science activities with the science community and the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO10: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of scientific development, technological advancement and global changes.

PO11: Use research-based knowledge and research-based methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO12: To value and foster physical, physiological and psychological well-being by staying committed through personal practice and conduct. Apply the learnings for life-long committing to ethics, to fulfilprofessional and social obligations.

PO13: Apply academic learning fora sustainable living, initiation of entrepreneurial advents through innovation to create opportunities and wealth for self and society.

PO14: Value and supportsocial causes and rural development through service and philanthropic activities.

PROGRAMME SPECIFIC OUTCOMES (PSO):

PSO1: Understand therequirements in mathematics, drawing from a range of contemporary research works and their applications in diverse areas of mathematical sciences and demonstrate educational skills in the areas of analysis, geometry, algebra, mechanics, differential equations etc.

PSO2: Apply skills and knowledge through on-the-job training, research projects and internshipsto use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion andcreating Mathematical models, algorithms, etc. to facilitate application of mathematics in different professions and knowledge domains.

PSO3: Analyse the applications of Mathematics and computing methods using MATLAB, PYTHON, MATHEMATICA etc. to solve the problems of Science in general and Mathematics in particular.

COURSE OUTCOMES (COs):
Semester-6

Paper: **Numerical Analysis** (C-14)

This course will enable the students to:

CO1: Recognize and analyze Solution of algebraic and transcendental equations and Solution of simultaneous equations.

CO2: Understand the fundamental concepts of Interpolation and Calculus of finite difference

CO3: Analyse the significance of the notions of Numerical differentiation.

CO4: Apply Numerical integration to find integral values.

CO5: Discuss about concepts of Solution of ordinary differential equations

CO1: Solid Foundation in Knowledge: Bachelor Degree in Mathematics is the culmination of in-depth knowledge of many core branches of mathematics, viz. Algebra, Calculus, Geometry, Differential Equations, Mechanics, Real and Complex Analysis. Thus, this course helps students in building a solid foundation for further higher studies and research in Mathematics.

CO2: Competency in Skills: The skills and knowledge gained in this course leads to proficiency in analytical reasoning, critical understanding, analysis and synthesis in order to solve theoretical and practical problems. This can orient students towards applications of mathematics in other disciplines and moreover, can also be utilised in modelling and solving real life problems.

CO3:Problem Solving: Students undergoing this course learn to logically question assertions, to recognize patterns and to distinguish between essential and irrelevant aspects of problems.

CO4: Interdisciplinary and Research Skills: Students completing this course will be able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives and explain fundamental concepts of mathematics to non-mathematicians.

CO5: Proficiency in Employments: This course will help students to enhance their employability for Government jobs, jobs in banking, insurance and investment sectors, data analysis jobs, and jobs in various other public and private enterprises.

A. CORRELATION BETWEEN POs AND COs

POs \ Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PSO 1	PSO 2	PSO 3
CO1	3	-	2	-	2	2	2	-	1	-	-	2	2	2	3	-	3
CO2	3	2	3	-	2	3	3	2	2	3	3	3	3	3	3	3	3
CO3	1	1	2	2	-	2	2	-	-	2	2	-	2	-	3	2	-
CO4	3	-	-	3	-	-	2	1	-	1	-	2	-	1	3	3	-
CO5	3	2	1	-	2	1	2	-	1	-	2	2	2	-	2	3	2

1. **Weak**　　　　2. **Moderate**　　　　3. **Strong**

COURSE TEACHING AND LEARNING ACTIVITIES

A. **PEDAGOGY**
   i. **Whiteboard**
   ii. **PPT**
   iii. **Zoom, Google meet**

B. COURSE DELIVERY PLAN:

UNIT	TOPIC/SUBTOPIC	LECTURE REQUIRED	CO ADDRESSED
1	Bisection method, Regula -Falsi method	6	CO1
2	Newton - Raphson method	6	CO1
3	Gauss's elimination method, Matrix inversion by tri-angularization method.	6	CO2
4	The operators⬚, ⬚, E, factorial notation, their properties and inter-relation between them	7	CO2
5	Fundamental theorem of difference calculus, divided differences	8	CO2
6	Newton's forwardand backward difference interpolation formula	6	CO2
7	Lagrange's interpolation formula, central difference interpolation	7	CO2
8	Gauss's forward, backward and central difference interpolation formula	7	CO2
9	Derivative using forward, backward and central difference interpolation formulae	7	CO3
10	General quadrature formula, Simpson's one-third and three-eighth rule, Weddle's rule, Newton-Cote's method	8	CO4
11	Picard's method of successive approximations	7	CO5

C. SUGGESTED READINGS
a. TEXT BOOKS:
1. Numerical Analysis–J B Scarborough.
2. Numerical Methods–B S Grewal.

b. REFERENCE BOOKS
1. Numerical Analysis–G Shankar Rao, New Age Int.Publishers.
2. Numerical Analysis–G S Mallik

c. VIDEO RESOURCE
1. https://archive.nptel.ac.in/courses/111/106/111106101/

d. WEB RESOURCES:-
1. https://en.wikipedia.org/wiki/Numerical_analysis

2.https://www.britannica.com/science/numerical-analysis

e. E-RESOURCES
1. https://www.math.iitb.ac.in/~baskar/book.pdf