COURSE PLAN

NAME OF THE DEPARTMENT: MATHEMATICS

NAME OF THE FACULTY: : Dr. R.C.L Das

Prof Shekhar Suman

Dr. Kandarp Vidyasagar

ACADEMIC SESSION: 2021-2024

YEAR: 2023

PROGRAMME: B.Sc.

SEMESTER: 3

COURSE TYPE: Core

COURSE: Differential Equations

COURSE CODE: C-7

TOTAL CREDIT: 6 (5+1)

PROGRAMME OUTCOMES (POs):

Student will be able:

PO1: Develop in-depth knowledge of algebra, analysis, calculus, geometry, 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 utilized for 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 program 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: Analyze 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-3
Paper: Ordinary and partial Differential Equations (C-7)
This course will enable the students to:

CO1: Understand the concepts of ordinary differential equations.

CO2: Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.

CO3: Know Picard's method of obtaining successive approximations of solutions of first order differential equations, passing through a given point in the plane.

CO4: Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations.
   a. Apply a range of techniques to solve first & second order partial differential equations.
   b. Model physical phenomena using partial differential equations such as the heat and wave equations.

A. CORRELATION BETWEEN POs AND COs

POs Cos↓ →	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO13	PO14	PSO1	PSO2	PSO3
CO1	2	-	3	-	3	3	2	-	1	-	-	2	3	3	3	-	3
CO2	2	3	3	-	2	3	3	2	1	2	3	3	3	3	3	3	3
CO3	-	-	2	2	-	2	2	-	-	1	2	-	2	-	3	2	-
CO4	3	-	-	2	-	-	2	1	-	2	-	1	-	2	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	Introduction:-Limits, Continuity and Differentiability	6	CO2
2	Continuity and discontinuity	8	CO1
3	Algebra of continuous function	5	CO1
4	Uniform continuity	8	CO1
5	Differentiability	7	CO1, CO2
6	Mean value theorems	6	CO1
7	Power series expansion	7	CO1
8	Introduction:-Riemann Integration	7	CO4, CO3
9	Darboux theorem	6	CO4, CO3
10	Fundamental theorem of Integral calculus	8	CO4, CO3
11	First and second Mean value theorem	7	CO4, CO5

C. SUGGESTED READINGS

a. TEXT BOOKS:
1. Real Analysis by Lalji Prasad.
2. Matrices – A R Vashishtha.
3. Differential equations by M.L. Khanna

b. REFERENCE BOOKS

1. Introduction to Real Analysis- R Bartle & D R Sherbert
2. Elements of Real Analysis- Shanti Narayan & M D Raisinghania.
3. Basic Abstract Algebra: P B Bhattacharya, Cambridge Univ. Press.
4. Matrices – Shanti Narayan.
5. Differential Equations – M D Raisinghania.

c. VIDEO RESOURCE

1. https://nptel.ac.in/courses/111106053
2. https://nptel.ac.in/courses/111106113

d. WEB RESOURCES:-

1. https://ocw.mit.edu/courses/18-100a-real-analysis-fall-2020/

e. E-RESOURCES

1. http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF