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: 2021

PROGRAMME: B.Sc.

SEMESTER: 1

COURSE TYPE: Core

COURSE: Differential calculus and vector calculus

COURSE CODE: C-6

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 through the use of mathematical modeling, 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: Understand logically 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 knowledge and 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 learning for life-long committing to ethics, to fulfill professional 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 support social causes and rural development through service and philanthropic activities.

PROGRAMME SPECIFIC OUTCOMES (PSO):

PSO1: Understand the requirements 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 internships to use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion and creating 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-1
Paper: **Differential calculus and vector calculus** (C-2)

This course will enable the students to:

CO1: Recognize and analyze Successive differentiation, Leibnitz's theorem. Maclaurin and Taylors series expansion.

CO2: Understand the fundamental concepts of Partial differentiation, Euler's theorem for functions of two variables, Total differential, Jacobian.

CO3: Analyse the significance of the notions of Tangent and normal, curvature. Asymptotes. Maxima and Minima of functions of two variables, Lagrange's multipliers.

CO4: Apply Product of three and four vectors, work done, moment of a vector about a point and a line. Scalar and vector point functions, differentiation of a vector function of scalar variables.

CO5: Discuss about concepts of Gradient, Divergence and Curl, second order operators in Cartesian coordinate system.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PSO 1	PSO 2	PSO 3
CO1	3	-	3	-	2	2	2	-	1	-	-	2	2	2	3	-	3
CO2	2	3	3	-	2	3	2	2	1	2	3	3	3	3	3	3	3
CO3	-	-	2	2	-	2	2	-	-	1	2	-	2	-	3	2	-
CO4	3	-	-	2	-	-	3	1	-	1	-	2	-	1	3	3	-
CO5	3	2	1	-	2	1	2	-	1	-	1	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	Successive differentiation, Leibnitz's theorem. Maclaurin and Taylor series expansion	6	CO1
2	Partial differentiation, Euler's theorem for functions of two variables	6	CO2
3	Total differential, Jacobian.	6	CO2
4	Tangent and normal, curvature. Asymptotes	7	CO3
5	Maxima and Minima of functions of two variables, Lagrange's multipliers.	8	CO3
6	Product of three and four vectors, work done	6	CO3
7	Moment of a vector about a point and a line	7	CO3
8	Scalar and vector point functions,	7	CO4
9	Differentiation of a vector function of scalar variables	7	CO4
10	.Gradient, Divergence and Curl	8	CO5
11	Second order operators in Cartesian coordinate system	7	CO5

C. SUGGESTED READINGS

a. TEXT BOOKS:
1. Differential Calculus–Das & Mukherjee.
2. Vector Calculus – Dasgupta.

b. REFERENCE BOOKS
1. Calculus – G.B. Thomas & R.L. Finney
2. Vector Calculus – Shanti Narayan

c. VIDEO RESOURCE

1.https://www.math-cs.gordon.edu/courses/mat230/notes/graphs.pdf2.https://archive.nptel.ac.in/noc/courses/noc16/SEM1/noc16-ma05/

d. WEB RESOURCES:-

1. https://www.britannica.com/science/differential-calculus
2. https://testbook.com/maths/vector-algebra

e. E-RESOURCES

1.https://www.lehman.edu/faculty/anchordoqui/VC-1.pdf