COURSEPLAN

NAME OF THE DEPARTMENT   **: MATHEMATICS**

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

                    Prof Shekhar Suman

                    Dr. Kandarp Vidyasagar

ACADEMIC SESSION   **: 2023-2027**

YEAR   **: 2023**

PROGRAMME   **: B.Sc.**

SEMESTER   **: 1**

COURSE TYPE   **: Major**

COURSE   **: Real Analysis and Matrices**

COURSE CODE   **: MJ-3**

TOTAL CREDIT   **: 4**

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 of the 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-3

Paper: Real Analysis and Matrices (MJ-3)
This course will enable the students to:
CO1: Remember - Recall and list the properties of the real number system, including algebraic properties, order properties, and the completeness property of $\mathbb{R}$.

CO2: Understand - Explain the concepts of sequences of real numbers, such as convergence, limits, and monotonicity, and understand the significance of the Archimedean property and the density of rational numbers in $\mathbb{R}$.

CO3: Apply - Apply convergence tests, such as the basic comparison test, D'Alembert's ratio test, and the integral test, to determine the convergence or divergence of infinite series of real numbers.

CO4: Analyze - Analyze the properties of matrices, including their operations, echelon forms, and the rank of a matrix, and analyze systems of linear equations using matrix methods.

CO5: Evaluate/Create - Evaluate the convergence of sequences and series using advanced convergence tests, and create solutions to problems involving matrices and systems of linear equations, demonstrating critical thinking and synthesis of knowledge.

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	3	-	2	2	2	1	-	-	2	2	2	-	3	3	3
CO2	2	2	-	-	2	3	3	2	-	2	3	3	3	3	3	3	1
CO3	3	2	2	2	1	2	2	-	-	1	2	2	2	2	3	-	2
CO4	3	1	-	2	-	1	2	1	1	1	3	2	-	-	3	3	-
CO5	-	2	1	-	2	1	2	1	1	-	2	2	2	-	2	3	-

1. Weak   2. Moderate   3. Strong

COURSE TEACHING AND LEARNING ACTIVITIES

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

B. COURSE COMPLETION PLAN

UNIT	NO. OF LECTURES		TEST	QUIZ	ASSIGNMENT
	Lectures	Tutorial Lectures			
1	15	2	1	1	1
2	16	1	1	1	1
3	10	1	2	1	1

4	14	1	1	1	1

B. COURSE DELIVERY PLAN:

UNIT	LECTURE REQUIRED	TOPIC	CO ADDRESSED
1	15	Real Number system	CO1, CO2
2	14	Sequences	CO5
3	15	Infinite series	CO4
4	16	Matrices	CO3, CO4

B. COURSE OUTCOME ASSESSMENT PLAN

a. DIRECT ASSESSMENT

(Please tick the appropriate column)

COURSE OUTCOME	ASSESSMENT				REMARKS
	QUIZ	TEST	MID SEMESTER	Term Exam	
CO1	1	1	1	1	
CO2	1	1	1	1	
CO3	1	1	1	1	
CO4	1	1	1	1	
CO5	1	1	1	1	

b. INDIRECT ASSESSMENT (STUDENT SURVEY)

Name of the Student:	
University Roll no/ Class roll no.:	
Name of the Programme:	
Semester and Session:	
Course and Course Code:	

Rate the following aspects of course outcomes. Use the scale 1-3

S. No	Course Outcome	1	2	3
1.	CO1			
2.	CO2			
3.	CO3			
4.	CO4			
5.	CO5			
6.	CO6			

1. Average
2. Good
3. Very Good

C. SUGGESTED READINGS

a. TEXT BOOKS:

1. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.

2. Shanti Narayan & M. D. Rai Singhania (2020). Elements of Real Analysis. S. Chand.

3. Shanti Narayan & P. K. Mittal (2010). A Textbook of Matrices. S. Chand.

b. REFERENCE BOOKS

1. A. R. Vashishtha (2014). Matrices. Krishna Prakashan.

c. VIDEO RESOURCE

1. https://archive.nptel.ac.in/courses/111/106/111106053/

2. https://onlinecourses.swayam2.ac.in/cec22_ma11/preview

d. WEB RESOURCES:-

1. https://en.wikipedia.org/wiki/Real_analysis
2. https://www.britannica.com/science/real-analysis

e. E-RESOURCES

1. https://ocw.mit.edu/courses/18-100c-real-analysis-fall-2012/