Semester	**FOUR**
Course	**Major (Paper 1)**
Paper Code	**C2ST230411T**
Paper Title	**Real Analysis II and Linear Algebra II**
No. of Credits	**4**
Theory/Composite/ Practical	**Theory**
Minimum No. of preparatory hours per week a student has to devote	**4**
Number of Module	**TWO**
Syllabus	***Module 1: Real Analysis II*** ***Unit 1:*** ***Applications of Differentiation***: Taylor's theorem, remainder terms. Maxima and minima of functions. L'Hospital's rule of limits. Statements of results and applications. [6L] ***Improper Integrals***: Definition, Simple tests. Beta and Gamma integrals-properties. [5L] ***Unit 2:*** ***Sequences and Series of functions***: Pointwise and uniform convergence. Properties of uniformly convergent functions. Weierstrass' M-test for convergence of series. Power series – radius of convergence, tests. Properties of power series. [8L] ***Analysis of functions in two variables***: Partial and total differentiation. Double integrals. [7L] ***Module 2: Linear Algebra II*** ***Unit 1:*** ***Vector Space:*** Vector spaces, subspaces, sum of subspaces, span of a set, dimension and basis, ortho-complement space. Row space & column space of a matrix. Null space and nullity. Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum, and the product of two matrices. [12L] ***Unit 2:*** ***Solution of a system of linear equations:*** Elementary matrices, row reduction, and echelon forms, the matrix equations Ax=b, solution set of linear equations, application of linear equations. [5L] ***Unit 3:*** ***Eigen vectors and Eigen values:*** Characteristic roots and vectors, properties of characteristic roots, Cayley-Hamilton theorem. [5L]

	Unit 4: ***Quadratic forms:*** Classification & canonical reduction. Rank and Signature. [4L]	
Learning Outcomes	o To apply differentiability to study properties of real-valued functions. o To identify improper integrals and apply tests to verify their convergence. o To identify sequences of functions and properties of uniformly convergent sequences. o To determine intervals of convergence of power series. o To evaluate partial differentials and double integrals of functions in two variables. o To understand vector spaces and the solution of a system of linear equations. o To understand eigen value problem and classification of quadratic forms.	
Reading/Reference List	1. Bertle R. G., Sherbert D. R. (2011): Introduction to Real Analysis, 4th Edition, Wiley & Sons Inc. 2. Goldberg R. R. (2020): Methods of Real Analysis, Oxford & IBH Publishing Co Pvt Ltd. 3. Apostol T. M. (2007): Calculus Volume 1, 2nd Edition, John Wiley & Sons. 4. Apostol T. M. (2007): Calculus Volume 2, 2nd Edition, John Wiley & Sons. 5. Hadley G. (2002): Linear Algebra. Narosa Publishing House (Reprint). 6. Kenneth H. and Kunze R. (1978): Linear Algebra. Phi Learning Pvt Ltd. 7. Mapa S. K. (2016): Higher Algebra: Abstract and Linear. Levant Books. 8. Rao A. R. and Bhimasankaram P. (2000): Linear Algebra. Hindustan Book Agency.	
Evaluation	CIA: 30 End-Sem: 70 Total: 100	
Paper Structure for Theory Semester Exam	Module-I (35 marks)	Module-II (35 marks)
	To answer Short: 4 out of 6 (5 marks) Long: 1 out of 2 (15 marks)	To answer Short: 4 out of 6 (5 marks) Long: 1 out of 2 (15 marks)