Semester	**THREE**
Paper Number	**HSTCR3071T**
Paper Title	**Mathematical Analysis**
No. of Credits	**6**
Theory/Composite	**Theory**
No. of periods assigned	Th: 5 Tutorial: 1
Module	Module 1: (Unit 1,2 & 3) : 3 periods/week Module 2: Unit 4 : 2 periods/week
Course description/objective	*At the end of the course, a student is expected to* o Identify sequences of real numbers and their properties. o Identify series of real numbers and apply tests to study their convergence/divergence. o Understand the properties of real valued functions. o Understand and apply Mean Value theorems in various problems. o Identify sequences and series of real functions (with special focus on power series), apply tests to identify their various modes of convergence. o Learn numerical approximations to analytically intractable functions.
Syllabus	**UNIT 1:** ***Sequence and Series of real numbers:*** Sequence of real numbers and their convergence, limits of sequences, Cauchy's general principle of convergence, Cauchy's first theorem on limits, monotonic sequences, limit superior and limit inferior of a bounded sequence. [10L] Infinite series, positive termed series and their convergence, Comparison tests, D'Alembert's ratio test, Cauchy's n^{th} root test, Gauss test, Cauchy's condensation test and integral test (Statements and examples only). Absolute convergence of series, Leibnitz's test for the convergence of alternating series, Conditional convergence. [6L] **UNIT 2:** ***Properties of real valued functions:*** Limit, Continuity, Differentiability, Uniform Continuity and Boundedness of functions, Indeterminate forms, L'Hospital's rule. Rolle's and Lagrange's mean value theorems. Taylor's theorem and Lagrange's and Cauchy's form of remainder (without proof). Taylor's and Maclaurin's series expansion. [14L] Reimann Integration of Real valued Functions. Convergence of Integrals, Simple tests. Multiple Integration. [10L] **UNIT 3:** ***Sequence and series of functions:*** Pointwise & Uniform convergence. Simple tests, Properties of Uniformly convergent

	functions. Power series. [12L] **UNIT 4:** ***Numerical Analysis:*** Finite differences and interpolation. Operators Δ and E. Newton's forward and backward interpolation formulae. Lagrange's interpolation formulae. Numerical Integration, Gauss quadrature, Trapezoidal rule, Simpson's one-third rule with error terms. Stirling's approximation to factorial n. Solution of equations in a single variable- Bisection, Iteration and Newton Raphson method. [26L]	
List of Practical	**NIL**	
Reading/Reference Lists	1. Bartle, R. G. and Sherbert, D. R. (2002): Introduction to Real Analysis (3rd Edition), John Wiley and Sons (Asia) Pte. Ltd., Singapore. 2. Goldberg, R. (1976) : Methods of Real Analysis (2^{nd} Edition), John Wiley and Sons. 3. Apostol T.M. (1987) : Mathematical Analysis, Second Edition, Narosa Publishing House, New Delhi. 4. Sastry, S.S. (2000): Introductory Methods of Numerical Analysis, 3rd edition, Prentice Hall of India Pvt. Ltd., New Delhi.	
Evaluation	CIA- 20 End Sem- 80 Total: 100 Module 1: 55 Module 2: 25	
Paper Structure	Short questions (5 marks each)	Long questions (15 marks each)
Module 1	5 out of 8	2 out of 3
Module 2	2 out of 3	1 out of 2