

Semester	2
Course ^{*1}	Major
Paper Code	C1MT230221T
Paper Title	Analysis-1
No. of Credits ^{*2}	4
Theory / Practical / Composite	Theory
Minimum No. of preparatory hours per week a student has to devote	4
Number of Modules	Nil
Syllabus	<p>Algebraic and Order Properties of \mathbb{R} [4]: Bounded and Unbounded subsets, Suprema and Infima, The Completeness Property of \mathbb{R} (2). The Archimedean Property, Density of Rational (and Irrational) numbers in \mathbb{R} with special reference to well-ordering property (2).</p> <p>Sequences of real numbers [24]: Sequence of real numbers Bounded sequence, Convergent sequence, Limit of a sequence (4). Limit Theorems, Proof of Squeeze theorem and application (3). Monotone Sequences, Monotone Convergence Theorem, Nested interval theorem (4). Subsequences, Divergence criteria Monotone Subsequence Theorem, Bolzano Weierstrass Theorem for Sequences (5). Subsequential limit. Limsup and liminf of a sequence. Looking into limsup and liminf from viewpoint of MCT (6). Cauchy sequence, Cauchy's Convergence Criterion (2)</p> <p>Convergence and divergence of infinite series [14]: Cauchy's criterion of convergence (2); Test for convergence: comparison test, limit comparison test, ratio test, Cauchy's nth root test, Raabe's test, Cauchy's condensation test (5); Alternating series, absolute and conditional convergence, Leibnitz test, Abel's and Dirichlet's test (4); Rearrangement of series, Riemann's Rearrangement theorem (Statement only) (3).</p> <p>Limits of functions [10] : Definition, sequential criterion for limits, divergence criteria. Limit theorems, one sided limits. Infinite limits and limits at infinity (10)</p>
Learning Outcomes ^{*3}	On successful completion of the course a student will be able to do the following:

	<ul style="list-style-type: none"> • Getting familiarised with properties of real numbers and about insufficiency of rational numbers to aptly measure a measurable quantity. • Learn to tests converging/diverging/oscillatory behaviour of successive values of a real variable; thereby helping to find approximate value of a measurable quantity in any quantitative study. • Getting introduced to concept of adding countable number of real numbers and knowing to test whether such an expression corresponds to a real number thus verifying whether successive addition of values keeps the aggregate quantifiable or not. • Getting acquainted with desirable properties of functions when change in function values can be kept desirably small by keeping change in independent variable small and checking the practical feasibility of getting approximately correct value for a small change in independent variable. 	
Reading/Reference Lists * ⁴	<ul style="list-style-type: none"> • Introduction to Real Analysis—Bartle, Sherbert • Real Analysis—S.K.Mapa <p>Online Lectures:</p> <ul style="list-style-type: none"> • https://onlinecourses.swayam2.ac.in/cec23_ma07/preview • http://www.math.louisville.edu/~lee/RealAnalysis/ • https://artofproblemsolving.com/community/c7t430f7_real_analysis_theorems. 	
Evaluation	<p>Theory</p> <p>CIA: 20+5+5=30</p> <p>Semester Exam:70</p>	<p>Practical (if applicable)</p> <p>CA:</p> <p>Semester Exam:</p>
Paper Structure for Theory Semester Exam	7 questions each carrying 10 marks out of 12 /13 questions.	