ST.JOSEPH’S COLLEGE FOR WOMEN ( AUTONOMOUS ) , VISAKHAPATNAM

IV SEMESTER **MATHEMATICS** TIME : 5 HRS/WEEK

M 4303 (3) **REAL ANALYSIS** MAX.MARKS : 100

w.e.f :(AH Batch) **SYLLABUS**

**COURSE OBJECTIVES:** To enable the students to –

1. Know and understand the definition and theorems of Real Analysis
2. Apply mathematical concepts and principles to perform numerical and symbolic computations.
3. Prove properties of convergent and divergent sequence.
4. Verify the given sequence in convergent and divergent by using behavior of Monotonic sequence.
5. Prove Cauchy’s first limit theorem, Cesaro’s theorem, Cauchy’s Second limit theorem.
6. Explain subsequences, upper and lower limits of a sequence.
7. Give examples for convergence, divergence and oscillating series.
8. Prove theorems on different test of convergence and divergence of a series of positive terms.
9. Verify the given series is convergent or divergent by using different test and To inculcate knowledge on real numbers and their properties & proofs.
10. Compare with other fields like engineering , physics and other allied sciences.

**COURSE OUTCOMES:** At the end of the course student will -

* **CO1:**Be able to gain knowledge and concepts of Real analysis and it’s applications
* **CO2:**Develop a higher level of mathematical knowledge combined with the ability to

think analytically

* **CO3:**Ability to understand the different math concepts and be able to implement them in our everyday problems
* **CO4:**Be able to write simple proofs on their own and study bigger theorems
* **CO5:**Be able to demonstrate the power to integrate data and ideas of differentiation and integration during a coherent and substantive manner and use acceptable techniques for resolution connected issues and establishing theoretical results
* **CO6:**Gain Knowledge of fundamental concepts of real numbers.
* **CO7:**Verify the value of the limit of a function at a point using the definition of the limit
* **CO8:**Learn to check function is continuous understand the consequences of the intermediate value theorem for continuous functions
* **CO9:**Apply the knowledge in higher studies like P.G. and Research.

**COURSE SYLLABUS:**

**UNIT – I** : **REAL NUMBERS :**The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supremum property; intervals. (No question is to be set from this portion).

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**REAL SEQUENCES:** Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence. The Cauchy’s criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrass theorem – Cauchy Sequences – Cauchy’s general principle of convergence theorem.

**UNIT –II: INFINITIE SERIES :SERIES :**Introduction to series, convergence of series. Cauchy’s general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.

1. P-test

2. Cauchy’s nth root test or Root Test.

3. D’-Alemberts’ Test or Ratio Test.

4. Alternating Series – Leibnitz Test.

Absolute convergence and conditional convergence.

**UNIT – III: CONTINUITY : LIMITS :**Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits.Limits at infinity. (No question is to be set from this portion).

**CONTINUOUS FUNCTIONS :** Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

**UNIT – IV: DIFFERENTIATION AND MEAN VALUE THEORMS :**

The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle’s Theorem, Lagrange’s Theorem, Cauchy’s Mean value Theorem.

**UNIT – V: RIEMANN INTEGRATION :**Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

**CO-CURRICULAR ACTIVITIES:** Seminar/ Quiz/ Assignments/ Real Analysis and its applications / Problem Solving.

**TEXT BOOK:**Introduction to Real Analysis by Robert G.Bartle and Donlad R. Sherbert, published by John Wiley.

**REFERENCE BOOKS :**

1. Real Analysis by Rabert&Bartely and .D.R. Sherbart, Published by John Wiley. (1997)

2.A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, Published by S. Chand &Company     Pvt. Ltd., New Delhi.(2007)

3.Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D.

Raisingkania Published by S. Chand & Company Pvt. Ltd., New Delhi. (2006)

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