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

IV SEMESTER **MATHEMATICS**  TIME:2HRS/WEEK

M 4353 (2) **REAL ANALYSIS** MAX.MARKS: 50

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

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

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

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

* **CO1:**Apply theoretical / analytical / statistical knowledge gained in various courses of B.Sc to solve numerical problems based on real life situations during practicals and draw meaningful solutions to day to day problems
* **CO2:**Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study
* **CO3:**Enhancing students overall development and to equip them with mathematical abilities, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
* **CO4:**Problem solving on Real Numbers, Sequences, Series, Continuity, Differentiation, Mean Value Theorems and Riemann Integration
* **CO5:**Be able to gain knowledge and concepts of Real analysis and it’s applications
* **CO6:**Develop a higher level of mathematical knowledge combined with the ability to think analytically
* **CO7:**Ability to understand the different math concepts and be able to implement them in our everyday problems
* **CO8:**Be able to write simple proofs on their own and study bigger theorems
* **CO9:**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
* **CO10:**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).

**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)

**\*\* \*\* \*\***