MAM2102 Real Analysis

UNIT I Metric Spaces: Definition and examples, limits of sequence, equivalence of metrics, bounded sets, limits of function on metric spaces, open and closed sets in metric space, compactness, completeness. Continuity: Limits of a function, continuity, compactness and connectedness, uniform continuity, discontinuity, Fixed-point theorem for contractions.

UNIT II Derivative: Derivatives and continuity, L' Hospital Rules, Mean-Value Theorem for derivatives, Intermediate-value theorem for derivatives, Taylor's formula with remainder, Derivatives of vector-valued functions, Differentiation of functions of a complex variable.

UNIT III The Riemann - Steiltjes integrals: Definition, properties, integration by parts, change of variables, step function ans integrators, reduction of a Riemann- Stieltjes integral to a finite sum, Euler's summation formula, upper and lower integrals, sufficient and necessary condition, mean value theorem (First and second), Bonnet's theorem, Fundamental theorem of integral calculus, Differentiation under integrals signs, integration under vector valued function, rectifiable curves.

UNIT IV Sequence and series of function: Uniform convergence, continuity, integration and Riemann Steiltjes integral, differentiation, equicontinuous families of functions, Stone-Weierstrass Theorem, power series, the substitution theorem, real power series, the Taylor series generated by a function.

UNIT V Special functions: Exponential and logarithmic functions, trigonometric functions, algebraic completeness of the complex field, Orthogonal systems of functions, The Fourier series of a function relative to an orthonormal system, Properties of the Fourier coefficients, The Riesz-Fischer theorem, Gamma function.

Textbook: Walter Rudin, *Principles of mathematical analysis*, Addison-Wesley, Reading, MA, 1974.

References

[1] A. K. Sharma, *Real Analysis*, Discovery publishing house Pvt. Lts., New Delhi, 2008.

[2] D Somasundaram and B. Choudhary, *A first course in mathematical analysis*, Narosa, Oxford, London, 1996.

[3] Halsey L. Royden, *Real Analysis*, Prentice Hall, Upper Saddle River, NJ, 1988.

[4] S Kumaresan, *Topology of Metric Space*, Alpha Science international Ltd, Harrow, UK, 2005.

[5] Tom M. Apostol, *Mathematical Analysis*, Addison-Wesley, Reading, MA, 1974.

[6] Walter Rudin, *Principles of mathematical analysis*, McGraw-Hill, New York, 2010.