

MA-306: REAL ANALYSIS

The Riemann Integral: Upper and lower sums, definition of a Riemann integral, integrability criterion, classes of integrable functions, properties of the Riemann integral.

Infinite Series: Review of sequences, the geometric series, tests for convergence, conditional and absolute convergence. Regrouping and rearrangement of series. Power series, radius of convergence.

Uniform Convergence: Uniform convergence of a sequence and a series, the M-test, properties of uniformly convergent series. Weierstrass approximation theorem.

Improper Integrals: Classification, tests for convergence, absolute and conditional convergence, convergence of $\int f(x) \sin x \, dx$, the gamma function. Uniform convergence of integrals, the M-test, properties of uniformly convergent integrals.

Fourier Series: Orthogonal functions, Legendre, Hermite and Laguerre polynomials, convergence in the mean. Fourier-Legendre and Fourier-Bessel series, Bessel inequality, Parseval equality. Convergence of the trigonometric Fourier series.

RECOMMENDED BOOKS:

1. Bartle, R.G. and Sherbert, D.R., Introduction to Real Analysis, John Wiley Sons 1994.
2. Widder, D.V., Advanced Calculus, Prentice Hall 1982.
3. Rudin, W., Principles of Real Analysis, McGraw-Hill 1995.
4. Rabenstein, R.L., Elements of Ordinary Differential Equations, Academic Press, 1984.