

MM5B07 : BASIC MATHEMATICAL ANALYSIS

5 hours/week

4 credits

30 weightage

Text 1 : Robert G. Bartle & Donald R. Sherbert : Introduction to Real Analysis, 3rd ed., Wiley.

Text 2 : J.W. Brown and Ruel V. Churchill : Complex Variables and Applications, 8th Ed., McGraw Hill.

Module I (20 hrs)

A quick review of sets and functions

Mathematical induction

Finite and infinite sets

Real Numbers

The algebraic property of real numbers

(Sec. 1.1, 1.2, 1.3, 2.1 of text 1)

Module II (20 hrs)

Absolute value and real line

The completeness property of \mathbb{R}

Applications of supremum property

Intervals, Nested interval property and uncountability of \mathbb{R}

(Sec 2.2, 2.3, 2.4 and 2.5 of text 1)

Module III (30 hrs)

Sequence of real numbers

Sequence and their limits

Limit theorems

Monotone sequences

Subsequence and Bolzano – Weirstrass theorem

Cauchy criterion

Properly divergent sequences.

Open and closed sets

(Sec. 3.1, 3.2, 3.3, 3.4, 3.5, 3.6 and 11.1 of text 1)

Module IV : Complex Numbers (20 hrs)

Sums and Products; Basic Algebraic properties; Further properties, Vectors and Moduli; Complex conjugates; Exponential form; Product and powers in

exponential form; Arguments of products and quotients; Roots of complex numbers; Regions in the complex plane.

(Sections 1 to 11 of Chapter 1 of Text 2)

References

1. J.M. Howie : Real Analysis, Springer 2007.
2. Ghorpade and Limaye : A Course in Calculus and Real Analysis, Springer, 2006.
3. K.A. Ross : Elementary Real Analysis : The Theory of Calculus, Springer Indian Reprint.
4. J.V. Deshpande : Mathematical Analysis and Applications, Narosh Pub. House.
5. M.R. Spiegel : Complex Variables, Schaum's Outline Series.

Seminar topics:

Expansions of $\sin n\theta$, $\cos n\theta$, $\sin^n\theta$, $\cos^n\theta$ etc. using de-Moivres theorem.

Sum of finite series like $\sin\theta + \sin 2\theta + \dots + \sin n\theta$ etc.