

B.Sc. (Hons.) Mathematics (Sem I)

Teaching Plan (DSC-2: Elementary Real Analysis):

Weeks 1 to 3: Algebraic and order properties of $\mathbb{R}$, Absolute value of a real number, Bounded above and bounded below sets, Supremum and infimum of a nonempty subset of $\mathbb{R}$, The completeness property of $\mathbb{R}$.

[1] Chapter 2 (Sections 2.1 to 2.3).

Week 4: Archimedean property, Density of rational numbers in $\mathbb{R}$.

[1] Chapter 2 [Section 2.4 (except 2.4.2 and 2.4.7)].

Weeks 5 and 6: Sequences and their limits, Convergent sequence, Limit theorems.

[1] Chapter 3 [Sections 3.1 (except 3.1.8 and 3.1.9), and 3.2].

Week 7 and 8: Monotone sequences, Monotone convergence theorem and applications.

[1] Chapter 3 (Section 3.3).

Week 9: Subsequences, Bolzano-Weierstrass theorem, Notion of limit superior and limit inferior for bounded sequence with illustrations.

[1] Chapter 3 [Section 3.4 (with Theorems 3.4.7 and 3.4.11 without proofs)].

Week 10: Cauchy sequences of real numbers and Cauchy's convergence criterion.

[1] Chapter 3 [Section 3.5 (3.5.1 to 3.5.6, except 3.5.6(a))].

Week 11: Convergence and divergence of infinite series, Sequence of partial sums of infinite series, Necessary condition for convergence, Cauchy criterion for convergence of series.

[3] Chapter 8 [Section 8.1 (with Theorem 8.1.10 without proof)].

Weeks 12 and 13: Tests for convergence of positive term series: Statement of the integral test and convergence of p -series, Basic comparison test, Limit comparison test, Ratio, root and Raabe's tests.

[3] Chapter 8 [Section 8.2 (with Theorems 8.2.3, 8.2.13, 8.2.16, 8.2.18, and 8.2.20 without proofs)].

Weeks 14 and 15: Alternating series, Leibniz test, Absolute and conditional convergence.

[2] Chapter 6 [Section 6.2 (with Theorem 6.2.9 without proof)].

References:

1. Bartle, Robert G., & Sherbert, Donald R. (2011). *Introduction to Real Analysis* (4th ed.). John Wiley & Sons. Wiley India Edition 2015.
2. Bilodeau, Gerald G., Thie, Paul R., & Keough, G. E. (2010). *An Introduction to Analysis* (2nd ed.). Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.
3. Denlinger, Charles G. (2011). *Elements of Real Analysis*. Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.