Department of Mathematics, University of Delhi

Teaching Plan: B.A. (Prog.) with Mathematics as Major, Semester-6

DSC-6: Elementary Mathematical Analysis (DSE-4(i) for B.Sc.)

Weeks 1 to 3: Sequential criterion for limits and continuity of functions, Continuity on intervals, Intermediate value theorem and applications.
[1]: Chapter 4 (Section 4.1 [Definition 4.1.1, Theorem 4.1.9, Corollary 4.1.10, 4.1.11, and Example 4.1.12]).
[1]: Chapter 5 (Section 5.1 [Definition 5.1.1, Theorem 5.1.3, Corollary 5.1.4, Example 5.1.5, and 5.1.11]).
[1]: Chapter 5 (Section 5.3 [page 249 to 252, Corollary 5.3.13]).

Week 4: Uniform continuity.
[1]: Chapter 5 (Section 5.4 [up to page 260, first proof that $f(x) = 1/x$ is *not* uniformly continuous on $(0,1)$]).

Weeks 5 to 7: Riemann integration, criterion for integrability and examples, Integrability of continuous and monotone functions.
[1]: Chapter 7 (Section 7.2).

Weeks 8 and 9: Algebraic properties of the Riemann integral, Fundamental theorem of calculus (first form).
[1]: Chapter 7 (Section 7.5 [Theorem 7.5.1, 7.5.2, and Corollary 7.5.5], alternative independent proofs using Theorem 7.2.14 may be given from Section 33 of K. A. Ross, Elementary Analysis: Theory of Calculus, Springer).
[1]: Chapter 7 (Section 7.6 [Definition 7.6.1, Theorem 7.6.2, and Remark 7.6.3]).

Weeks 10 and 11: Sequences and series of functions: Pointwise and uniform convergence,
Uniform Cauchy criterion.
[1]: Chapter 9 (pages 544 to 551, all theorems without proofs)

Weeks 12 and 13: Weierstrass M-test, Implications of uniform convergence in calculus.
[1]: Chapter 9 (Theorem 9.2.11 to Corollary 9.2.14, page 553]).
[1]: Chapter 9 (Section 9.3 [pages 557 to 562, all theorems without proofs]).

Weeks 14 and 15: Power series, Radius and interval of convergence, Applications of Abel's theorem for power series.
[1]: Chapter 8 (Section 8.6, all theorems without proofs).

Essential Reading

1. Denlinger, Charles G. (2011). Elements of Real Analysis. Jones & Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.