Teaching Plan (DSC-8: Riemann Integration): B.Sc. (Hons.) Mathematics, Semester-3

Weeks 1 and 2: Definition of upper and lower Darboux sums, Darboux integral, Inequalities for upper and lower Darboux sums.
[1]: Chapter 6 (Sections 32.1 to 32.4).

Weeks 3 to 5: Necessary and sufficient conditions for the Darboux integrability; Riemann's definition of integrability by Riemann sum and the equivalence of Riemann's and Darboux's definitions of integrability.
[1]: Chapter 6 (Sections 32.5 to 32.10).

Week 6: Definition and examples of the Riemann-Stieltjes integral.
[1]: Chapter 6 (Sections 35.1, and 35.2).

Weeks 7 to 9: Riemann integrability of monotone functions and continuous functions, Properties of Riemann integrable functions.
[1]: Chapter 6 (Sections 33.1, and 33.6).

Week 10: Definitions of piecewise continuous and piecewise monotone functions and their Riemann integrability; Intermediate value theorem for integrals,
[1]: Chapter 6 (Sections 33.7 to 33.9, and Exercise 33.14).

Week 11: Fundamental Theorems of Calculus (I and II).
[1]: Chapter 6 (Sections 34.1 to 34.3).

Weeks 12 and 13: Methods of integration: integration by substitution and integration by parts; Volume by slicing and cylindrical shells, Length of a curve in the plane and the area of surfaces of revolution.
[2]: Chapter 4 (Section 4.9), Chapter 7 (Section 7.2), and Chapter 5 (Sections 5.2 to 5.5).

Weeks 14 and 15: Improper integrals of Type-I, Type-II and mixed type, Convergence of improper integrals, The beta and gamma functions and their properties.
[3]: Chapter 7 (Section 7.8).
[4]: Chapter 9 [Sections 9.5 (up to examples 9.47, page 395), and 9.6 (pages 405 to 408).

Essential Readings

1. Ross, Kenneth A. (2013). Elementary Analysis: The Theory of Calculus (2nd ed.). Undergraduate Texts in Mathematics, Springer.
2. Anton, Howard, Bivens Irl and Davis Stephens (2012). Calculus (10th ed.). John Wiley & Sons, Inc.
3. Denlinger, Charles G. (2011). Elements of Real Analysis, Jones & Bartlett India Pvt. Ltd.
4. Ghorpade, Sudhir R. and Limaye, B. V. (2006). A Course in Calculus and Real Analysis. Undergraduate Texts in Mathematics, Springer (SIE). Indian Reprint.