Indraprastha College for Women
University of Delhi

Course Name:	B.Sc. (Hons.) Mathematics
Paper Title:	Riemann Integration
Unique Paper Code:	2352012302
Semester:	III
Faculty(s):	Sarita Anand
Year:	2024

Work Plan

Period	Unit No.	Learning Objective	Topics to be Covered
1st Aug -3rd Aug	I	● Understand the integration of bounded functions on a closed and bounded interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. ● Learn some of the properties of Riemann integrable functions, its generalization and the applications of the fundamental theorems of integration. ● Get an exposure to the utility of integration for practical purposes	Definition of upper and lower Darboux sums, Darboux integral, Inequalities for upper and lower Darboux sums.
5th Aug-10th Aug	I	● Understand the integration of bounded functions on a closed and bounded interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. ● Learn some of the properties of Riemann integrable functions, its generalization and the applications of the fundamental theorems of integration. ● Get an exposure to the utility of integration for practical purposes	Definition of upper and lower Darboux sums, Darboux integral, Inequalities for upper and lower Darboux sums.
12th Aug-17th Aug	I	● Understand the integration of bounded functions on a closed and bounded interval and its extension	Definition of upper and lower Darboux sums, Darboux

		to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. ● Learn some of the properties of Riemann integrable functions, its generalization and the applications of the fundamental theorems of integration. ● Get an exposure to the utility of integration for practical purposes	integral, Inequalities for upper and lower Darboux sums.
19th Aug-24th Aug	I	● Understand the integration of bounded functions on a closed and bounded interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. ● Learn some of the properties of Riemann integrable functions, its generalization and the applications of the fundamental theorems of integration. ● Get an exposure to the utility of integration for practical purposes	Necessary and sufficient conditions for the Darboux integrability; Riemann's definition of integrability by Riemann sum.
26th Aug-31st Aug	I	● Understand the integration of bounded functions on a closed and bounded interval and its extension to the cases where either the interval of integration is infinite, or the integrand has infinite limits at a finite number of points on the interval of integration. ● Learn some of the properties of Riemann integrable functions, its generalization and the applications of the fundamental theorems of integration. ● Get an exposure to the utility of integration for practical purposes	Necessary and sufficient conditions for the Darboux integrability; Riemann's definition of integrability by Riemann sum.
31st Aug			RETIREMENT

Unit	TOPICS
I	**The Riemann Integral** Definition of upper and lower Darboux sums, Darboux integral, Inequalities for upper and lower Darboux sums, 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; Definition and examples of the Riemann-Stieltjes integral.

II	**Properties of The Riemann Integral and Fundamental Theorems** Riemann integrability of monotone functions and continuous functions, Properties of Riemann integrable functions; Definitions of piecewise continuous and piecewise monotone functions and their Riemann integrability; Intermediate value theorem for integrals, Fundamental Theorems of Calculus (I and II).
III	**Applications of Integrals and Improper Integrals** 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. Improper integrals of Type-I, Type-II and mixed type, Convergence of improper integrals, The beta and gamma functions and their properties.

S. No.	**Name of Authors/Books/Publishers**
1.	Ross, Kenneth A., Elementary Analysis: The Theory of Calculus (2nd ed.) (2013). Undergraduate Texts in Mathematics, Springer.
2.	Anton, Howard, Bivens Irl and Davis Stephens, Calculus (10th edn.) (2012). John Wiley & Sons, Inc.
3.	Denlinger, Charles G., Elements of Real Analysis (2011), Jones & Bartlett India Pvt. Ltd., Indian Reprint.
4.	Ghorpade, Sudhir R. and Limaye, B. V. (2006), A Course in Calculus and Real Analysis. Undergraduate Texts in Mathematics, Springer (SIE). Indian Reprint.