PROGRAME NAME: **B.Sc.(H) Mathematics**
COURSE NAME: **Riemann Integration & Series of Functions**
SEMESTER DURATION: **January to May**

Week	Topic(s)	Teaching Methodology Adopted/ Continuous Internal Evaluation
1.	Definition of Riemann integration, Inequalities for upper and lower Darboux sums.	Presentations
2.	Necessary and sufficient conditions for the Riemann integrability, Definition of Riemann integration by Riemann sum and equivalence of the two definitions.	Lectures/Discussions
3.	Riemann integrability of monotone functions and continuous functions, Algebra and properties of Riemann integrable functions.	Lectures
4.	Definitions of piecewise continuous and piecewise monotone functions and their Riemann integrability, Intermediate value theorem for integrals.	Presentations/lectures
5.	First and second fundamental theorems of integral calculus, and the integration by parts.	Case Study/Practicals
6.	Improper integrals of Type-I, Type-II and mixed type.	Practicals
7.	Convergence of Beta and Gamma functions, and their properties.	Lectures

8.	Definitions and examples of pointwise and uniformly convergent sequence of functions.	Demonstration/Lectures
9.	Motivation for uniform convergence by giving examples. Theorem on the continuity of the limit function of a sequence of functions.	Lectures
10.	The statement of the theorem on the interchange of the limit function and derivative, and its illustration with the help of examples. The interchange of the limit function and integrability of a sequence of functions.	Practicals
11.	Pointwise and uniform convergence of series of functions, Theorems on the continuity, derivability and integrability of the sum function of a series of functions.	Practicals
12.	Cauchy criterion for the uniform convergence of series of functions, and the Weierstrass MTest for uniform convergence.	Case study/Lectures
13.	Definition of a power series, Radius of convergence, Absolute and uniform convergence of a power series.	Assignments
14.	Differentiation and integration of power series, Statement of Abel's Theorem and its illustration with the help of examples.	Assignments

Course Objectives: To 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. The sequence and series of real valued functions, and an important class of series of functions (i.e., power series).

Course Learning Outcomes: The course will enable the students to learn about:

i) Some of the families and properties of Riemann integrable functions, and the applications of the fundamental theorems of integration.

ii) Beta and Gamma functions and their properties.

iii) The valid situations for the inter-changeability of differentiability and integrability with infinite sum, and approximation of transcendental functions in terms of power series.