Course No	Course Name	L-T-P-Credits
MA 102	**Integral Calculus and Complex Variables**	**3-1-0: 4**

Prerequisite: nil

Course Objectives: The objective of this course is to introduce the fundamental concepts and techniques of integral calculus of single and multi variables, vector calculus and theory of complex variables, and to develop problem solving and critical thinking skills.

Course outcomes: After successful completion of the course, student will be able to:

1. Apply definite integrals to evaluate length of plane curves; to determine volume and surface area of solids of rotation.
2. Understand the concepts of improper integrals and their convergence properties.
3. Apply the knowledge of multiple integrals to solve problems related to areas, volumes, etc.
4. Apply Gauss' divergence theorem, Stokes' theorem and Green's theorem to evaluate double and triple integrals.
5. Understand complex numbers, the algebra and geometry of complex numbers, complex plane and analytic functions.
6. Evaluate contour integrals by using Cauchy's Integral Theorem, Cauchy Integral Formulae, Residual Theorem.

SYLLABUS

Module	Contents	Hours
I	**Integral Calculus:** Definite integral: length of a plane curve, surface area of revolution, volume of solids of revolution; Differentiation under sign of integral: Leibnitz rule; Improper integrals, convergence tests, beta and gamma functions; Multiple Integrals: double and triple integrals, volume and surface integrals.	16
II	**Vector Calculus:** Gradient, divergence, curl; line and surface integrals; Green's theorem; Gauss' theorem; Stoke's theorem.	08
III	**Complex Variables:** Analytic functions, Cauchy-Riemann equations, harmonic functions; Line integrals, Cauchy's integral theorem, Cauchy's integral formula; Power series, Taylor and Laurant series; Poles and residues, Cauchy's residual theorem.	12

Essential Readings:

1. J. Stewart, "*Calculus*", Cengage Learning India Pvt. Limited, 7th edition, 2017.
2. E. Kreyszig, "*Advanced Engineering Mathematics*", John Wiley & Sons, 10th edition 2015.

Supplementary Readings:

1. R. K. Jain and S. R. K. Iyengar, "*Advanced Engineering Mathematics*", Narosa Publishing House, 5th edition, 2016.