Semester*	: II
Course Type	: DSC
Course Code**	: MAT-DSC-152
Name of the Course	: Integral Calculus and Vectors
Learning level***	: 199
Credits	: 3
Contact Hours	: 45
Total Marks	: 100
End Semester Marks	: 70
Internal Marks	: 30

Course Objective

The aim of this course is to introduce integral calculus and vectors to study indefinite, definite integrals and the properties of definite integrals, reduction formulae, rectification of plane curves, areas of surfaces of revolution and volumes of solids of revolution. This course further explores the scalar and vector triple products, vector equations, vector functions, etc.

Unit – I

Integration of rational functions, definite integral as the limit of a sum. Definite integrals and their properties.

Unit – II

Reduction formulae, derivations and illustrations of reduction formulae of the types $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \sec^n x\,dx$, $\int (\log x)^n\,dx$, $\int \sin^m x\,\cos^n x\,dx$, $\int \sin^m x\,\cos nx\,dx$.

Unit-III

Cartesian and parametric equations of plane curves, rectification of plane curves, areas of surfaces of revolution and volumes of solids of revolution.

Unit – IV

Scalar and vector triple products, related problems. Vector equations of lines, planes and spheres.

Unit – V

Vector functions, limit, continuity and differentiation of vector functions, and related problems, gradient, divergence and curl, their identities and related problems.

Textbooks:

1. B.C. Das and B.N. Mukherjee, Integral Calculus with Differential Equations, 57th ed., U.N. Dhur
and Sons, 1938 (Unit-I-III)
2. M.R. Spiegel, Schaum's Outlines: Vector Analysis, 2nd ed., McGraw Hill Education, 2017 (Unit-IV, V)

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytical Geometry, 9th ed., Pearson Education India, 2010.
2. Shanti Narayan and P.K. Mittal, Integral Calculus, 35th ed., S. Chand, 2005.
3. Shanti Narayan and P.K. Mittal, A Textbook of Vector Analysis, S. Chand, 2020.

Course Learning Outcome

After completion of the course, learners will be able to

1. Solve problems of definite and indefinite Integrations and learn properties of definite integrals.
2. Prove reduction formulae and solved some problems by using these formulae.
3. Explain the importance of integrations and its techniques to solve real life problems.
4. Understand vector calculus and related problems.