INTEGRAL CALCULUS AND NUMERICAL TECHNIQUES

II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A5BS03	BSC	3	1	-	4	30	70	100

Course Objectives

To learn

1. The concepts of finite differences, operators and relations between them.
2. Evaluation of integrals by using numerical methods.
3. Evaluation of the multiple integrals.
4. Fourier series for periodic functions.
5. Fourier transform and inverse transform of common functions.

UNIT-I INTERPOLATION AND CURVE FITTING

INTERPOLATION: Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Difference of a polynomial – Missing terms - Newton's forward interpolation, Newton's backward interpolation, Gauss's forward and backward interpolation formulae. Interpolation with unequal intervals – Lagrange's interpolation.

CURVE FITTING: Method of least squares - Fitting a straight line, second degree parabola and non-linear curves of the form $y= a e^{bx}$, $y= a x^{b}$, $y = a b^{x}$ by the method of least squares.

UNIT-II NUMERICAL TECHNIQUES

ROOT FINDING TECHNIQUES :

Bisection method-Regula Falsi method and Newton Raphson method.

NUMERICAL INTEGRATION :

Trapezoidal rule - Simpson's one-third rule - Simpson's three-eighth rule.

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS: Taylor's series method – Euler's - modified Euler's Method – Runge-Kutta method.

UNIT-III MULTIPLE INTEGRALS

Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals, Change of variables (Cartesian to polar) in double integrals. Finding the area and volume of a region using double and triple integral.

UNIT-IV FOURIER SERIES

Periodic function-Determination of Fourier Coefficients-Fourier Series-Even and Odd functions-Fourier series in arbitrary interval-Even Odd periodic continuation-Half range Fourier sine and cosine expansions.

UNIT-V FOURIER TRANSFORMS

Fourier integral theorem (statement)-Fourier sine and cosine integrals –Fourier transforms –Fourier sine and cosine transforms-properties- Inverse transforms-Finite Fourier transforms.

Text Books:

1. Ervin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna publishers, 36th Edition, 2010.

Reference Books:

1. G.B.Thomas, calculus and analytical geometry,9th Edition, Pearson Reprint 2006.
2. N.P Bali and Manish Goyal ,A Text of Engineering Mathematics,Laxmi publications,2008.

COURSE OUTCOMES

At the end of the course, student will be able to:

1. Find Interpolating polynomial for the given tabular data.
2. Solve the first order ordinary differential equations using numerical techniques.
3. Evaluate multiple integrals.
4. Find the Fourier series of the given functions.
5. Find the Fourier transforms of the given functions.