ADVANCED CALCULUS

I Year II Semester : Common to All Branches								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
A5BS04	**BSC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	-	4	30	70	100
Contact Classes: 44	**Tutorial Classes: 08**	**Practical Classes: Nil**				**Total Classes: 52**		

Course Objectives
To learn
1. Evaluation of improper integrals using Beta and Gamma functions.
5. The partial derivatives of several variable functions.
3. Concept and application of Laplace transforms.
4. Fourier series for periodic functions.
5. Numerical techniques.

UNIT-I	**BETA GAMMA FUNCTIONS AND MULTIPLE INTEGRALS**	**Classes: 11**

Beta- Gamma Functions and their Properties-Relation between them- Evaluation of improper integrals using Gamma and Beta functions.
Double and triple integrals (Cartesian and polar), Change of order of integration in double integrals.

UNIT-II	**CALCULUS OF SEVERAL VARIABLES**	**Classes: 11**

Limit, Continuity - Partial derivative- Partial derivatives of higher order -Total derivative - Chain rule, Jacobians -functional dependence & independence. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints)

UNIT-III	**LAPLACE TRANSFORMS**	**Classes: 12**

Laplace transforms of elementary functions- First shifting theorem - Change of scale property – Multiplication by t^n- Division by t – Laplace transforms of derivatives and integrals – Unit step function – Second shifting theorem – Periodic function – Evaluation of integrals by Laplace transforms – Inverse Laplace transforms- Method of partial fractions – Other methods of finding inverse transforms – Convolution theorem – Applications of Laplace transforms to ordinary differential equations.

UNIT-IV	**FOURIER SERIES**	**Classes:10**

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	**NUMERICAL TECHNIQUES**	**Classes: 08**

ROOT FINDING TECHNIQUES :
Bisection method-Regula falsi method,Iteration 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.

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.
3. E.L.Ince, Ordinary differential Equations,Dover publications,1958.

E -Text Books:
1.https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS Course:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

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

1. Evaluate the improper integrals using beta and gamma functions.
2. Find the Maxima and Minima of several variable functions.
3. Solve the differential equations using Laplace transform techniques.
4. Find the Fourier series of the periodic functions.
5. Apply various numerical techniques to solve differential equations.