

**BS111: ADVANCED CALCULUS  
CREDITS - 4 (LTP:3,1,0)**

**Course Objectives:**

The basic necessity for the Foundation of Engineering & Technology being Mathematics, the main aim is, to teach Mathematical concepts, develop Mathematical skills & enhance thinking power of students.

**Teaching and Assessment Scheme:**

Teaching Scheme (Hours per week)			Credits	Assessment Scheme				Total Marks
L	T	P		C	Theory Marks		Practical Marks	
			ESE		CE	ESE	CE	150
3	1	0	4	60	40	20	30	

**Course Contents:**

Unit No.	Topics	Teaching Hours
1	Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.	08
2	Rolle's theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Differentiation of Hyperbolic and Inverse Hyperbolic functions, Successive differentiation, standard forms, Leibnitz's theorem and applications, power series, expansion of functions, Indeterminate forms and L'Hospital's rule; Maxima and minima.	08
3	Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.	10
4	Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.	10
5	Sequence and Their Convergence, Convergence and Divergence of Infinite Series, Geometric Series, P-Test, A Necessary Condition for Convergence, Comparison Test, Ratio Test.	06
<b>Total</b>		<b>42</b>

**List of References:**

- Weir, M.D. et al., *Thomas' Calculus (11th Edition)*, Pearson Education, 2008.
- Grewal B. S., "*Higher Engineering Mathematics*", Khanna Publisher, New Delhi, (Latest Edition).
- Sastry S. S., "*Engineering Mathematics – Vol. I and II*", Prentice Hall of India.
- Stuart J., "*Calculus*", Cengage Learning, India Pvt. Ltd. (2008).

**Course Outcomes (COs):**

On successful completion of the course, students will be able to:

1. Apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. Acquire knowledge of advanced differential calculus for single variable and their applications.
4. Get acquainted with the knowledge of functions of several variables.
5. Learn differential and integral calculus of several variables.
6. Apply knowledge of differential and integral calculus of several variables for engineering applications.