

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	CALCULUS
Course Code:	1ET1000101
Pre-requisite Course:	Limit of a function, Continuity and Differentiability of a function, Differentiation and Integration.

Course Objectives:

- CO1-Understand mathematical basic preliminaries.
- CO2-Express physical phenomenon in mathematical formulation.
- CO3-Apply Differential and Integral Calculus in formal representation of various computing constructs.
- CO4-Recognize the importance of Calculus for analysis in engineering problems.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	2	-	5	28	70	12	30	-	-	-	-	100

Subject Contents:

Sr. No	Topic	Total Hours	Weightage (%)
1.	Introduction to Complex Numbers: Revision, De-moivre's Theorem and examples based on it. Roots of complex numbers. Circular functions and Hyperbolic functions, Exponential functions, Logarithmic functions. Relation between circular and hyperbolic functions.	4	9
2.	Successive Differentiation: Successive Derivatives, n^{th} derivative of some standard functions, Leibnitz's Theorem and its examples, Taylor's Theorem (without proof), Maclaurian's series (without proof) and their examples. Expansions of $\sin x$, $\cos x$, e^x etc.	5	12
3.	Indeterminate forms: L' Hospital Rule (without proof) Indeterminate forms $0/0$, ∞/∞ , $\infty * 0$, $\infty - \infty$ Indeterminate forms 0^0 , ∞^0 , 1^∞	3	7
4.	Partial Differentiation: Functions of 2-variables, Limit, Continuity of function of several variables, Partial derivative, Total derivative, Chain rule, Implicit differentiation, Euler's theorem for homogeneous functions and examples based on it. Taylor's formula for functions two variables.	7	17
5.	Applications of Partial Differentiation: Tangent plane, Normal line, Linear approximation, Extreme values of functions of two variables, Lagrange multipliers, Jacobians.	5	12
6.	Improper Integrals: Improper integrals of Type- I and Type – II, Convergence and divergence of improper integrals.	3	7

7.	Applications of Definite Integrals: Volume by Rotation about axes, Volume by Slicing, Volume by Cylindrical shells, Length of Cartesian and Polar curves.	4	9
8.	Multiple Integrals: Double integrals, Evaluation of Double Integrals, Change of order of Integration, Double integrals in polar co-ordinates, Transformation of variables by Jacobian only for double integration, Triple Integrals.	7	17
9.	Applications of Multiple Integrals: Areas, Volumes, Centre of Gravity, Moment of Inertia.	4	10

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002

Reference Books:

1. Calculus, Volumes 1 and 2, T. M. Apostol, Wiley Eastern, Second Edition.
2. Calculus with Early Transcendental Functions, James Stewart, Cengage Learning, Fifth Edition.
3. Thomas' Calculus, Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education, Eleventh Edition.
4. Calculus – Single and Multivariable, Hughes – Hallett et al., John-Wiley and Sons, Fourth Edition.

List of Open Source Software/learning website:

- <http://calculus.org/>
- <http://www.math.com/homeworkhelp/Calculus.html>
- <https://www.khanacademy.org/math/calculus-1>

LAB/Practical- NA

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Discuss the knowledge on the fundamentals of Mathematics	2 Understanding
CLO2	Know the complex numbers and able to perform the algebraic operations for complex numbers	2 Understanding 3 Applying
CLO3	Derive and the list out the formula for the nth derivatives of some standard functions and enable to find nth derivatives of functions.	1 Remembering 3 Applying
CLO4	Understood the concept of Partial derivative and enable to solve the extreme value problems.	2 Understanding 3 Applying
CLO5	Evaluate double and triple integrals techniques over a region in two dimensional and three dimensional geometry	3 Applying 5 Evaluate
CLO6	Enable to find the area and volume using the multiple integrals.	3 Applying

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H											M				
CLO2	H	M														
CLO3	H	M	M									M				
CLO4	H															
CLO5	H	M														
CLO6	H	M										M				

H: High, M: Medium, L: Low