MAT1011	Calculus for Engineers	L T P J C	
Prerequisites:	None	3 0 2 0 4	
Course Objectives:	• To provide the requisite and relevant background necessary to understand the other important engineering mathematics courses offered for Engineers and Scientists. • To introduce important topics of applied mathematics, namely Single and Multivariable Calculus and Vector Calculus are introduced. • To impart the knowledge of Laplace transform, an important transform technique for Engineers which requires knowledge of integration		
Module	**Topics**	**Lecture Hours**	**SLO**
1	**Applications of Single variable differentiation and Integration**: Differentiation- Extrema on an Interval-Rolle's Theorem and the Mean Value Theorem-Increasing and Decreasing functions and First derivative test-Second derivative test-Maxima and Minima-Concavity. Integration-Average function value - Area between curves - Volumes of solids of revolution - Beta and Gamma functions–interrelation	9	1,2,7, 9
2	**Laplace transforms**: Definition of Laplace transform-Properties-Laplace transform of periodic functions-Laplace transform of unit step function, Impulse function-Inverse Laplace transform-Convolution.	7	1,2,7, 9
3	**Multivariable Calculus**: Functions of two variables-limits and continuity-partial derivatives –total differential-Jacobian and it Properties.	4	1,2,7, 9
4	**Applications of Multivariable Calculus**: Taylor's expansion for two variables–maxima and minima–constrained maxima and minima-Lagrange's multiplier method.	5	1,2,7, 9
5	**Multiple integrals**: Evaluation of double integrals–change of order of integration–change of variables between Cartesian and polar co-ordinates- - Evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates- -evaluation of multiple integrals using gamma and beta functions.	8	1,2,7, 9
6	**Vector Differentiation:** Scalar and vector valued functions – gradient, tangent plane–directional derivative-divergence and curl–scalar and vector potentials–Statement of vector identities-Simple problems.	5	1,2,7, 9
7	**Vector Integration:** Line, surface and volume integrals - Statement of Green's, Stroke's and Gauss divergence theorems -verification and evaluation of vector integrals using them.	5	1,2,7, 9
8	**Expert Guest Lecture :** Applications of Differential and integral calculus in Engineering.	2	
	Total Lecture Hours	45	
Tutorial	• Minimum of 10 problems per module **Mode:** Individual Exercises to be submitted to designated RAs	Non-contact	1,2,7, 9
Laboratory exercises • Understanding of the concepts through Mathematics LAB – 12 experiments 1. Introduction to MATLAB through matrices 2. Plotting and visualizing general functions, rates of change of functions/tangent line 3. Understanding integration as Area under the curve		30	1, 2, 7,9,12, 18, 20