

Course Code MAT1001	Calculus and Laplace Transforms		Course Type: LT	
Prerequisite: ----		Credits:4		
Objectives:				
<ul style="list-style-type: none">• The course provides requisite and relevant topics for better understanding of other• important engineering mathematics courses offered for Engineers and Scientists. Three important topics of applied mathematics, namely Multiple integrals, Vector Calculus and Laplace transforms which require knowledge of integration are introduced.				
Expected Outcomes:				
By the end of the course, the students will be able to				
<ul style="list-style-type: none">• evaluate multiple integrals in Cartesian, Cylindrical and Spherical coordinate systems.• understand the powerful language of Vector calculus to deal with subjects such as Fluid Dynamics and Electromagnetic fields.• solve linear ordinary differential equations with constant coefficients				
Student Learning Outcomes (SLO):		a,e,j,k		
Module No	Module Contents	No. of hours	SLOs	
1	Partial derivatives Functions of two variables – Limits and continuity - partial derivatives – Interpretations of partial derivative - Tangent planes and differentials - Chain rule - Directional derivatives and gradient vector – Extreme values and saddle points - Lagrange Multipliers with one constraint - Taylor’s formula for two variables	8	a,e,j,k	
2	Multiple Integrals Double integrals over rectangles and general regions – Double integrals in polar coordinates – change of order of integration – change of variables from Cartesian to polar coordinates - Triple integrals in Cartesian coordinates - change of variables from Cartesian to cylindrical and spherical co-ordinates - Applications of double and triple integrals restricted to area and volume problems	8	a,e,j,k	
3	Vector Calculus Vector fields - Line integrals - work, circulation and flux – Path independence, conservative fields and potential functions - Green’s Theorem (statement) – Curl and Divergence – Surface integrals – Stoke’s Theorem (statement) – Divergence Theorem	9	a,e,j,k	

	(statement) – Applications restricted to area and volume problems		
4	Differential equations First order linear differential equations – Second order linear differential equations with constant coefficients – complementary function - method of undetermined coefficients - method of variation of parameters – general solutions of homogeneous and non-homogeneous equations – Cauchy-Legendre and Cauchy-Euler equations	9	a,e,j,k
5	Laplace transforms Definition of Laplace transform – conditions for existence - Laplace transforms of elementary functions, periodic functions, unit step and unit impulse functions - properties - Definition of Inverse Laplace transform – Inverse Laplace transform by partial fraction method and convolution theorem - solution of simple differential equations using Laplace Transforms	9	a,e,j,k
6	Guest Lectures by experts on contemporary topics	2	
	Total Lecture:	45	
Mode of Teaching and Learning: # Class room teaching # Use of mathematical softwares (such as MATLAB, MATHEMATICA, SAGE, ETC.) as teaching aid # Minimum of 2 hours lectures by experts on contemporary topics			
Mode of Evaluation and assessment: Digital Assignments, Continuous Assessment Tests, Final Assessment Test and unannounced open book examinations, quizzes, student’s portfolio generation and assessment, innovative assessment practices.			
Text Books:			
1.	Thomas’ Calculus by George B. Thomas, Maurice D. Weir, Joel R. Hass, 12 th edition, Pearson Education Inc., 2010		
2.	Higher Engineering Mathematics by B. S. Grewal, 43 rd Edition, Khanna Publishers, India, 2014.		
Reference Books:			
1.	Calculus: Early Transcendentals by James Stewart, 8 th Edition, Cengage Learning, 2014.		
2.	Advanced Engineering Mathematics by Erwin Kreyszig, 10 th Edition, Wiley India Pvt. Ltd., New Delhi, 2015.		

3.	Advanced Engineering Mathematics by Peter V. O' Neil, 7 th edition, Cengage Learning, 2012.	
Recommendation by the Board of Studies on		22-04-2017
Approval by Academic council on		07-09-17
Compiled by		Dr.V.Prabhakar & Dr.C.Vijayalakshmi