Course Code	21MAB101T	Course Name	Calculus and Linear Algebra	Course Category	B	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Mathematics	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR)	The purpose of learning this course is to:	Learning	Program Outcomes (PO)											
			1	2	3	4	5	6	7	8	9	10	11	12
CLR-1:	Apply the concept of Matrices in Science and Engineering	Blooms Level (1-6)	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning
CLR-2:	Utilize Taylor series, Maxima minima, composite function and Jacobian in solving various Engineering problems													
CLR-3:	Apply the concept of Differential Equations in problems of Science and Engineering													
CLR-4:	Utilize the concepts of radius of curvature, evolute, envelope in problems of Science and Engineering													
CLR-5:	Apply Sequences and Series concepts in Science and Engineering													
CLR-6:	Utilize appropriate mathematical techniques for the different solutions required in Science and Engineering applications													

Course Outcomes (CO):	At the end of this course, learners will be able to:	Blooms Level	1	2	3	4	5	6	7	8	9	10	11	12
CO-1:	Apply the concepts of Matrices to find Eigenvalues and Eigen Vectors problem-solving in Science and Engineering	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-2:	Apply Maxima and Minima, Jacobian, and Taylor series to solve problems in Science and Engineering	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-3:	Solve the different types of Differential Equations in Science and Engineering applications	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-4:	Identify Radius, Centre, envelope, and Circle of curvature and apply them in Science and Engineering	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-5:	Identify convergence and divergence of series using different tests in Engineering applications	4	3	3	-	-	-	-	-	-	-	-	-	-
CO-6:	Identify, Analyze and Apply mathematical techniques to arrive at solutions in Science and Engineering	4	3	3	-	-	-	-	-	-	-	-	-	-

Unit-1: Matrices

Characteristic equation- Eigen values of a real matrix- Eigen vectors of a real matrix- Properties of Eigen values Cayley – Hamilton theorem-Finding A inverse using Cayley – Hamilton theorem - Finding higher powers of A - orthogonal reduction of a symmetric matrix to diagonal form -orthogonal reduction of a symmetric matrix to diagonal form-Hands on tutorial session using computer processes-Reduction of Quadratic form to canonical- Quadratic form to canonical form by orthogonal transformations- Orthogonal matrices-Reduction of quadratic form to canonical form.

Unit-2: Functions of several variables

Function of two variables – Partial derivatives- Total differential concepts - Taylor's expansion with two variables up to second order terms- Maxima and Minima- Constrained Maxima and Minima by Lagrangian Multiplier method - Jacobians of two Variables- Properties of Jacobians and Problems.

Unit-3: Ordinary differential equations

Linear equations of second order with constant coefficients when PI=0 or exponential - Linear equations of second order with constant coefficients when PI=sinax or cos ax- Linear equations of second order with constant coefficients when PI= exponential with polynomial-Linear equations of second order with constant coefficients when PI=polynomial with sinhax or coshax- Linear equations of second order variable coefficients- Homogeneous equation of Euler type- Homogeneous equation of Legendre's Type- Equations reducible to homogeneous form- Variation of parameters- Simultaneous first order with constant co-efficient.

Unit-4: Differential Calculus and Beta Gamma functions

Radius of Curvature – Cartesian coordinates-Radius of Curvature – Polar coordinates-Circle of curvature- Circle of curvature- Centre of curvature- Evolute of a parabola- Evolute of an ellipse- Envelope of standard curves. Beta Gamma Functions-Beta Gamma Functions and

Their Properties-Sequences – Definition and Examples- Series – Types of Convergence - Series of Five terms – Test of Convergence-Comparison test – Integral test

Unit-5: Sequence and series

Series of Five terms – Test of Convergence- Comparison test – Integral test- D'Alemberts Ratio test- Raabe's root test.- Covergent of Exponential Series- Cauchy's Root test- Log test- Alternating Series: Leibnitz test- Series of positive and Negative terms.- Absolute Convergence- Conditional Convergence

Learning Resources	1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006. 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010. 3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008 4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010 5. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002 6. *N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008*

Student learning shall be assessed with a weightage of 60% for internal assessment and 40% for end semester examination.

	Bloom's Level of Thinking	Continuous Learning Assessment (CLA) - By the Course Faculty				By The CoE	
		Formative CLA-1 Average of unit test (50%)		Life Long Learning CLA-2 (10%)		Summative Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	20%	-	20%	-
Level 2	Understand	20%	-	20%	-	20%	-
Level 3	Apply	30%	-	30%	-	30%	-
Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers		
a) Experts from Industry	**b) Experts from Higher Technical Institutions**	**c) Internal Experts**
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