

Course Code	18MAB101T	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 Learning Outcomes (PLO)
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CLR-1 :	Application of Matrices in problems of Science and Engineering	1	2	3		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Utilize Taylor series, Maxima minima, composite function and Jacobian in solving real-time application 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 :	Application of Sequences and Series in all problems involving Science and Engineering																			
CLR-6 :	Utilize appropriate mathematical techniques for the different solutions required in Science and Engineering applications																			
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)		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	PSO - 1	PSO - 2	PSO - 3
CLO-1 :	Apply Matrices, Eigenvalues and Eigen Vectors Reduce to Quadratics form in Science and Engineering problem solving	2	80	80		H	-	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-2 :	Apply Maxima and Minima, Jacobian, and Taylor series to solve problems in Science and Engineering	2	85	80		H	-	-	H	H	-	-	-	-	-	-	-	-	-	-
CLO-3 :	Solve the different types of Differential Equations in Science and Engineering applications	2	85	80		-	H	-	-	-	-	-	H	-	-	H	-	-	-	-
CLO-4 :	Identify Radius, Centre, envelope and Circle of curvature and apply them in the problem solving	2	90	90		H	H	-	H	-	-	-	-	H	-	-	H	-	-	-
CLO-5 :	Apply convergence and divergence of series using different test and apply sequences and Series in the problem solving	2	90	80		-	H	H	-	-	-	-	-	H	-	-	H	-	-	-
CLO-6 :	Identify, Analyze and Apply mathematical techniques to arrive at solutions in Science and Engineering	2	90	90		H		H	-	-	-	-	-	H	-	-	H	-	-	-

Duration (hour)	12	12	12	12	12
S-1	SLO-1	Characteristic equation	Functions of two variables – Partial derivatives	Linear equations of second order with constant coefficients when $PI=0$ or exp.	Radius of Curvature – Cartesian coordinates
	SLO-2	Eigen values of a real matrix	Total differential	Linear equations of second order with constant coefficients when $PI=\sin x$ or $\cos x$	Radius of Curvature – Cartesian coordinates
S-2	SLO-1	Eigen vectors of a real matrix	Total differential	Linear equations of second order with constant coefficients when $PI=\text{polynomial}$	Radius of Curvature – Polar coordinates
	SLO-2	Eigen vectors of a real matrix	Taylor's expansion with two variables up to second order terms	Linear eqn. of second order with constant coefficients when $PI=\exp.$ with $\sin x / \cos x$	Radius of Curvature – Polar coordinates
S-3	SLO-1	Properties of Eigen values	Taylor's expansion with two variables up to third order terms	Linear eqn. of second order with constant coefficients when $PI=\exp.$ with polynomial	Circle of curvature
	SLO-2	Cayley – Hamilton theorem	Maxima and Minima	Linear eqn. of 2 nd order with const. coeff. when $PI=\text{polynomial}$ with $\sin x$ or $\cos x$	Circle of curvature
S-4	SLO-1	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 6	Problem solving using tutorial sheet 11
	SLO-2	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 6	Applications of Radius of curvature in engineering
S-5	SLO-1	Finding A inverse using Cayley – Hamilton theorem	Maxima and Minima	Linear equations of second order variable coefficients	Centre of curvature

	SLO-2	Finding higher powers of A using Cayley – Hamilton theorem	Maxima and Minima	Linear equations of second order variable coefficients	Centre of curvature	Raabe's root test.
S-6	SLO-1	orthogonal reduction of a symmetric matrix to diagonal form	Maxima and Minima	Homogeneous equation of Euler type	Centre of curvature	Covergent of Exponential Series
	SLO-2	orthogonal reduction of a symmetric matrix to diagonal form	Constrained Maxima and Minima by Lagrangian Multiplier method	Homogeneous equation of Legendre's Type	Evolute of a parabola	Cauchy's Root test
S-7	SLO-1	orthogonal reduction of a symmetric matrix to diagonal form	Constrained Maxima and Minima by Lagrangian Multiplier method	Homogeneous equation of Legendre's Type	Evolute of an ellipse	Log test
	SLO-2	orthogonal reduction of a symmetric matrix to diagonal form	Constrained Maxima and Minima by Lagrangian Multiplier method	Equations reducible to homogeneous form	Envelope of standard curves	Log test
S-8	SLO-1	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 9	Problem solving using tutorial sheet 12	Problem solving using tutorial sheet 15
	SLO-2	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 9	Applications of Curvature in engineering	Problem solving using tutorial sheet 15
S-9	SLO-1	Reduction of Quadratic form to canonical	Jacobians of two Variables	Equations reducible to homogeneous form	Beta Gamma Functions	Alternating Series: Leibnitz test
	SLO-2	Quadratic form to canonical form by orthogonal transformations	Jacobians of Three variables	Variation of parameters	Beta Gamma Functions and Their Properties	Alternating Series: Leibnitz test
S-10	SLO-1	Quadratic form to canonical form by orthogonal transformations	Jacobians problems	Variation of parameters	Sequences – Definition and Examples	Series of positive and Negative terms.
	SLO-2	Orthogonal matrices	Jacobians Problems	Simultaneous first order equations with constant co-efficient.	Series – Types of Convergence	Series of positive and Negative terms.
S-11	SLO-1	Reduction of quadratic form to canonical form	Properties of Jacobians and Problems	Simultaneous first order equations with constant co-efficient.	Series of Positive terms – Test of Convergence-	Absolute Convergence
	SLO-2	Reduction of quadratic form to canonical form	Properties of Jacobians and problems	Simultaneous first order equations with constant co-efficient.	Comparison test – Integral test-	Conditional Convergence
S-12	SLO-1	Problem solving using tutorial sheet 3	Application of Taylor's series Maxima Minima Jacobians in Engineering	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13	Problem solving using tutorial sheet 13
	SLO-2	Applications of Matrices in Engineering	Application of Taylor's series Maxima Minima Jacobians in Engineering	Applications of Differential Equation in engineering	Problem solving using tutorial sheet 13	Applications Convergence of series in engineering

Learning Resources	1. B. H. Erwin kreyszig, <i>Advanced Engineering Mathematics</i> , 9th Edition, John Wiley & Sons, 2006. 2. B.S. Grewal , <i>Higher Engineering Mathematics</i> , Khanna Publishers, 36th Edition, 2010. 3. Veerarajan T. , <i>Engineering Mathematics for first year</i> , Tata McGraw-Hill, New Delhi, 2008	4. Ramana B.V. , <i>Higher Engineering Mathematics</i> , Tata McGraw Hill New Delhi, 11 th Reprint, 2010 5. G.B. Thomas and R.L. Finney , <i>Calculus and Analytic geometry</i> , 9th Edition, Pearson, Reprint, 2002 6. N.P. Bali and Manish Goyal , <i>A text book of Engineering Mathematics</i> , Laxmi Publications, Reprint, 2008
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Understand										
Level 2	Apply	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Analyze										
Level 3	Evaluate	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers					
Experts from Industry	Experts from Higher Technical Institutions			Internal Experts	
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