

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)
----------------------------------	--	----------	---------------------------------

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	Level of Thinking	Expected Proficiency	Expected Attainment	Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Modern Tool Usage	Society & Culture	Environment & Ethics	Individual & Team	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3		
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:																		
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	Problem solving using tutorial sheet 14
S-5	SLO-1	<i>Finding A inverse using Cayley – Hamilton theorem</i>	<i>Maxima and Minima</i>	<i>Linear equations of second order variable coefficients</i>	<i>Centre of curvature</i>	<i>Raabe's root test.</i>
	SLO-2	<i>Finding higher powers of A using Cayley – Hamilton theorem</i>	<i>Maxima and Minima</i>	<i>Linear equations of second order variable coefficients</i>	<i>Centre of curvature</i>	<i>Raabe's root test.</i>
S-6	SLO-1	<i>orthogonal reduction of a symmetric matrix to diagonal form</i>	<i>Maxima and Minima</i>	<i>Homogeneous equation of Euler type</i>	<i>Centre of curvature</i>	Covergent of Exponential Series
	SLO-2	<i>orthogonal reduction of a symmetric matrix to diagonal form</i>	<i>Constrained Maxima and Minima by Lagrangian Multiplier method</i>	<i>Homogeneous equation of Legendre's Type</i>	<i>Evolute of a parabola</i>	Cauchy's Root test
S-7	SLO-1	<i>orthogonal reduction of a symmetric matrix to diagonal form</i>	<i>Constrained Maxima and Minima by Lagrangian Multiplier method</i>	<i>Homogeneous equation of Legendre's Type</i>	<i>Evolute of an ellipse</i>	Log test
	SLO-2	<i>orthogonal reduction of a symmetric matrix to diagonal form</i>	<i>Constrained Maxima and Minima by Lagrangian Multiplier method</i>	<i>Equations reducible to homogeneous form</i>	<i>Envelope of standard curves</i>	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	<i>Reduction of Quadratic form to canonical</i>	Jacobians of two Variables	<i>Equations reducible to homogeneous form</i>	Beta Gamma Functions	<i>Alternating Series: Leibnitz test</i>
	SLO-2	<i>Quadratic form to canonical form by orthogonal transformations</i>	Jacobians of Three variables	<i>Variation of parameters</i>	Beta Gamma Functions and Their Properties	<i>Alternating Series: Leibnitz test</i>
S-10	SLO-1	<i>Quadratic form to canonical form by orthogonal transformations</i>	Jacobians problems	<i>Variation of parameters</i>	<i>Sequences – Definition and Examples</i>	<i>Series of positive and Negative terms.</i>
	SLO-2	<i>Orthogonal matrices</i>	Jacobians Problems	<i>Simultaneous first order equations with constant co-efficient.</i>	<i>Series – Types of Convergence</i>	<i>Series of positive and Negative terms.</i>
S-11	SLO-1	<i>Reduction of quadratic form to canonical form</i>	Properties of Jacobians and Problems	<i>Simultaneous first order equations with constant co-efficient.</i>	<i>Series of Positive terms – Test of Convergence-</i>	<i>Absolute Convergence</i>
	SLO-2	<i>Reduction of quadratic form to canonical form</i>	Properties of Jacobians and problems	<i>Simultaneous first order equations with constant co-efficient.</i>	<i>Comparison test – Integral test-</i>	<i>Conditional Convergence</i>
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, 9th Edition, John Wiley & Sons, 2006.</i> 2. B.S. Grewal, <i>Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.</i> 3. Veeraranjan T., <i>Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008</i>	4. Ramana B.V., <i>Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010</i> 5. G.B. Thomas and R.L. Finney, <i>Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002</i> 6. N.P. Bali and Manish Goyal, <i>A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008</i>

[illegible]

	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	
1. Mr.V.Mabeshwaran, CTS, Chennai, mabeshwaranv@yahoo.com	1. Dr.K.C.Sivakumar, IIT, Madras, keskumar@iitm.ac.in			1. Dr. A. Govindarajan, SRMIST	
2. Dr. Sricharan Srinivasan, Wipro Technologies, sricharanms@gmail.com	2. Dr. Nanjundan, Bangalore University, nanjundan@gmail.com			2. Dr. Srinivasan, SRMIST	