

Course Learning Syllabus (// includes Learning Outcomes & Learning Plan & Assessment Plan)

Course Code	18MAB101T	Course Name	CALCULUS AND LINEAR ALGEBRA						Course Category	BS	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:	To apply the concept of Taylor series, Maxima Minima, Composite function and Jacobian in problems of science and Engineering				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
CLR – 3:	To apply the concept of Differential Equations in problems of Science and Engineering																						
CLR – 4:	To apply 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																						
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																						
CLO – 1:	Apply the Knowledge of Matrices, Eigen values and Eigen Vectors, Reduce to Quadratics form in problems involving Science and Engineering				2	85	80		L		L						M			H			
CLO – 2:	Gain familiarity in the knowledge of Maxima and Minima, Jacobian and Taylor series and apply them in the problems involving Science and Engineering				2	85	80		L			M	M										
CLO – 3:	Gain knowledge in solution of Differential Equations and its applications in engineering problems				2	85	80			M							M			H			
CLO – 4:	To gain the knowledge of Radius, Centre, envelope and Circle of curvature and apply them in the problems involving Science and Engineering				2	85	80		L	M		M					M			H			
CLO – 5:	Gain the knowledge of convergence and divergence of series using different test and apply sequence and series in the problems involving Science and Engineering				2	85	80			M	L						M			H			

<i>Duration 12 Hours</i>		<i>Learning Unit / Module 1</i>	<i>Proposed Date & Hour</i>	<i>Conducted Date & Hour</i>	<i>Remarks</i>
S-1	SLO-1	Characteristic equation			
	SLO-2	Eigen values of a real matrix			
S-2	SLO-1	Eigen vectors of a real matrix			
	SLO-2	Eigen vectors of a real matrix			
S-3	SLO-1	Properties of Eigen values			
	SLO-2	Cayley-Hamilton theorem			
S-4	SLO-1	Problem solving using Tutorial Sheet – 1			
	SLO-2	Problem solving using Tutorial Sheet – 1			
S-5	SLO-1	Finding A inverse using Cayley-Hamilton theorem			
	SLO-2	Finding higher powers of A using Cayley-Hamilton theorem			
S-6	SLO-1	Orthogonal reduction of a symmetric matrix to diagonal form			
	SLO-2	Orthogonal reduction of a symmetric matrix to diagonal form			
S-7	SLO-1	Orthogonal reduction of a symmetric matrix to diagonal form			
	SLO-2	Orthogonal reduction of a symmetric matrix to diagonal form			
S-8	SLO-1	Problem solving using Tutorial Sheet – 2			
	SLO-2	Problem solving using Tutorial Sheet – 2			
S-9	SLO-1	Reduction of Quadratic form to Canonical form			
	SLO-2	Quadratic form to Canonical form by orthogonal transformations			
S-10	SLO-1	Quadratic form to Canonical form by orthogonal transformations			
	SLO-2	Orthogonal matrices			
S-11	SLO-1	Reduction of Quadratic form to Canonical form			
	SLO-2	Reduction of Quadratic form to Canonical form			
S-12	SLO-1	Problem solving using Tutorial Sheet – 3			
	SLO-2	Applications of Matrices in Engineering			
<i>Duration 12 Hours</i>		<i>Learning Unit / Module 2</i>	<i>Proposed Date & Hour</i>	<i>Conducted Date & Hour</i>	<i>Remarks</i>
S-1	SLO-1	Function of two variables – Partial derivatives			
	SLO-2	Total differential			
S-2	SLO-1	Total differential			
	SLO-2	Taylor's expansion with two variables upto second order terms			
S-3	SLO-1	Taylor's expansion with two variables upto third order terms			
	SLO-2	Maxima and Minima			
S-4	SLO-1	Problem solving using Tutorial Sheet – 4			
	SLO-2	Problem solving using Tutorial Sheet – 4			

S-5	SLO-1	Maxima and Minima			
	SLO-2	Maxima and Minima			
S-6	SLO-1	Maxima and Minima			
	SLO-2	Constrained Maxima and Minima by Lagrangian Multiplier Method			
S-7	SLO-1	Constrained Maxima and Minima by Lagrangian Multiplier Method			
	SLO-2	Constrained Maxima and Minima by Lagrangian Multiplier Method			
S-8	SLO-1	Problem solving using Tutorial Sheet – 5			
	SLO-2	Problem solving using Tutorial Sheet – 5			
S-9	SLO-1	Jacobians of two variables			
	SLO-2	Jacobians of three variables			
S-10	SLO-1	Jacobians problems			
	SLO-2	Jacobians problems			
S-11	SLO-1	Properties of Jacobians and problems			
	SLO-2	Properties of Jacobians and problems			
S-12	SLO-1	Application of Taylor's series, Maxima Minima, Jacobians in Engineering			
	SLO-2	Application of Taylor's series, Maxima Minima, Jacobians in Engineering			
Duration 12 Hours		Learning Unit / Module 3	Proposed Date & Hour	Conducted Date & Hour	Remarks
S-1	SLO-1	Linear equations of second order with constant coefficients when $PI = 0$ or exponential			
	SLO-2	Linear equations of second order with constant coefficients when $PI = \sin a x$ or $\cos a x$			
S-2	SLO-1	Linear equations of second order with constant coefficients when $PI = \text{polynomial}$			
	SLO-2	Linear equations of second order with constant coefficients when $PI = \text{exponential with } \sin a x \text{ or } \cos a x$			
S-3	SLO-1	Linear equations of second order with constant coefficients when $PI = \text{exponential with polynomial}$			
	SLO-2	Linear equations of second order with constant coefficients when $PI = \text{polynomial with } \sinh a x \text{ or } \cosh a x$			
S-4	SLO-1	Problem solving using Tutorial Sheet – 6			
	SLO-2	Problem solving using Tutorial Sheet – 6			
S-5	SLO-1	Linear equations of second order with variable coefficients			
	SLO-2	Linear equations of second order with variable coefficients			
S-6	SLO-1	Homogeneous equation of Euler type			
	SLO-2	Homogeneous equation of Legendre's type			
S-7	SLO-1	Homogeneous equation of Legendre's type			
	SLO-2	Equations reducible to homogeneous form			

S-8	SLO-1	Problem solving using Tutorial Sheet – 7			
	SLO-2	Problem solving using Tutorial Sheet – 7			
S-9	SLO-1	Equations reducible to homogeneous form			
	SLO-2	Variation of parameters			
S-10	SLO-1	Variation of parameters			
	SLO-2	Simultaneous first order with constant coefficient			
S-11	SLO-1	Simultaneous first order with constant coefficient			
	SLO-2	Simultaneous first order with constant coefficient			
S-12	SLO-1	Problem solving using Tutorial Sheet – 8			
	SLO-2	Application of differential equation in Engineering			
Duration 12 Hours		Learning Unit / Module 4	Proposed Date & Hour	Conducted Date & Hour	Remarks
S-1	SLO-1	Radius of curvature – Cartesian coordinates			
	SLO-2	Radius of curvature – Cartesian coordinates			
S-2	SLO-1	Radius of curvature – Polar coordinates			
	SLO-2	Radius of curvature – Polar coordinates			
S-3	SLO-1	Circle of curvature			
	SLO-2	Circle of curvature			
S-4	SLO-1	Problem solving using Tutorial Sheet – 9			
	SLO-2	Application of Radius of curvature in Engineering			
S-5	SLO-1	Centre of curvature			
	SLO-2	Centre of curvature			
S-6	SLO-1	Centre of curvature			
	SLO-2	Evolute of a parabola			
S-7	SLO-1	Evolute of an ellipse			
	SLO-2	Envelope of standard curves			
S-8	SLO-1	Problem solving using Tutorial Sheet – 10			
	SLO-2	Application of curvature in Engineering			
S-9	SLO-1	Beta Gamma functions			
	SLO-2	Beta Gamma functions and their properties			
S-10	SLO-1	Sequences – Definition and Examples			
	SLO-2	Series – Types of convergence			
S-11	SLO-1	Series of positive terms – Test of convergence			
	SLO-2	Comparison test – Integral test			
S-12	SLO-1	Problem solving using Tutorial Sheet – 11			
	SLO-2	Problem solving using Tutorial Sheet – 11			

<i>Duration 12 Hours</i>		<i>Learning Unit / Module 5</i>	<i>Proposed Date & Hour</i>	<i>Conducted Date & Hour</i>	<i>Remarks</i>
S-1	SLO-1	Series of positive terms – Test of convergence			
	SLO-2	Comparison test – Integral test			
S-2	SLO-1	Comparison test – Integral test			
	SLO-2	Comparison test – Integral test			
S-3	SLO-1	D'Alembert's Ratio test			
	SLO-2	D'Alembert's Ratio test			
S-4	SLO-1	Problem solving using Tutorial Sheet – 12			
	SLO-2	Problem solving using Tutorial Sheet – 12			
S-5	SLO-1	Raabe's root test			
	SLO-2	Raabe's root test			
S-6	SLO-1	Convergent of Exponential series			
	SLO-2	Cauchy's root test			
S-7	SLO-1	Log test			
	SLO-2	Log test			
S-8	SLO-1	Problem solving using Tutorial Sheet – 13			
	SLO-2	Problem solving using Tutorial Sheet – 13			
S-9	SLO-1	Alternating series: Leibnitz test			
	SLO-2	Alternating series: Leibnitz test			
S-10	SLO-1	Series of positive and negative terms			
	SLO-2	Series of positive and negative terms			
S-11	SLO-1	Absolute convergence			
	SLO-2	Conditional convergence			
S-12	SLO-1	Problem solving using Tutorial Sheet – 14			
	SLO-2	Applications of Convergence of series in Engineering			

<i>Learning Resources</i>	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, 11 th 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.	
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	<i>Level of Thinking</i>	<i>Continuous Assessment</i>			<i>Final Examination (40%)</i>
		<i>CA - 1 (20%)</i>	<i>CA - 2 (20%)</i>	<i>CA - 3 (20%) #</i>	
<i>Level 1</i>	<i>Remember</i>	40 %	30 %	30 %	30 %
	<i>Understand</i>				
<i>Level 2</i>	<i>Apply</i>	40 %	40 %	40 %	40 %
	<i>Analyze</i>				
<i>Level 3</i>	<i>Evaluate</i>	20 %	30 %	30 %	30 %
	<i>Create</i>				

CA - 3 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

SLO – Session Learning Outcome

<i>Course Designers</i>							
<i>(a) Experts from Industry</i>							
1	Mr.V.Maheshwaran	CTS, Chennai	maheshwaranv@yahoo.com				
<i>(b) Experts from Higher Technical Institutions</i>							
3	Dr.K.C.Sivakumar	IIT, Madras	kcskumar@iitm.ac.in	4	Dr.Nanjundan	Bangalore University	nanzundan@gmail.com
<i>(b) Internal Experts</i>							
5	Dr.A.Govindarajan	SRMIST	govindarajan.a@ktr.srmuniv.ac.in	6	Dr.Srinivasan	SRMIST	srinivasan.va@srmuniv.ac.in

To emerge as a World - Class University in creating and disseminating knowledge, and providing students a unique learning experience in Science, Technology, Medicine, Management and other areas of scholarship that will best serve the world and betterment of mankind.

MOVE UP through international alliances and collaborative initiatives to achieve global excellence. ACCOMPLISH A PROCESS to advance knowledge in a rigorous academic and research environment.

ATTRACT AND BUILD PEOPLE in a rewarding and inspiring environment by fostering freedom, empowerment, creativity and innovation.

Prepared by

Approved by