Template 6 : Course Learning Syllabus

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:
CLR-1:	Application of Matrices in problems of Science and Engineering
CLR-2:	To apply the concept of Taylor series, Maxima minima, composite function and Jacobian in problems of science and Engineering
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:	Learning: Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO): 1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt. & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO - 3
CLO-1:	Apply the Knowledge of Matrices, Eigenvalues 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 tn 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, envelopre and Circle of 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 sequences and Series in the problems involving Science and Engineering	2	85	80		M	L						M			H			

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		12	12	12	12	12
S-1	SLO-1	Characteristic equation	Function of two variables - Partial derivatives	Linear equations of second order with constant coefficients when PI=0 or exponential	Radius of Curvature - Cartesian coordinates	Series of Five terms - Test of Convergence-
	SLO-2	Eigen values of a real matrix	Total differential	Linear equations of second order with constant coefficients when PI=sinax or cosax	Radius of Curvature - Cartesian coordinates	Comparison test - Integral test-
S-2	SLO-1	Eigen vectors of a real matrix	Total differential	Linear equations of second order with constant coefficients when PI=polynomial	Radius of Curvature - Polar coordinates	Comparison test - Integral test-
	SLO-2	Eigen vectors of a real matrix	Taylor's expansion with two variables up to second order terms	Linear equations of second order with constant coefficients when PI=exponential with sinax or Cosax	Radius of Curvature - Polar coordinates	Comparison test - Integral test-.
S-3	SLO-1	Properties of Eigen values	Taylor's expansion with two variables up to third order terms	Linear equations of second order with constant coefficients when PI= exponential with polynomial	Circle of curvature	D'Alemberts Ratio test,
	SLO-2	Cayley - Hamilton theorem	Maxima and Minima	Linear equations of second order with constant coefficients when PI=polynomial with sinhax or coshax	Circle of curvature	D'Alemberts Ratio test,
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	Problem solving using tutorial sheet 14
	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-	Finding A inverse	Maxima and Minima	Linear equations of	Centre of curvature	Raabe's root test.

	1	using Cayley – Hamilton theorem		second order variable coefficients		
	SLO-2	Finging 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 with constant co-efficient.	Series – Types of Convergence	Series of positive and Negative terms.
S-11	SLO-1	Reduction of quadratic form to	Properties of Jacobians and	Simultaneous first order with constant	Series of Five terms – Test of	Absolute Convergence

		canonical form	Problems	co-efficient.	Convergence-	
	SLO-2	Reduction of quadratic form to canonical form	Properties of Jacobians and problems	Simultaneous first order 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. 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

	Level of Thinking	Continuous Assessment			Final Examination (40%)
		CA – 1 (20%)	CA – 2 (20%)	CA – 3 (20%) #	
Level 1	Remember Understand	40 %	30 %	30 %	30 %
Level 2	Apply Analyze	40 %	40 %	40 %	40 %
Level 3	Evaluate Create	20 %	30 %	30 %	30 %

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

Course Designers							
(a) Experts from Industry							
1	Mr.V.Maheshwaran	CTS, Chennai	maheshwaranv@yahoo.com				
(b) Experts from Higher Technical Institutions							
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(b) Internal Experts							
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Template 6 : Course Learning Syllabus

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

Course Code	18MAB102T	Course Name	ADVANCED CALCULUS AND COMPLEX ANALYSIS	Course Category	BS	Basic Sciences	L	T	P	C
							3	1	0	4

Pre-requisite Courses	18MAB101T	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:
CLR-1:	To gain knowledge in evaluation of Double and triple Integral and apply then in problems in Engineering· Industries·
CLR-2:	To gain knowledge in evaluation of Surface and Volume Integral are Application of Gauss theorem, Stokes and Green's theorem all Engineering fields
CLR-3:	To know the techniques of Laplace Transforms and inverse transform and apply them in the problems of Science and Engineering
CLR-4:	To know the properties of Complex functions and apply them in the all Engineering fields
CLR-5:	To gain knowledge of evaluation of improper integrals involving complex functions using Residue theorem and apply them in Engineering fields

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Learning: Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Program Learning Outcomes (PLO): 1 Engineering Knowledge	2 Problem Analysis	3 Design & Development	4 Analysis, Design, Research	5 Modern Tool Usage	6 Society & Culture	7 Environment & Sustainability	8 Ethics	9 Individual & Team Work	10 Communication	11 Project Mgt· & Finance	12 Life Long Learning	13 PSO - 1	14 PSO - 2	15 PSO - 3
CLO-1:	Gain familiarity in evaluation of multiple integrals using change of variables,	2	85	80	L		M						M			H			
CLO-2:	Gain knowledge in applying the techniques of vector calculus in problems involving Science and Engineering In solving ODE	2	85	80	L			M	M										
CLO-3:	Many Engineering problems can be transformed in to problems involving ODE, PDE and integrals· Laplace transform method and complex analytic methods can be used for solving them	2	85	80		M							M			H			
CLO-4:	Gain knowledge in Fundamentals of complex analytic functions and its properties	2	85	80	L	M		L					M			H			
CLO-5	Gain knowledge in evaluating improper integrals using	2	85	80		M	M						M			H			

:	*Residue theorem involving problems in Science and Engineering*																

		Learning Unit / Module 1	Learning Unit / Module 2	Learning Unit / Module 3	Learning Unit / Module 4	Learning Unit / Module 5
Duration (hour)		12	12	12	12	12
S-1	SLO-1	Evaluation of double integration Cartesian and plane polar coordinates	Review of vectors in 2,3 dimensions ,	Laplace Transforms of standard functions	Definition of Analytic Function – Cauchy Riemann equations	Cauchy's integral formulae - Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Gradient, divergence,	Transforms properties	Cauchy Riemann equations	Cauchy's integral formulae- Problems
S-2	SLO-1	Evaluation of double integration of plane polar coordinates	curl – Solenoidal	Transforms of Derivatives and Integrals	Properties of analytic function functions	Cauchy's integral formulae- Problems
	SLO-2	Evaluation of double integration of plane polar coordinates	Irrotational fields	Transform of derivatives and integrals	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
S-3	SLO-1	Evaluation of double integral by changing of order of integration	Vector identities (without proof) – Directional derivatives	Initial value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Taylor's expansions with simple problems
	SLO-2	Evaluation of double integral by changing of order of integration	Line integrals	Final value theorems (without proof) and verification for some problems	Determination of analytic function using – Milne-Thomson's method	Laurent's expansions with simple problems
S-4	SLO-1	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 7	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13
	SLO-2	Problem solving using tutorial sheet 1	Problem solving using tutorial sheet 4	Problem solving using tutorial sheet 7	Problem solving using tutorial sheet 10	Problem solving using tutorial sheet 13
S-5	SLO-1	Evaluation of double integral by changing of order of integration	Line integrals	Inverse Laplace transforms using partial fractions	Conformal mappings: magnification	Laurent's expansions with simple problems

	SLO-2	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms sing Partial fractions	Conformal mappings: rotation	Singularities
S-6	SLO-1	Area as a double integral (Cartesian)	Surface integrals	Inverse Laplace transforms section shifting theorem	Conformal mappings: inversion	Types of Poles and Residues
	SLO-2	Area as a double integral (polar)	Volume Integrals	LT using Convolution theorem -problems only	Conformal mappings: inversion	Types of Poles and Residues
S-7	SLO-1	Area as a double integral (polar)	Green's theorem (without proof),	LT using Convolution theorem -problems only	Conformal mappings: reflection	Cauchy's residue theorem (without proof)-
	SLO-2	Triple integration in Cartesian coordinates	Green's theorem (without proof),	ILT using Convolution theorem -problems only	Conformal mappings: reflection	Contour integration: Unit circle·
S-8	SLO-1	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 8	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
	SLO-2	Problem solving using tutorial sheet 2	Problem solving using tutorial sheet 5	Problem solving using tutorial sheet 8	Problem solving using tutorial sheet 11	Problem solving using tutorial sheet 14
S-9	SLO-1	Conversion from Cartesian to polar in double integrals	Gauss divergence theorem (without proof), verification	LT of periodic functions -problems only	bilinear transformation	Contour integration: Unit circle·
	SLO-2	Conversion from Cartesian to polar in double integrals	Gauss divergence theorem (without proof) applications to cubes·	LT of periodic functions -problems only	bilinear transformation	Contour integration: Unit circle
S-10	SLO-1	Triple integration in Cartesian coordinates	Gauss divergence theorem (without proof applications to parallelepiped·	Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficient only	bilinear transformation	Contour integration: semicircular contour·
	SLO-2	Triple integration in Cartesian coordinates	Stoke's theorems (without proof) - Verification	Applications of Laplace transforms for solving linear ordinary differential equations up to	bilinear transformation	Contour integration: semicircular contour·

				second order with constant coefficient only		
S-11	SLO-1	Triple integration in Cartesian coordinates	Stoke's theorems (without proof) - Applications to cubes	Solution of Integral equation and integral equation involving convolution type	Cauchy's integral theorem (without proof)	Contour integration: semicircular contour·
	SLO-2	Area of triple Integral	Stoke's theorems (without proof) - Applications to parallelepiped only·	Solution of Integral equation and integral equation involving convolution type	Cauchy's integral theorem applications	Contour integration: semicircular contour·
S-12	SLO-1	Problem solving using tutorial sheet 3	Problem solving using tutorial sheet 6	Problem solving using tutorial sheet 9	Problem solving using tutorial sheet 12	Problem solving using tutorial sheet 15
	SLO-2	Application of Multiple integral in engineering	Application of Line and Volume Integrals in engineering	Application of Laplace Transform in engineering	Application of Bilinear Transformation and Cauchy Integral in engineering	Application Contour integration in engineering

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1	Mr.V.Maheswaran	CTS, Chennai	maheswaran@yahoo.com	2			
(b) Experts from Higher Technical Institutions							
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(b) Internal Experts							
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