Course Designers		
Experts from Industry	**Experts from Higher Technical Institutions**	**Internal Experts**
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Course Code	UMS20G02T	Course Name	MATHEMATICAL FOUNDATION	Course Category	G	Generic Elective Course	L	T	P	C
							3	1	0	4

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

Course Learning Rationale (CLR):	*The purpose of learning this course is to:*	Learning	Program Learning Outcomes (PLO)

		1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-1 :	*To apply the basic concepts and theorems of matrices*																		
CLR-2 :	*To learn the concepts of polynomial equations, reciprocal equations and approximation of roots.*																		
CLR-3 :	*To learn the basic concepts of differentiation, successive differentiation and partial differentiation*																		
CLR-4 :	*To learn the basic concepts of integration and to apply Bernoulli's formula and reduction formula.*																		
CLR-5 :	*To understand how a function is transformed by Laplace and inverse Laplace methods and how they are related.*																		

Course Learning Outcomes (CLO):	*At the end of this course, learners will be able to:*	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	Scientific 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 :	Gaining knowledge in basic concepts of matrix method.	3	85	80	L	L	L	M	L	-	-	-	L	M	H	M	-	-	-
CLO-2 :	Gaining knowledge in the concepts of polynomial equations and reciprocal equations and applying Horner's and Newton's methods for finding roots	3	80	75	M	M	M	M	M	-	-	-	M	M	H	M	-	-	-
CLO-3 :	Understanding the concepts of differentiation and to solve the problems of Radius of	3	85	80	H	H	M	H	M	-	-	-	M	M	H	H	-	-	-

	curvature and Euler's theorem															
CLO-4 :	Understanding the concepts of integration and to evaluate reduction formula.	3	85	80		M	H	M	H	M	-	-	-	M	M	H	H	-	-	-
CLO-5 :	Getting the knowledge of Laplace and Inverse Laplace transformation and their application.	3	85	80		H	H	M	H	H	-	-	-	M	M	H	M	-	-	-

		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	Definition and types of matrix	Introduction to algebraic equations	Introduction to Differentiation	Introduction to integration	Introduction to Laplace Transforms
	SLO-2	Examples of types of matrix.	Types of algebraic equations	Solving basic problems	Basic problems on integration	Basic properties
S-2	SLO-1	Symmetric matrix	Relation between roots and coefficients of equation	More examples	Integration of polynomial functions	Problems on Laplace Transforms
	SLO-2	Skew symmetric matrix	Simple problems	More examples	Integration of polynomial functions	Problems on Laplace Transforms
S-3	SLO-1	Hermitian matrix	Problems on irrational roots	Minima of functions of single variable	Integration of irrational functions	Solving problems of type $L\left[e^{at}f(t)\right]$
	SLO-2	Skew Hermitian matrix	Problems on complex roots	Maxima of functions of single variable	Integration of irrational functions	Solving problems of type $L\left[e^{at}f(t)\right]$
S 4	SLO-1	Orthogonal matrix	Reciprocal equations-Definition	Minima and maxima of functions of single variable	Integration of irrational functions	Solving problems of type $L\left[tf(t)\right]$
	SLO-2	Unitary matrix	Solving Reciprocal equation of degree four with like and unlike signs for its coefficients-Type I	Minima and maxima of functions of single variable	Integration of irrational functions	Solving problems of type $L\left[tf(t)\right]$
S-5	SLO-1	Eigen values of a matrix	Solving reciprocal equation of odd degree with like signs for its coefficients-Type II	More examples on maxima and minima	Integration by the method of partial fractions	Solving problems of type $L\left[tf(t)\right]$
	SLO-2	Eigen values of a matrix	Solving reciprocal equation of odd degree with like signs for its coefficients-Type II	More examples on maxima and minima	Integration by the method of partial fractions	Solving problems of type $L\left[tf(t)\right]$
S-6	SLO-1	Eigen vectors of a matrix	Solving reciprocal equation of odd degree with unlike signs for its coefficients-Type III	Introduction to curvature	Integration by the method of partial fractions	Solving problems of type $L\left[e^{at}tf(t)\right]$
	SLO-2	Eigen vectors of a matrix	Solving reciprocal equation of odd degree with unlike signs for its coefficients-Type III	Radius of curvature	Integration by the method of partial fractions	Solving problems of type $L\left[e^{at}tf(t)\right]$

S -7	SLO-1	Eigen values and eigen vectors of a matrix	Solving reciprocal equation of even degree with unlike signs for its coefficients and the middle term is absent-Type IV	Problems based on radius of curvature	Integration by the method of partial fractions	Solving problems of type $L\left[e^{at}tf(t)\right]$
	SLO-2	Eigen values and eigen vectors of a matrix	Solving reciprocal equation of even degree with unlike signs for its coefficients and the middle term is absent-Type IV	Problems based on radius of curvature	Integration by the method of partial fractions	Solving problems of type $L\left[e^{at}tf(t)\right]$
S -8	SLO-1	Eigen values and eigen vectors of a matrix	Problems based on Type I and II	Problems based on radius of curvature	Bernoulli's formula	Solving problems of type $L\left[\dfrac{f(t)}{t}\right]$
	SLO-2	Eigen values and eigen vectors of a matrix	Problems based on Type III and IV	Problems based on radius of curvature	Simple problems	Solving problems of type $L\left[\dfrac{f(t)}{t}\right]$
S-9	SLO-1	Cayley Hamilton theorem	Newton-Raphson method.	Partial differentiation-Introduction	Reduction formula for $\int \sin^n x\,dx$	Introduction of Inverse Laplace transforms
	SLO-2	Problems based on Cayley Hamilton theorem	Problems on Newton-Raphson method.	Simple problems	Reduction formula for $\int \sin^n x\,dx$	Simple problems
S-10	SLO-1	Problems based on Cayley Hamilton theorem	Problems on Newton-Raphson method.	Euler's theorem	Reduction formula for $\int \cos^n x\,dx$	Basic problems on Inverse Laplace Transforms
	SLO-2	Problems based on Cayley Hamilton theorem	Problems on Newton-Raphson method.	Problems on Euler's theorem	Reduction formula for $\int \cos^n x\,dx$	Basic problems on Inverse Laplace Transforms
S-11	SLO-1	Cramer's rule	Horner's method	Problems on Euler's theorem	Reduction formula for $\int_{0}^{\frac{\pi}{2}} \sin^n x\,dx$	Finding inverse Laplace transforms by the method of partial fractions
	SLO-2	Problems based on Cramer's rule.	Problems on Horner's method	Problems on Euler's theorem	Reduction formula for $\int_{0}^{\frac{\pi}{2}} \sin^n x\,dx$	Finding inverse Laplace transforms by the method of partial fractions

					Reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$	
S-12	SLO-1	Problems based on Cramer's rule.	Problems on Horner's method	Problems on Euler's theorem	Reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$	Finding inverse Laplace transforms by the method of partial fractions
	SLO-2	Problems based on Cramer's rule.	Problems on Horner's method	Problems on Euler's theorem	Reduction formula for $\int_0^{\frac{\pi}{2}} \cos^n x\,dx$	Finding inverse Laplace transforms by the method of partial fractions

Learning Resources	*Theory:* *1.Dr.A.Singaravelu, Allied Mathematics, 7th edition, A.R.S.Publicatiions, 2015* *2., P.R.Vittal, <edition>, Margham Publications, <year of publication>*

Learning Assesment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	30%		30%		30%		30%		30%	-
	Understand										
Level 2	Apply	40%		40%		40%		40%		40%	-
	Analyze										
Level 3	Evaluate	30%		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 Academic	**Internal Experts**
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