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:*
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:*	Learning		
		1	2	3
		Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	*Gaining knowledge in basic concepts of matrix method.*	*3*	*85*	*80*
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*
CLO-3 :	*Understanding the concepts of differentiation and to solve the problems of Radius of curvature and Euler's theorem*	*3*	*85*	*80*
CLO-4 :	*Understanding the concepts of integration and to evaluate reduction formula.*	*3*	*85*	*80*
CLO-5 :	*Getting the knowledge of Laplace and Inverse Laplace transformation and their application.*	*3*	*85*	*80*

Program Learning Outcomes (PLO)													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
L	*L*	*L*	*M*	*L*	-	-	-	*L*	*M*	*H*	*M*	-	-	-
M	*M*	*M*	*M*	*M*	-	-	-	*M*	*M*	*H*	*M*	-	-	-
H	*H*	*M*	*H*	*M*	-	-	-	*M*	*M*	*H*	*H*	-	-	-
M	*H*	*M*	*H*	*M*	-	-	-	*M*	*M*	*H*	*H*	-	-	-
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 $L[e^{at}f(t)]$
	SLO-2	Skew hermitian matrix	Problems on complex roots	*Maxima of functions of single variable*	Integration of irrational functions	Solving problems of type $L[e^{at}f(t)]$
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 $L[tf(t)]$
	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 $L[tf(t)]$

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 $L[tf(t)]$
	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 $L[tf(t)]$
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 $L[e^{at}tf(t)]$
	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 $L[e^{at}tf(t)]$
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 $L[e^{at}tf(t)]$
	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 $L[e^{at}tf(t)]$
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 $L\left[\frac{f(t)}{t}\right]$
	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 $L\left[\frac{f(t)}{t}\right]$
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

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 Assessment

Level	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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