

Course Code	PAD21G01T	Course Name	MATHEMATICS FOR DATA SCIENCE	Course Category	G	Generic Elective Course	L	T	P	C
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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)
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CLR-1 :	To apply the basic concepts and theorems of matrices	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	To understand basic mathematical concepts needed for Data Science	Le	Ex	Ex	Sci	Pr	De	An	Mo	So	En	Eth	Ind	Co	Pr	Lif	PS	PS	PS
CLR-3 :	To learn the basic concepts of differentiation and integration	vel	pe	pe	ent	obl	sig	alis	der	cie	vir	ics	ivid	om	oje	e	O	O	O
CLR-4 :	To understand and implement linear algebra and matrices concept	of	cte	cte	ific	em	n &	De	To	ty	on		ual	m	ct	Lo	1	2	3
CLR-5 :	To strengthen the knowledge in Calculus and Vector analysis	Thi	Pr	Att	Kn	An	De	sig	ol	&	me		&	mu	Mg	ng			
CLR-6 :	To equip the students with the knowledge of Mathematics and its applications	nk	of	ain	owl	ly	vel	n,	Us	Cul	Su		Te	n	t.	L			
		ing	nc	me	ge	y	op	re	age	tur	sta		am	on	&	ear			
		(Bl	y	nt		(%)	me	arc		e	na		Wo	ce	Fin	ning			
		oom)	(%)	(%)				h			bili		rk		ance				
		m)))							ty								
Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:																		
CLO-1 :	Gain knowledge in basic concepts of matrix method.	3	85	80	L	L	-	L	M	-	-	-	M	M	-	M	-	-	-
CLO-2 :	Understand concepts of linear transformation	3	80	75	M	M	-	H	L	-	-	-	M	M	-	H	-	-	-
CLO-3 :	Understand the concepts of differentiation	3	85	80	M	H	M	H	M	-	-	-	M	M	-	M	-	-	-
CLO-4 :	Acquire the knowledge of applying mathematics in data science	3	85	80	M	H	H	H	M	-	-	-	M	M	-	H	-	-	-
CLO-5 :	Learners will understand the concept of numerical integration	3	85	80	H	H	H	M	M	-	-	-	M	M	-	H	-	-	-
CLO-6 :	To be familiarized with the fundamentals of vector analysis	3	85	80	M	M	H	M	L	-	-	-	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 System of linear equations-Introduction	Linear transformation – Introduction	Characteristic equation	Differentiation - Introduction	Vector analysis – Introduction
	SLO-2 Matrix form of system	Linear transformation –examples	Eigen values of a real matrix	Functions and derivatives	Geometric approach
S-2	SLO-1 Elementary matrix operations	Linear transformation –properties	Eigen values of a real matrix	Multivariate functions	Vector addition by a scalar

	SLO-2	Matrix addition	Matrix transformation of a Linear transformation	Eigen vectors of a real matrix	Multivariate functions - Problems	Vector multiplication by a scalar
S-3	SLO-1	Matrix scalar multiplication	Problems	Eigen vectors of a real matrix	Partial derivatives	Practice problems
	SLO-2	Elementary row operations	Linear transformation corresponding to a matrix problem	Properties of Eigen values	Problems on partial derivatives	Co-ordinate vectors
S-4	SLO-1	Elementary row reduction	Change of basis concept	Minimal polynomial	Line integral	Vector addition
	SLO-2	Elementary row reduction	Isomorphism – Problems	Cayley-Hamilton theorem	Problems on line integral	Properties of vector operations
S-5	SLO-1	Matrix Echelon form	Rank of a Matrix	Problems based on Cayley-Hamilton theorem	Double integral	Transposition operator
	SLO-2	Matrix Echelon form	Problems on Rank of a Matrix	Problems based on Cayley-Hamilton theorem	Problems on double integral	Practice problems
S-6	SLO-1	Practice problems	Determinant of a Matrix	Invariant sub-spaces	Triple integral	Norms- Definition and examples
	SLO-2	Gauss elimination method	Problem on Determinant of a Matrix	Matrix - Diagonal forms	Problems on triple integral	Common vector norms
S-7	SLO-1	Problems on Gauss elimination method	Theorems on Rank of Matrices	Matrix - Diagonal forms - Problems	Multiple integration	Norm representations
	SLO-2	Solving linear system	Nullity theorem	Matrix - Triangular forms	Applications of Multiple integration	Problems and applications
S-8	SLO-1	Gauss Jordan method	Application of Nullity theorem	Matrix - Triangular forms	Examples of multiple integrals	The dot product - Definition
	SLO-2	Practice problems	Linear functional-Examples	Hermitian matrices	Polar coordinates	Geometric interpretation
S-9	SLO-1	Vector spaces-Definition and examples.	Linear functional-properties	Skew- Hermitian matrices	Polar coordinates - Problems	Parallel and perpendicular components
	SLO-2	Vector space-Simple properties		Unitary matrices	Cylindrical coordinates	Projection
S-10	SLO-1	Problems based on vector space	Dual space- Definition and examples	Practice problems	Cylindrical coordinates - Problems	Practice problems
	SLO-2	Subspaces – Definition and examples	Dual space – problems	Direct sum decompositions	Problems on Cylindrical coordinates	Properties of dot product
S-11	SLO-1	Practice problems	Annihilator – Examples	Direct sum decompositions - Problems	Spherical polar coordinates	Commutative property
	SLO-2	Linear dependence	Annihilator – Problems	Invariant direct sum	Spherical polar coordinates - Problems	Distributive property
S-12	SLO-1	Linear dependence-Properties	Double dual space	Primary decomposition theorem.	Problems on Spherical polar coordinates	Applications of properties
	SLO-2	Problems based on linear dependence	Transpose of a linear transformation	Problems on Primary decomposition	Differential expressions	Problems on dot product properties

Learning	TEXT BOOK:	REFERENCE BOOKS:
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Resources	<ul style="list-style-type: none">• <i>Essential Math for Data Science</i>, by Hadrien Jean, November 2020• <i>Data Science from Scratch</i>, by Joel Grus, April 2015	<i>Principles of Data Science</i> , by Sinan Ozdemir, December 2016
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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
	J.Madhumitha , Assistant Professor, Department of Mathematics and Statistics