Programme	B. Sc. Mathematics Honours			
Course Title	**MATRIX THEORY**			
Course Code	MAT1MN105			
Type of Course	**Minor**			
Semester	I			
Academic Level	100 – 199			
Course Details	Credit	Lecture/Tutorial per week	Practical per week	Total Hours
	4	4	-	60
Pre-requisites	Higher Secondary Algebra			
Course Summary	This course provides a comprehensive introduction to linear algebra, focusing on systems of linear equations, matrix algebra, determinants, and Euclidean vector spaces. Through a blend of theoretical concepts and practical applications, students will develop a strong foundation in linear algebra techniques and their uses in various fields.			

Course Outcomes (CO):

CO	CO Statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Understand the fundamental operations and concepts of systems of linear equations, including Gaussian elimination and elementary row operations, leading to an understanding of matrix algebra	U	C	Internal Exam/Assignment/ Seminar/ Viva / End Sem Exam
CO2	Apply the properties of determinants to evaluate them using cofactor expansions and row reduction techniques, and comprehend the relationships between matrices and determinants.	Ap	P	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
CO3	Explore the geometry and properties of Euclidean vector spaces, including norms, dot products, distances, orthogonality, and the cross product.	An	C	Internal Exam/ Assignment/ Seminar/ Viva/ End Sem Exam
* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C) # - Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)				

Detailed Syllabus:

Text : Howard Anton and Chriss Rorres, Elementary Linear Algebra (11/e), Applications version, Wiley

Module	Unit	Content	Hrs (48 +12)	Ext. Marks (70)
I		**System Of Linear Equations**	12	
	1	Section 1.1: -Introduction to systems of linear equations – up to and including Example 5		
	2	Section 1.1: - Rest of the section.		
	3	1.2 :- Gaussian Elimination – up to Example 5		
	4	Section 1.2; - From Example 5 onwards.		
	5	Section 1.3: - Matrices and Matrix Operations – up to and including Example 7.		
	6	Section 1.3; - Rest of the section.		
II		**Matrix Algebra**	12	
	7	Section 1.4: - Inverses; Algebraic Properties of Matrices - up to and including Example 6.		
	8	Section 1.4; - Properties of inverses onwards – up to and including Example 12.		
	9	Section 1.4: - Rest of the section.		
	10	Section 1.5; - Elementary matrices and a method for finding inverse (Proof of Theorem 1.5.3 is optional)		
	11	Section 1.6: - More on Linear systems and Invertible Matrices (Proofs of all the theorems are optional)		
	12	Section 1.7; - Diagonal, Triangular and Symmetric Matrices (Proof of theorem 1.7.1 is optional)		
III		**Determinants**	12	
	13	Section 2.1 :- Determinants by Cofactor expansions		
	14	Section 2.2; - Evaluating determinants by row reduction		
	15	Section 2.3: - Properties of determinants; Cramer's Rule – up to and including Theorem 3.2.5 (proofs of all the results are optional).		
	16	Section 2.3;- up to and including Example 7.		
	17	Section 2.3;- rest of the section.(proofs of all the results are optional)		
IV		**Euclidean Vector Spaces**	12	
	18	Section 3.1:- Vectors in 2-space, 3-space and n-space		
	19	Section 3.2:- Norm , dot product and distance in R^n (proofs of all the results are optional).		
	20	Section 3.3: - Orthogonality (proofs of all the results are optional).		
	21	Section 3.4:-The geometry of linear systems.		
	22	Section 3.5:-Cross product (Proof of Theorem 3.5.4 is optional)		
V		**Open Ended Module**	12	
		Matrix Transformations, Combinatorial approach to determinants, Rank of Matrix (From reference 1) Orthogonal Matrices (from reference 1)		

References:
1. Advanced Engineering Mathematics, 6th Edition, Dennis G. Zill, Jones & Bartlett Learning LLC (2018) ISBN: 978-1-284-10590-2.
2. Advanced Engineering Mathematics, Erwin Kreyzsig, 10th Edition, Wiley India.
3. Linear Algebra and its Applications: 3rd Edition, David C. Lay, Pearson Publications

Note: 1) Optional topics are exempted for end semester examination. (2) Proofs of all the results are exempted for external exam. (3) 70 external marks are distributed over the first four modules subjected to a minimum of 15 marks from each module.

Mapping of COs with PSOs and POs :

	PSO5	PSO6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3	2	3	1	2	2	3	1	2
CO 2	3	2	3	1	2	2	3	1	2
CO 3	2	1	3	1	3	2	3	1	2

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High

Assessment Rubrics:

- Assignment/ Seminar
- Internal Exam
- Viva
- Final Exam (70%)

Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment	Seminar	Viva	End Semester Examinations
CO 1	✓	✓	✓	✓	✓
CO 2	✓	✓	✓	✓	✓
CO 3	✓	✓	✓	✓	✓