MAM231 T: Linear Algebra-I

Semester: III	Course Title: Linear Algebra-I	Credit: 4
Course No.: 231T	Major(T)	Hours: 4/week

COs with cognitive Abilities:

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Student will be able to identify vector space and subspace.
CO2	UNDERSTANDING	Student will be able to obtain basis and determine dimension of vector spaces and subspaces.
CO3	APPLYING	Students will be able to employ linear algebra to solve some scientific problems
CO4	ANALYSING	Student will be able to solve different mathematical problems using the transition between vector spaces by some mathematical tools such as linear transformations.
CO5	EVALUATING	Student will be able to interpret and use the concepts of linear algebra in real-world problem.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	1				
CO 2	2				
CO 3		2		1	2
CO 4		2		1	2
CO 5			2		

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Unit I Vector space:** Definition, Examples, Properties, Subspaces, Necessary and Sufficient Condition to be a Subspace, Examples of Subspaces, Intersection, Addition, and Direct Sum ofSubspaces. Linear Variety	15
II	**Unit Il Basis & Dimension of a vector space:** Finite Linear Combination, Span of a Set, Linear Dependence/Independence and their properties (with proof), Examples regarding Linear Dependence/ Independence. Dimension and Basis of a vector space, Dimension Theorem	15
III	**Unit III Linear Transformations** Definition and Examples. Range and Kernel of a Linear Map and results regarding them. Rank and Nullity of a Linear Map, Rank Nullity Theorem. Examples for verification of Rank-Nullity Theorem. Inverse of a Linear Map, Consequences of Rank -Nullity Theorem. Isomorphism	15
IV	**Unit IV Linear Map and matrices** Matrix associated with a Linear Map, Linear Map associated with a	15

	Matrix. Linear operations in M, Only introduction of L(U,V) and Isomorphism between L(U,V) and Dimension Theorems for min and L(U,V). Rank Nullity of Matrices and verification of the Rank-Nullity Theorem for Matrices.	

Text Book

An Introduction to Linear Algebra-V. Krishnamurthy & others. (Affiliated East-West press, New Delhi)

Suggested Reference Books:

1. Linear Algebra a Geometric Approach 5. Kumaresan, PHI.
2. Linear Algebra with Applications-Otto Bretscher-3d ed.-Pearson Education.
3. An Introduction to Linear Algebra-1. K. Rana, Ane Books Pvt. Ltd., New Delhi.
4. Theory and Problems of Linear Algebra R. D. Sharma, IK Int. Publishing House Pvt. Ltd.
5. Matrix and Linear Algebra K. B. Datta, Prentice Hall, New Delhi.
6. Linear Algebra: Theory & Appl. Ward Cheney & David Kincaid Viva Books, Jones &Bartlett.
7. Vector Calculus, Linear Algebra & Differential Forms: A unified approach. Hubbard & Hubbard Prentice Hall 1999.
8. Introduction to Linear Algebra-Serge Lang, Springer, India.
9. Finite Dimension Vector Spaces P. R. Halmos.
10. Linear Algebra Problem Book-P. R. Halmos.
11. Linear Algebra with Applications- Jeanne, L. Agnew & Robert C. Knapp Brooks/Col publishing Co, California.
12. A First Course in Linear Algebra Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata. McGraw-Hill Edu. Pvt. Ltd.

MAM232 T: Calculus-I

Semester: III	Course Title: Calculus-I	Credit: 4
Course No.:232T	Major (T)	Hours: 4/week

COs with cognitive Abilities:

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Student will be able to employ concepts of multivariate calculus.
CO2	UNDERSTANDING	Student will be able to obtain series expansion of several real valued functions of more than one variable and use it in real-life estimation problems.
CO3	APPLYING	Students will be able to employ multivariate differential calculus to extreme value problems.
CO4	ANALYSING	Students will be able to employ multivariate differential calculus to solve geometrical problems.
CO5	EVALUATING	Student will able to evaluate the applicability of partial derivatives in real-world problems.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1	√				
CO 2	√				
CO 3		√		√	√
CO 4		√		√	
CO 5			√		

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Unit-1 Limit-Continuity of function of several variables and partial derivatives:** Introduction to function of several variables, rectangular and spherical neighbourhood of a point in R, Limit of function of several variables, concept of iterated limits, limit and path, continuity of function of several variables	15
II	**Unit-Il Differentiability of function of several variables-l:** Directional derivatives, Introduction to partial derivatives, different notations and its geometric interpretation, higher order partial derivatives and problems. Differentiability of function of two variables, theorems on differentiability conditions and their converses, Schwartz's theorem and Young's theorem	15
III	**Unit-III Differentiability of function of several variables-II:** Differential of function of two variables, Chain rules for differentiability, derivatives of Implicit functions. Homogeneous functions, Euler's theorem for homogeneous functions of n-variables, Extreme values of functions of two variables and its theorems,	15

	Lagrange's method of undetermined multipliers (only problems to be asked)	
IV	**Unit-IV Applications of partial derivatives:** Taylor's Theorem for function of two variables (proof of two variables only), Maclaurin's theorem, problems on Taylor and Maclaurin theorems, Concept of multiple points, double points, different types of double points and examples, radius of curvature for Cartesian-parametric-polar equations of a curve in R	15

Suggested Reference Books:

1. . Mathematical Analysis-S. C. Malik and Savita Arrora, Second Edition, New Age Int. (P) Ltd.
2. Differential Calculus-Shanti Naraya.
3. Calculus David V. Widder-PHI-second edition.
4. Advanced Calculus Volume IIT. M. Apostol.
5. Calculus-James Stewart.
6. Calculus with Early Transcendental functions James Stewart, Indian Edition, Engage Learning India Pvt. Ltd.
7. Calculus & Analytic Geometry-G. B. Thomas & R. L. Finney Addison-Wesley pub, India.
8. A course in Multivariable Calculus & Analysis-S. R. Ghorpade & B. V. Limaye, Springer India.
9. All the Mathematics you missed but need to know Thomas A. Garrity, Cambridge Uni.Press.

MAM233 P: Mathematics Major Practical

Semester: III	Course Title: Mathematics Major Practical	Credit: 4
Course No.: 233 P	Major (P)	Hours: 8/week

COs with Cognitive Abilities

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Student will able to recall the concepts and definitions.
CO2	UNDERSTANDING	Students will able to explain the basic concepts of linear algebra and partial derivatives.
CO3	APPLYING	Student will able to solve the examples.
CO4	ANALYSING	Student will able to apply these methods to solve real world problem.
CO5	EVALUATING	Student will able to explore the role of these topics and solve the problems related to those topics.
CO6	CREATING	Student will able to create a mathematical model on various problems.

CO-PO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1					
CO 2					
CO 3					
CO 4					
CO 5					

(Manual/Computer)

Sr. No.	Title of the Practical	No. of Hours of Teaching
1.	Examples on vector spaces.	5
2.	Examples on vector subspace.	5
3.	Examples on linear combinations.	5
4.	Examples on Span of a vector.	5
5.	Examples on Linear dependance and Independence.	5
6.	Examples on Dimension and basis.	5
7.	Examples on Range and kernel.	5
8.	Examples on Rank- Nullity theorem.	5
9.	Examples on Isomorphism.	5
10.	Examples on matrix associated with linear map.	5
11.	Examples on Rank Nullity of Matrices.	5
12.	Examples on limits.	5
13.	Examples on Continuity.	5
14.	Directional derivatives.	5
15.	Differentiability of function of two variables.	5
16.	Examples on schwartz's theorem.	5
17.	Examples on young's theorem.	5
18.	Examples on homogeneous function.	5
19.	Examples on Euler's theorem.	5

20.	Examples on Extreme values.	5
21.	Examples on Lagrange's undetermined multipliers.	5
22.	Examples on Taylor's theorem for function two variables.	5
23.	Examples on Maclaurin's theorem.	5
24.	Examples on Radius of curvature.	5