MAM241 T: Linear Algebra-II

Semester: IV	Course Title: Linear Algebra-II	Credit: 4
Course No.: 241T	Major(T)	Hours: 4/week

COs with cognitive Abilities:

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Student will be able to transform regions in a vector space by some mathematical tools such as linear operators, linear functional and bilinear forms
CO2	UNDERSTANDING	Student will be able to solve different mathematical problems using the transition between vector spaces and transform by some mathematical tools such as linear functional.
CO3	APPLYING	Student will be able to identify quadratic curves as well as quadratic surfaces using diagonalization of a square matrix.
CO4	ANALYSING	Students will be able to employ linear algebra to solve some scientific problems.
CO5	EVALUATING	Student will be able to identify real life problems which can be solved by some advanced concepts in Linear algebra.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1					
CO 2					
CO 3					
CO 4					
CO 5					
CO 6					

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Unit I:** Composition of Linear Maps, The Space L(U,V), Operator Equation, Linear Functional Dual Spaces. Dual of Dual, Dual Basis Existence Theorem, Annihilators, bilinear forms.	15
II	**Unit II :**Inner Product Space, Norm, Cauchy-Schwarz Inequality, Orthogonalization and orthonormalisation of Basis, Gram-Schmidt Orthogonalization Process, Orthogonal complement and its properties. Orthogonal transformations.	15
III	**Unit III:** Determinants and their properties, Value of determinant, Basic results, Laplace expansion, Cramer's rule.	15
IV	**Unit IV:** Eigen values and Eigen vectors of linear operators and square matrices, Cayley Hamilton's Theorem and its verification, Application to reduction of Quadrics classification of Quadries, Diagonalization of real and symmetric Matrices, Spectral Theorem.	15

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 - L. 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. Linear Algebra with Applications- Jeanne, L. Agnew & Robert C. Knapp Brooks/Col publishing Co, California.
9. A First Course in Linear Algebra Dr. Aloknath Chakrabarti. ISBN: 9788182091306. Tata. McGraw-Hill Edu. Pvt. Ltd.

MAM242 T: Calculus-II

Semester: IV	Course Title: Calculus-II	Credit: 4
Course No.: 242 T	Major (T)	Hours: 4/week

COs with cognitive Abilities:

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Students will be able to solve some real life problems using multiple integral.
CO2	UNDERSTANDING	Students will be able to evaluate definite integral using Beta and Gamma functions.
CO3	APPLYING	Students will be able to apply vector calculus to solve some scientific problems.
CO4	ANALYSING	Student will be able to formulate and solve partial differential equations.
CO5	EVALUATING	Students will be able to access the correctness of the results by verifications or alternative methods.
CO6	CREATING	Students will be able to design mathematical models using multiple applications such as volume and surface area.

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CO 1					
CO 2					
CO 3					
CO 4					
CO 5					
CO 6					

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Unit 1 Multiple integrals:** Introduction to double integral, repeated or iterated integral, double integral over a closed region, evaluation of double integral, changing the order of double integral, triple integrals, Iterated triple integrals, Geometrical interpretation of double and triple integrals and problems based on it, Introduction to Jacobian (only definition), transformation of double and triple integrals	15
II	**Unit II Beta and Gamma functions and Vector calculus:** Definition of beta and gamma functions, properties of beta and gamma functions, relation between beta and gamma functions, duplication formula, evaluation of definite integrals using beta-gamma functions. (b) Definition of gradient, divergence and curl, properties of theses operators	15
III	**Unit III Line surface and volume integrals:** Definition of line integral, Green's theorem, surface and volume	15

	integral, Gauss's divergence theorem, Stoke's theorem, verification of the three theorems and probierns based on the theorems.	
IV	**Unit IV Partial Differential Equations:** Formation of Partial differential equations by the elimination of Arbitrary constants and arbitrary functions. Partial differential equations of the first order, the complete and particular integrals, Lagrange's solution of the linear equation. Some special types of equations which can be solved easily by the methods other than Charpit's method	15

Suggested Reference Books:

1. Mathematical Analysis-S. C. Malik and Savita Arrora, Second Edition, New Age Int. (P) Ltd.
2. Integral calculus-Shanti Narayan.
3. Calculus-Second Edition, David V. Widder, PHI.
4. Advanced Calculus Volume II-T. M. Apostol.
5. Ordinary and Partial Differential Equations-Nita H Shah, PHI Learning.
6. Calculus-James Stewert.
7. Partial Differential Equations-T. Amarnath.
8. Elements of Partial Differential Equations-lan N. Sneddon, McGraw Hill co.
9. Calculus with Early Transcendental furictions James Stewart, Indian Edition, Engage Learning India Pvt Ltd.
10. Calculus & Analytic Geometry G. B. Thomas & R. L. Finney, Addison-Wesley pub. india.
11. A course in Multivariable Calculus & Analysis-S. R. Ghorpade & B. V. Limaye, Springer India.

MAM243 P: Mathematics Major Practical

Semester: III	Course Title: Mathematics Major Practical	Credit: 4
Course No.: 243P	Major (P)	Hours: 8/week

COs with Cognitive Abilities

COs	COGNITIVE ABILITIES	COURSE OUTCOMES
CO1	REMEMBERING	Students will be able to find the key transformations.
CO2	UNDERSTANDING	Students will be able to explain the relationships between matrices, determinant and vector spaces. Also, the role of multiple integral in calculating area.
CO3	APPLYING	Students will able to solve the problems by using various methods.
CO4	ANALYSING	Students will be able to examine the various topics of linear algebra and calculus.
CO5	EVALUATING	Students will be able to access the applications of multiple integrals in real-world scenario.
CO6	CREATING	Students will be able to construct a mathematical model by using the applications of various concept.

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 L(U,V) space.	5
2.	Examples on Dual spaces.	5
3.	Examples on bilinear forms.	5
4.	Examples on Inner product space.	5
5.	Examples on Norm, Cauchy-Schwarz Inequality.	5
6.	Examples on Orthogonalization & ortho normalization.	5
7.	Examples on Gram-Schmidt Orthogonalization Process.	5
8.	Examples on Laplace expansion's.	5
9.	Examples on Cramer's rule.	5
10.	Examples on Eigen Values & Eigen Vectors.	5
11.	Examples on Cayley-Hamilton theorem.	5
12.	Examples on Double integration.	5
13.	Examples on Change the order of the integration.	5
14.	Examples on Triple integration.	5
15.	Examples on double and triple integration using Jacobian's.	5
16.	Examples on Beat and Gamma function.	5

17.	Examples on line integrals.	5
18.	Examples on Green's theorem.	5
19.	Examples on Gauss's Divergence theorem.	5
20.	Examples on Stokes's theorem.	5
21.	Examples on Surface and volume integrals.	5
22.	Examples on Formation of Partial Differential Equations.	5
23.	Examples on Partial differential equation of first order & first degree.	5
24.	Examples on charpit's method.	5