MA432: Linear Algebra

Instructor: Prashant Shekhar, PhD

Tentative Schedule for Fall 2023

SNo: Week of (class days)	*Section*	*Topics*	*Homework*	*Learning Outcome*
1: 28^{th} Aug (Tu,Th)	1.1 1.2	Systems of Linear Equations Row Reduction and Echelon Forms		1 1
2: 4^{th} Sept (Tu,Th)	1.3 1.4	Vector Equations Matrix Equation: Ax=b Quiz 1		2,3 1,3
3: 11^{th} Sept (Tu,Th)	1.5 1.7	Solution set of linear systems Linear Independence	HW1 released	1,3,12 5
4: 18^{th} Sept (Tu,Th)	2.1 1.8	Matrix Operations Introduction to linear transformations Quiz 2		2 6
5: 25^{th} Sept (Tu,Th)	1.9 2.2 2.3	Matrix of Linear Transformations Inverse of a matrix Characterizations of Invertible Matrices	HW1 due HW2 released	6,7,12 1,12 8,12
6: 2^{rd} Oct (Tu,Th)	2.5	Matrix Factorizations Test 1 review Test 1		1,8,11,12
7: 9^{th} Oct (Tu,Thu)	 2.8 4.1	No Lecture (10^{th} Oct) Subspaces of $\mathbf{R}^n$ Vector Spaces and Subspaces	 HW2 due	 2,4,5 2,4,5
8: 16^{th} Oct (Tu,Th)	4.2	Null Spaces, Column Spaces, Row Spaces, and Linear Transformations Quiz 3 No Lecture (19^{th} Oct)	HW3 released	2,4,5,7,8
9: 23^{th} Oct (Tu,Th)	2.9 4.3	Dimension and Rank Linearly Independent Sets; Bases		4,5,8 4,5,8
10: 30^{st} Oct (Tu,Th)		Project Day I Project Day II	 HW3 due	12 12
11: 6^{th} Nov (Tu,Th)	3.1 3.2 5.1	Introduction to Determinants Properties of Determinants Eigenvectors and Eigenvalues	HW4 released Project released	1,9 1,9 9
12: 13^{th} Nov (Tu,Th)	5.2 5.3	The Characteristic Equation Quiz 4 Diagonalization		9 7,9,11,12
13: 20^{th} Nov (Tu, Th)	6.1	Inner Product, Length, and Orthogonality No Lecture (23^{rd} Nov)	HW4 due	10
14: 27^{th} Nov (Tu,Th)	6.2 6.4	Orthogonal Sets The Gram-Schmidt Process Test 2 Review		10 10,11
15: 4^{th} Dec (Tu,Th)		Test 2 Questions ?	 Project due	

Learning outcome: After successful completion of this course, you will acquire knowledge to:

1. Use Gaussian Elimination to solve systems of linear equations or to calculate matrix inverses.
2. Perform vector and matrix operations such as addition and multiplication.
3. Calculate equations of planes and lines in three dimensions.
4. Use the definition of vector spaces to identify vector spaces and subspaces.
5. Test set of vectors for linear independence and calculate bases for given vector spaces.
6. Calculate matrices representing linear transforms such as projections, reflections, and rotations.
7. Use similarity transforms to calculate matrix representations of linear transforms when a new basis is selected.
8. Use matrices to solve linear homogeneous and nonhomogeneous equations and relate the rank and nullity of the matrices to the linear equations.
9. Calculate a basis of eigenvectors so that a linear transformation is represented by a diagonal matrix.
10. Use the definition of inner product in a variety of vector spaces and use Gram-Schmidt process to construct an orthonormal basis for a vector space.
11. Identify orthogonal matrices and symmetric matrices and utilize their properties for matrix decompositions.
12. Apply the concepts learned in the course to solve real-world problems.