



MA304 Abstract Linear Algebra (Online)

Instructor Information	Wanchunzi Yu Home Institution: Bridgewater State University Email: wyu@bridgew.edu		
Term	December 13, 2021 - January 7, 2022	Credits	4 units
Course Delivery	The course will be delivered in the format of online. Other than recorded lecture videos, the instructor will arrange 3 hours' real-time interaction with students per week (via zoom meeting). The workload students are expected to complete to properly pass this course is about 12-16 hours per week. Exams are proctored under zoom-meeting camera.		
Required Texts (with ISBN)	Linear Algebra: A Modern Introduction (4 th Edition) By David Poole ISBN-13: 978-1285463247 ISBN-10: 9781285463247		
Prerequisite	Linear Algebra		



Course Overview

This course introduces students to a rigorous and abstract study of linear algebra, which is an extension of introduction to linear algebra course. Topics covered include matrix algebra, vector space, eigenvalues and eigenvectors, orthogonalization, diagonalization, linear transformation, inner product space, and applications.

Learning Outcomes

Upon successful completion of this course, students will be conversant with

- understanding concepts of linear algebra and matrix algebra
- understanding linear independence, span, and basis
- developing problem solving skills, such as solving systems of linear equations using multiple methods
- applying principles of matrix algebra to linear transformation
- understanding examples, theorems, algorithms, and applications

Course Structure

1. Asynchronous Hours: Sunday through Thursday, total 25 hours Pre-recorded videos will be posted on SJTU SCE online learning platform.
2. Synchronous Hours: Beijing Time: Tuesday: 9:00 – 10:30 pm, Thursday: 10:00 – 11:30 am



Grading Policy

Three Assignments	30%
Quizzes/Attendance	20%
Middle Exam	25%
Final Exam	25%

Grading Scale is as follows

Number grade	Letter grade	GPA
90-100	A	4.0
85-89	A-	3.7
80-84	B+	3.3
75-79	B	3.0
70-74	B-	2.7
67-69	C+	2.3
65-66	C	2.0
62-64	C-	1.7
60-61	D	1.0
≤59	F (Failure)	0



Class Schedule

Date	Lecture	Online Teaching Arrangement
Day 1	1.0: Introduction: The Racetrack Game 1.1: The Geometry and Algebra of Vectors 1.2: Length and Angle: The Dot Product	Approximately 80 minutes pre-recorded video lectures
Day 2	1.3: Lines and Planes 1.4: Applications 2.0: Introduction: Triviality	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 3	2.1: Introduction to Systems of Linear Equations 2.2: Direct Methods for Solving Linear Systems	Approximately 80 minutes pre-recorded video lectures
Day 4	2.3: Spanning Sets and Linear Independence 2.4: Applications	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 5	2.5: Iterative Methods for Solving Linear Systems 3.0: Introduction: Matrices in Action	Approximately 80 minutes pre-recorded video lectures
Day 6	3.1: Matrix Operations 3.2: Matrix Algebra	Approximately 80 minutes pre-recorded video lectures
Day 7	3.3: The Inverse of a Matrix 3.4: The LU Factorization	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 8	3.5: Subspaces, Basis, Dimension, and Rank 3.6: Introduction to Linear Transformations	Approximately 80 minutes pre-recorded video lectures
Day 9	3.7: Applications 4.0: Introduction: A Dynamical System on Graphs 4.1: Introduction to Eigenvalues and Eigenvectors	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 10	4.2: Determinants 4.3: Eigenvalues and Eigenvectors of $n \times n$ Matrices	Approximately 80 minutes pre-recorded video lectures
Day 11	Midterm Exam Review	Approximately 80 minutes pre-recorded video lectures
Day 12	Midterm Exam	Exam via Zoom
Day 13	4.4: Similarity and Diagonalization 4.5: Iterative Methods for Computing Eigenvalues	Approximately 80 minutes pre-recorded video lectures
Day 14	4.6: Applications and the Perron-Frobenius Theorem 5.0: Introduction: Shadows on a Wall	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 15	5.1: Orthogonality in \mathbb{R}^n 5.2: Orthogonal Complements and Orthogonal Projections	Approximately 80 minutes pre-recorded video lectures
Day 16	5.3: The Gram-Schmidt Process and the QR Factorization 5.4: Orthogonal Diagonalization of Symmetric Matrices	Approximately 80 minutes pre-recorded video lectures



Day 17	5.5: Applications 6.0: Introduction: Fibonacci in (Vector) Space 6.1: Vector Spaces and Subspaces	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 18	6.2: Linear Independence, Basis, and Dimension 6.3: Change of Basis 6.4: Linear Transformations	Approximately 80 minutes pre-recorded video lectures
Day 19	Final Exam Review	Approximately 30 minutes pre-recorded video lectures plus 90 minutes online interaction via Zoom
Day 20	Final Exam	Exam via Zoom