Course Subject, Number and Title
MATH 340 001– Elementary matrix and linear algebra

Credits
3

Canvas Course URL

Course Designations and Attributes
Breadth - Natural Science
L&S Credit - Counts as Liberal Arts and Science credit in L&S

Meeting Time and Location
MWF 1:20pm-2:10pm
B130 Van Vleck Hall

Instructional Mode
Classroom Instruction

How Credit Hours are met by the Course
This class meets for three 50-minutes lectures and one 50-minutes discussion section each week. It carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 3 hours out of classroom for every class period. The syllabus includes more information about meeting times and expectations for student work.

INSTRUCTORS AND TEACHING ASSISTANTS
Instructor:
Yousheng Shi
Office Hours
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Instructor Email
shi58@wisc.edu

Teaching Assistants:
Chun Gan,
Discussions: 301, 303, 305
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Josiah Jacobsen-Grocott
Discussion: 302
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OFFICIAL COURSE DESCRIPTION

DESCRIPTION: Matrix algebra, linear systems of equations, vector spaces, sub-spaces, linear dependence, rank of matrices, determinants, linear transformations, eigenvalues and eigenvectors, diagonalization, inner products and orthogonal vectors, symmetric matrices. Prospective math majors should instead consider Math 341 for a proof based introductory linear algebra course.

Prerequisites Math 222. Not open to students with credit for either Math 341 or 375.

LEARNING OUTCOMES

Material covered
Chapter 1-7 of the textbook.

Course Learning Outcomes

1 Matrix Algebra: Perform matrix addition, subtraction and multiplication and elementary row operations; solve linear systems of equations using row reduced echelon form of a matrix and invertible matrices; find the inverse of a matrix using row operations and understand properties of invertible matrices.

2 Determinants: Find the determinant of a matrix using the definition, the properties of determinants and cofactor expansion; understand the relationship between the determinant and the invertibility of a matrix; and solve a system of linear equations using determinants.

3 Vector Spaces: Understand the algebraic structure of a vector space over the real numbers, subspaces and span of a set of vectors; linear independence of vectors; find a basis and dimension of a finite dimensional vector space; find the null space, the nullity, the column space and the rank of a matrix; understand coordinates, isomorphisms and change of bases and compute transition matrices.

4 Linear Transformations: Understand the definition and the properties of a linear transformation between two vector spaces; find the kernel and the range of a linear transformation and the relation between their dimensions; find the matrix of a linear transformation.

5 Eigenvalues and Eigenvectors: Find eigenvalues and eigenvectors of a linear operator and of a square matrix; diagonalize a linear operator and a square matrix.

6 Inner Product Spaces: Find the inner product of vectors and the angle between two vectors in an inner product space; and find an orthonormal basis for a finite dimensional inner product space using Gram-Schmidt process.
GRADING
Quizzes (20%), two midterms (25% each), one final (30%)
The grading is `curved' in the sense that average is about a BC if the grade distribution is sufficiently broad (or `normal') and the average is not too high or too low. This `curving' adapts to the actual cumulative scores to correct for natural variations, in exam difficulty and grading for example, since we want you to `show your work' and we award `partial credit'. We use the full grading scale from 0 to 100% with the guideline
A (93-100%), AB (86-92%), B (80-85%), BC (73-79%), C (67-72%), D (60-66%), F (less than 60%)

DISCUSSION SESSIONS
301: 12:05-12:55pm Thursday
302: 8:50-9:40am Thursday
303: 13:20-14:10pm Tuesday
305: 13:20-14:10pm Thursday

REQUIRED TEXTBOOK
Elementary Linear Algebra with Applications, Ninth Ed
- Author: Bernard Kolman & David R. Hill
- Publisher: Pearson / Prentice Hall

EXAMS
Exam 1   Friday Feb 21\textsuperscript{st} in class
Exam 2   Friday Apr 3\textsuperscript{rd} in class
Final   Tuesday May 5\textsuperscript{th}, 5:05pm-7:05pm, location:TBA

HOMEWORK
Assigned every Friday starting from Jan 24\textsuperscript{th}, posted on Canvas. The homework will not be graded but quizzes and most of the exam problems will be based on homework problems. Most of the homework problems will come from the textbook. The solutions to all the odd-number problems can be found at the end of the textbook.

Quizzes
There are biweekly quizzes (7 in total). Quizzes are mostly based on the homework problems and will be given during the discussion sessions. One lowest score will be dropped.

RULES, RIGHTS & RESPONSIBILITIES
To see the Guide’s Rules, Rights and Responsibilities information, refer to http://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext.

ACADEMIC INTEGRITY
By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison’s community of scholars in which everyone’s academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wisweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES
McBurney Disability Resource Center syllabus statement: “The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.” http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION
Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” https://diversity.wisc.edu/