

Washtenaw Community College Comprehensive Report

MTH 197 Linear Algebra Effective Term: Winter 2018

Course Cover

Division: Math, Science and Engineering Tech

Department: Mathematics

Discipline: Mathematics

Course Number: 197

Org Number: 12200

Full Course Title: Linear Algebra

Transcript Title: Linear Algebra

Is Consultation with other department(s) required: No

Publish in the Following: College Catalog , Time Schedule , Web Page

Reason for Submission: Three Year Review / Assessment Report

Change Information:

Consultation with all departments affected by this course is required.

Course description

Pre-requisite, co-requisite, or enrollment restrictions

Outcomes/Assessment

Objectives/Evaluation

Rationale: Update as a result of an assessment report.

Proposed Start Semester: Winter 2018

Course Description: This is a first course in linear algebra. Topics include systems of linear equations, vector equations and matrix equations; matrix algebra, partitions and factorizations; determinants; matrix inverses and the Invertible Matrix Theorem; vector spaces and subspaces; linear independence, bases and dimension; null and column spaces, rank; linear transformations on vector spaces, kernel and range; injective, surjective and bijective mappings; isomorphism; eigenvalues and eigenspaces; diagonalization; inner product spaces, orthogonal matrices, Gram-Schmidt orthogonalization; least-squares approximation; and diagonalization of symmetric matrices.

Course Credit Hours

Variable hours: No

Credits: 4

Lecture Hours: Instructor: 60 **Student:** 60

Lab: Instructor: 0 **Student:** 0

Clinical: Instructor: 0 **Student:** 0

Total Contact Hours: Instructor: 60 **Student:** 60

Repeatable for Credit: NO

Grading Methods: Letter Grades

Audit

Are lectures, labs, or clinicals offered as separate sections?: NO (same sections)

College-Level Reading and Writing

College-level Reading & Writing

College-Level Math

Level 7

Requisites

Prerequisite

Academic Math Level 7

or

Prerequisite

MTH 191 minimum grade "C"

General Education

Degree Attributes

Assoc in Applied Sci - Area 3

Assoc in Science - Area 3

Assoc in Arts - Area 3

MACRAO Science & Math

Michigan Transfer Agreement - MTA

MTA Mathematics

Request Course Transfer

Proposed For:

Central Michigan University
Eastern Michigan University
Ferris State University
Grand Valley State University
Jackson Community College
Lawrence Tech
Michigan State University
Oakland University
University of Detroit - Mercy
University of Michigan
Wayne State University
Western Michigan University

Student Learning Outcomes

1. Solve systems of linear equations.

Assessment 1

Assessment Tool: Common departmental exam questions

Assessment Date: Spring/Summer 2019

Assessment Cycle: Every Two Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Department rubric

Standard of success to be used for this assessment: 75% of students will score 75% or better

Who will score and analyze the data: Departmental faculty

2. Compute determinants and inverses of matrices.

Assessment 1

Assessment Tool: Common departmental exam questions

Assessment Date: Spring/Summer 2019

Assessment Cycle: Every Two Years

Course section(s)/other population: All sections
Number students to be assessed: All students
How the assessment will be scored: Department rubric
Standard of success to be used for this assessment: 75% of students will score 75% or better
Who will score and analyze the data: Departmental faculty

3. Apply the fundamental theorems of linear transformations on vector spaces.

Assessment 1

Assessment Tool: Common departmental exam questions
Assessment Date: Spring/Summer 2019
Assessment Cycle: Every Two Years
Course section(s)/other population: All sections
Number students to be assessed: All students
How the assessment will be scored: Department rubric
Standard of success to be used for this assessment: 75% of students will score 75% or better
Who will score and analyze the data: Departmental faculty

4. Apply the basic theorems of inner product spaces.

Assessment 1

Assessment Tool: Common departmental exam questions
Assessment Date: Spring/Summer 2019
Assessment Cycle: Every Two Years
Course section(s)/other population: All sections
Number students to be assessed: All students
How the assessment will be scored: Department rubric
Standard of success to be used for this assessment: 75% of students will score 75% or better
Who will score and analyze the data: Departmental faculty

5. Compute eigenvalues and eigenvectors and use them in applications.

Assessment 1

Assessment Tool: Common departmental exam questions
Assessment Date: Spring/Summer 2019
Assessment Cycle: Every Two Years
Course section(s)/other population: All sections
Number students to be assessed: All students
How the assessment will be scored: Department rubric
Standard of success to be used for this assessment: 75% of students will score 75% or better
Who will score and analyze the data: Departmental faculty

6. Calculate the least-squares solution to a system of linear equations.

Assessment 1

Assessment Tool: Common departmental exam questions
Assessment Date: Spring/Summer 2019
Assessment Cycle: Every Two Years
Course section(s)/other population: All sections
Number students to be assessed: All students
How the assessment will be scored: Department rubric
Standard of success to be used for this assessment: 75% of students will score 75% or better
Who will score and analyze the data: Departmental faculty

Course Objectives

1. Translate from a system of linear equations to a vector equation.
2. Translate from a system of linear equations to a matrix equation.

3. Solve a system of linear equations by row-reducing the coefficient matrix.
4. Calculate the parametric form of the solution of a system of linear equations.
5. Determine if a matrix is invertible or not.
6. Compute the inverse of an invertible matrix.
7. Compute the determinant of an n-by-n matrix.
8. Apply the Invertible Matrix Theorem to answer questions about the column space, null space, rank, and the transformation $x \rightarrow Ax$, for a given matrix A.
9. Determine if a given subset of a vector space is a subspace.
10. Find a basis for a subspace.
11. Determine if a linear transformation is one-to-one and onto.
12. Identify the null space, column space, and rank of a matrix.
13. Identify the kernel and range of a linear transformation.
14. Determine if a set of vectors is orthogonal.
15. Construct a set of orthogonal vectors using the Gram-Schmidt algorithm.
16. Find an orthogonal basis for a subspace.
17. Calculate the orthogonal projection of a vector onto a subspace.
18. Calculate the characteristic equation of an n-by-n matrix.
19. Calculate the eigenvectors and associated eigenspaces of an n-by-n matrix.
20. Diagonalize an n-by-n matrix.
21. Orthogonally diagonalize a symmetric matrix.
22. Identify the rotation and scaling associated with the complex eigenvalues of a 2-by-2 matrix.
23. Solve the Normal Equations to find the least-squares solution to an inconsistent system of linear equations.
24. Determine if a QR factorization of a matrix exists, and if so, compute it.
25. Determine if a unique least-squares solution exists for a given system of linear equations, and if so, use the QR factorization to compute the solution.

New Resources for Course

Course Textbooks/Resources

Textbooks

Lay, D., Lay, S., McDonald, J. *Linear Algebra and Its Applications*, 5 ed. Pearson, 2016, ISBN: 0-321-98261-4.

Manuals

Periodicals

Software

Equipment/Facilities

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
Faculty Preparer: <i>Lawrence David</i>	<i>Faculty Preparer</i>	<i>Aug 21, 2017</i>
Department Chair/Area Director: <i>Lisa Rombes</i>	<i>Recommend Approval</i>	<i>Aug 21, 2017</i>
Dean: <i>Kristin Good</i>	<i>Recommend Approval</i>	<i>Aug 23, 2017</i>
Curriculum Committee Chair: <i>Lisa Veasey</i>	<i>Recommend Approval</i>	<i>Oct 23, 2017</i>
Assessment Committee Chair:		

Michelle Garey

Recommend Approval

Oct 24, 2017

Vice President for Instruction:

Kimberly Hurns

Approve

Oct 25, 2017