Glendale College

Course Outline of Record Report

Course ID 003250

Revision - May 2023

MATH107H : Honors Linear Algebra

General Information

Author:	• Suzanne Palermo
Course Code (CB01) :	MATH107H
Course Title (CB02) :	Honors Linear Algebra
Department:	MATH
Proposal Start:	Fall 2023
TOP Code (CB03) :	(1701.00) Mathematics, General
CIP Code:	(27.0101) Mathematics, General.
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	Yes
Will this course be taught asynchronously?:	No
Course Control Number (CB00) :	CCC000578445
Curriculum Committee Approval Date:	05/10/2023
Board of Trustees Approval Date:	
Last Cyclical Review Date:	05/01/2019
Course Description and Course Note:	MATH 107H covers the topics of vector spaces, linear transformations and matrices, matrix algebra, determinants, eigenvalues and eigenvectors, and solutions of systems of equations. Solution techniques include row operations, Gaussian elimination and matrix algebra. Specific topics in vector spaces and matrix theory include inner products, norms, orthogonality, eigenvalues, eigenspaces, linear transformations and applications. The honors section of this course features more theory and proof, and one or more projects related to the topics of this course.
Justification:	Coding/Category Change
Academic Career:	• Credit
Author:	• Suzanne Palermo

Academic Senate Discipline

Primary Discipline:	• Mathematics

Transferability & Gen. Ed. Options

General Education Status (CB25)

GE Status (CSU) B4, (UC) 2

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

IGETC Area	Area	Status	Approval Date	Comparable Course
2-Math	Mathematical Concepts and Quantitative Reasoning	Approved	09/05/2001	No Comparable Course defined.

CSU GE-Breadth Area	Area	Status	Approval Date	Comparable Course
B4-Mathematics/Quantitative Reasoning	Mathematics/Quantitative Reasoning	Approved	09/05/2001	No Comparable Course defined.

C-ID	Area	Status	Approval Date	Comparable Course
MATH	Mathematics	Approved	08/29/2016	MATH 250 - Introduction to Linear Algebra

Units and Hours

Summary

Minimum Credit Units (CB07)	5
Maximum Credit Units (CB06)	5
Total Course In-Class (Contact) Hours	90
Total Course Out-of-Class Hours	180
Total Student Learning Hours	270

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

☐ Variable Credit Course

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	5	10
Laboratory Hours	0	0
Studio Hours	0	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	
Lecture	90
Laboratory	0
Studio	0
Total	90
Course Out-of-Class Hours	
Lecture	180
Laboratory	0
Studio	0
Total	180

Time Commitment Notes for Students

No value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

MATH104E - Calculus and Analytic Geometry II

Objectives

- evaluate definite and indefinite integrals using a variety of techniques, including integration by parts, trigonometric substitution, and partial fractions;
- evaluate improper integrals;
- model differential equations;
- solve separable differential equations;
- work with exponential and logistic models of growth and decay;
- graph conic sections;
- determine divergence or convergence of infinite sequences and series by applying convergence tests;
- differentiate and integrate power series;
- find Taylor and Maclaurin series for a function.
- graph equations in polar and parametric form;

OR

Prerequisite

MATH 104/104H

AND

Advisory

MATH105 - Multivariable and Vector Calculus

Objectives

- perform basic vector algebra operations;

Entry Standards

Entry Standards

No value

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Methods of Instruction	Discussion
Methods of Instruction	Multimedia
Methods of Instruction	Collaborative Learning
Methods of Instruction	Demonstrations

Out of Class Assignments

- Homework (e.g. problem sets related to course content);
- Group assignments and projects (e.g. prove a theorem stated in the textbook and present to proof to the instructor);

Methods of Evaluation	Rationale
Exam/Quiz/Test	Quizzes
Exam/Quiz/Test	Four or more regularly scheduled exams are required
Exam/Quiz/Test	A comprehensive final examination is required

Textbooks

Author	Title	Publisher	Date	ISBN

Anton, Howard	Elementary Linear Algebra	Wiley	2020	978-1-119-40677-8

Other Instructional Materials (i.e. OER, handouts)

No Value

Learning Outcomes and Objectives

Course Objectives

Perform matrix arithmetic.

Find the inverse of a matrix.

Solve a linear system of equations using matrix operations (Gaussian and Gauss Jordan elimination)

Evaluate determinants by raw reduction and cofactor expansion.

Identify vector spaces and subspaces.

Determine if a set of vectors is linearly independent.

Find a base for and the dimension of a vector space.

Use the Gram-Schmidt process to find an orthonormal basis for an inner product space.

Find the kernel and range of a linear transformation.

Find matrix representations of linear transformations.

Find the eigenvalues and eigenvectors of a matrix.

Diagonalize a matrix.

Determine eigenvalues and eigenspaces of matrices and linear transformations.

Use quadratic forms to obtain graphs of conic sections and quadratic surfaces.

Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvectors and eigenvalues.

Use bases and orthonormal bases to solve problems in linear algebra.

Find the dimension of spaces such as those associated with matrices and linear transformations.

SLOs

Analyze vector spaces, subspaces, linear independence, span, bases, dimension, and linear transformations by applying definitions and proving theorems.
Expected Outcome Performance: 70.0

MATH Mathematics - A.A. Degree Major	Analyze, synthesize and evaluate theorems in Linear Algebra.
	solve a variety of rudimentary and second order differential equations.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
MATH Mathematics - A.S. Degree Major	analyze, synthesize and evaluate theorems in Linear Algebra.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
MATH Mathematics - AS-T	analyze, synthesize and evaluate theorems in Linear Algebra.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
ILOs General Education	apply techniques of analysis and critical thinking to critique real world and theoretical topics and issues

Perform matrix and vector operations and apply properties of linear systems, inverses, determinants, eigenvalues/eigenvectors, and inner products to solve problems and prove theorems.
Expected Outcome Performance: 70.0

MATH Mathematics - A.A. Degree Major	Analyze, synthesize and evaluate theorems in Linear Algebra.
	solve a variety of rudimentary and second order differential equations.
	solve applications in math and science using derivatives, integrals, differential equations and linear algebra.
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Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No Value

Is this proposal submitted in response to learning outcomes assessment data?

No Value

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Systems of Linear Equations and Matrices (17)

- Introduction to systems of linear equations
- Gaussian and Gauss-Jordan elimination
- Matrices and matrix operations Inverses; rules of matrix arithmetic
- Elementary matrices and finding the inverses of a matrix
- Results on systems of equations and invertibility
- Diagonal, triangular, and symmetric matrices

Determinants (8)

- The determinant function
- Evaluating determinants by raw reduction
- Properties of the determinant function
- Cofactor expansion; Cramer's rule

Vectors in R^n (10)

- Introduction to vectors (Geometric)
- Norm of a vector
- Vector arithmetic
- The dot product and projections
- The cross product
- Orthogonality of two vectors
- Lines and planes in 3-space

Euclidean Vector Spaces (7)

- Euclidean n-space
- Linear transformations from Rn to Rm
- Properties of Linear transformations from Rn to Rm

General Vector Spaces (10)

- Real vector spaces
- Subspaces
- Linear independence
- Basis and dimension
- Raw space, column space and nullspace
- Rank and Nullity

Inner Product Spaces (10)

- Inner products
- Angle and orthogonality in inner product spaces
- Orthonormal bases; Gram-Schmidt process; QR-Decomposition
- Best approximation; least squares
- Orthogonal matrices; change of bases

Eigenvalues and Eigenvectors (11)

- Eigenvalues and eigenvectors
- Diagonalization
- Orthogonal diagonalization

Linear Transformations (11)

- General linear transformations
- Kernel and range
- Inverse linear transformations
- Matrix representations of general linear
- Transformations
- Similarity

Applications (6)

- Fourier Series
- Quadratic Forms and their applications

Total Hours = 90