COURSE OUTLINE OF RECORD

Number: MATH A285H **TITLE:** Introduction to Linear Algebra and Differential Equations Honors

ORIGINATOR: Instructor Placeholder AAA **EFF TERM:** Fall 2016

FORMERLY KNOWN AS: **DATE OF OUTLINE/REVIEW:** 12-02-2015

CROSS LISTED COURSE: **TOP NO:** 1701.00

CID:

SEMESTER UNITS: 5.0

HRS LEC: 108.0 **HRS LAB:** 0.0 **HRS OTHER:** 0.0

CONTACT HRS TOTAL: 108.0

STUDY/NON-CONTACT HRS RECOMMENDED: 162.0

CATALOG DESCRIPTION:

Introduction to linear algebra and differential equations. Topics include matrices, determinants, vector spaces, linear systems of equations, linear product spaces, first and second order differential equations, systems of differential equations, and Laplace transforms. Additional honors topics include Jacobian matrices, properties of R3 and simple abstract topological spaces, and some exterior algebra. May be taken for grades or on a pass-no pass basis. Transfer Credit: CSU; UC.

JUSTIFICATION FOR COURSE:

Comparable to UC course

PREREQUISITES:

- MATH A182H: Calculus 1 and 2 Honors with a minimum grade of C or better
  or
- OCC Math Placement Level of 90 or higher.
- MATH A185: Calculus 2 with a minimum grade of C or better
  or
- GWC Math Placement Level of 90 or higher.
  or
- MATH A185H: Calculus 2 Honors with a minimum grade of C or better
- CCC Math Placement Level of 90 or higher.
  or
- MATH A182H: Calculus 1 and 2 Honors with a minimum grade of C or better
  or
- MATH A185: Calculus 2 with a minimum grade of C or better
  or
- MATH A185H: Calculus 2 Honors with a minimum grade of C or better
  or
- MATH G185: Calculus 2 with a minimum grade of C or better
  or
- MATH C185: Calculus 2 with a minimum grade of C or better
  or
- MATH A280: Calculus 3 with a minimum grade of C or better
  or
- MATH A280H: Calculus 3 Honors with a minimum grade of C or better
  or
- MATH G282: Ordinary Differential Equations with a minimum grade of C or better
  or

COREQUISITES:

ADVISORIES:

ASSIGNED DISCIPLINES:
Mathematics

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00

CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]

GRADING POLICY: Pass/No Pass [X] Standard Letter [X] Not Graded [ ]

OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]

TRANSFER STATUS: CSU Transferable[ ] UC/CSU Transferable[X] Not Transferable[ ]

BASIC SKILLS STATUS: Yes [ ] No [X] **LEVELS BELOW TRANSFER:** Not Applicable

CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable

NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course

OCCUPATIONAL (SAM) CODE: E

REPEATABLE ACCORDING TO STATE GUIDELINES: No [X] Yes [ ] NUMBER REPEATS:

REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]
COMPUTER PROGRAMMING(Certificate of Achievement)
COMPUTER PROGRAMMING(Associate in Science)

GE AND TRANSFER REQUIREMENTS MET:

IGETC Area 2: Mathematical Concepts and Quantitative Reasoning
2A: Mathematic

CSU GE Area B: Scientific Inquiry and Quantitative Reasoning
B4 - Mathematics/Quantitative Thinking

OCC AA Gen Ed
AREA A2: LANGUAGE AND RATIONALITY - Communication and Analytical Thinking

OCC AS Gen Ed
AREA A2 – ENGLISH COMMUNICATION - Communication and Analytical Thinking

COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:

1. Use matrix algebra and row-reduction methods to solve linear systems.
2. Solve linear systems, including under- and over-determined systems.
3. Prove lemmas and corollaries in linear algebra.
4. Relate linear transformations to their matrices with respect to given bases.
5. Describe linear transformations as functions mapping an n-dimensional space to an m-dimensional space.

COURSE OBJECTIVES:

1. Use matrix algebra and row reduction methods to solve linear systems.
2. Prove basic properties of linear spaces and linear maps, including spans, independence and basic dimension theorems.
3. Compute null spaces and images of linear functions, and apply this to superposition of solutions in applications.
4. Compute change of bases.
5. Explore consequences of the Rank & Nullity Theorem.
6. Work with inner product and orthogonality, including abstract Fourier coefficients, and the Gramm Schmidt processes.
7. Define n?n determinants and explore their elementary properties.
8. Use linear theory to solve first and second order ordinary differential equations and linear systems of ordinary differential equations.

9. Compute eigenvalues and eigenvectors.

COURSE CONTENT:

LECTURE CONTENT:

A. Row-reduction methods, including elementary row operations, Gauss-Jordan elimination, and echelon matrices
B. Matrix algebra including matrix addition, scalar multiplication, multiplication of matrices, identities, inverses, and proofs of some of the properties of these operations
C. Linear spaces with focus on subspaces, spans, independence, bases, and dimension theory
D. Linear functions with emphasis on null spaces, images, fundamental theorems including the Rank-Nullity Theorem, and change of basis
E. Introduction to Inner Product Spaces including definitions, examples, norms, orthogonality, Fourier coefficients and the Gramm-Schmidt processes
F. Determinants with emphasis on multilinear functions, elementary properties of determinants, adjoints, and Cramer's rule
G. Introduction to Ordinary Differential Equations with focus on first and second order equations
H. Eigenvalues and eigenvectors: definitions, computation, and eigenbases
I. Introduction to systems of ordinary differential equations using elimination, eigen methods, and the exponential matrix
J. Introduction to Laplace transforms and their use in the solution of linear differential equations
K. Numerical methods for solution of ordinary differential equations such as Euler's method, an improved Euler's method, or the Runge-Kutta method
L. Series solutions to differential equations
M. Introduction to Fourier series
N. Introduction to Jacobian matrices in the discussion of differentiability of mappings from Euclidean n-space to m-space with extension to a general analysis of the chain rule, implicit function theorem and the inverse function theorem

LABORATORY CONTENT:

METHODS OF INSTRUCTION:

A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

Lecture, discussion

COURSE ASSIGNMENTS:

Reading Assignments

Students will spend approximately 1 hour per week reading from assigned text.

Out-of-class Assignments

Students will spend approximately 8 hours per week on out-of-class assignments, including reading, written defintions, justifications, and test preparation.

Writing Assignments

Students will spend approximately 1 hour per week on writing assignments, including written definitions, theorems, proofs, and justifications.

METHODS OF STUDENT EVALUATION:
Midterm Exam
Final Exam
Short Quizzes
Written Assignments
Objective Examinations
Report
Problem Solving Exercises

Demonstration of Critical Thinking:

Students write definitions, theorems, proofs, and justifications.

Required Writing, Problem Solving, Skills Demonstration:

Several written tests and a comprehensive final

TEXTS, READINGS, AND RESOURCES:

TextBooks:

1. Williamson, Richard and Hale Trotter. . *Multivariable Mathematics*, ed. New York: Pearson , 2003
2. Goode, Stephen . *Differential Equations and Linear Algebra*, ed. New York: Prentice Hall, 1999

LIBRARY:

Adequate library resources include: Print Materials
Non-Print Materials
Online Materials
Services

Comments:

Attachments:

Attached Files