COURSE OUTLINE OF RECORD

Number: MATH A285 **TITLE:** Introduction to Linear Algebra and Differential Equations

ORIGINATOR: Tab Livingston
EFF TERM: Fall 2016
FORMERLY KNOWN AS:
DATE OF OUTLINE/REVIEW: 12-02-2015
CROSS LISTED COURSE:
TOP NO: 1701.00
CID:

SEMESTER UNITS: 4.0
HRS LEC: 90.0 **HRS LAB:** 0.0 **HRS OTHER:** 0.0
CONTACT HRS TOTAL: 90.0
STUDY/NON-CONTACT HRS RECOMMENDED: 126.0
CATALOG DESCRIPTION:

Introduction to linear algebra and differential equations. Topics include matrices, determinants, vector spaces, linear systems of equations, inner product spaces, first and second order differential equations, systems of differential equations, and Laplace transforms. May be taken for grades or on a pass-no pass basis. Transfer Credit: CSU; UC.

JUSTIFICATION FOR COURSE:

Comparable to C-ID, UC and CSU course

PREREQUISITES:

- 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
- Appropriate OCC Math Placement Score.

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. Solve linear systems, including under- and over-determined systems.
2. Use matrix algebra and row-reduction methods to solve linear 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 6 hours per week on out-of-class assignments, inclduing reading, written definitions, justifications, and test preparation.

Writing Assignments

Students will spend approximately 1 hour per week on writing assignments, including 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:

Several written tests, comprehensive final

Required Writing, Problem Solving, Skills Demonstration:

Students will write definitions, theorems, proofs and justifications

TEXTS, READINGS, AND RESOURCES:

TextBooks:

1. Williamson, Richard and Hale Trotter . *Multivariable Mathematics*, ed. New York: Pearson , 2003

2. Goode, S . *Differential Equations and Linear Algebra.* , ed. New York: Prentice Hall, 1999

3. Kaplan, W. and Lewis, D. *Calculus and Linear Algebra v2: Vector Spaces, Many-Variable Calculus and Differential Equations*, ed. Ann Arbor, 2013

LIBRARY:

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

Comments:

Attachments:

Attached Files