COURSE OUTLINE OF RECORD

Number: MATH G285 TITLE: Introduction to Linear Algebra and Differential Equations

ORIGINATOR: Pete Bouzar
EFF TERM: Fall 2015
FORMERLY KNOWN AS: Ordinary Differential Equations
DATE OF OUTLINE/REVIEW: 12-02-2014
CROSS LISTED COURSE: TOP NO: 1701.00
CID: MATH 910S

SEMMESTER UNITS: 5.0
HRS LEC: 90.0
HRS LAB: 0.0
HRS OTHER: 0.0
CONTACT HRS TOTAL: 90.0
STUDY NON-CONTACT HRS RECOMMENDED: 180.0

CATALOG DESCRIPTION:
This course is designed to introduce students to the fields of 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.

JUSTIFICATION FOR COURSE:

PREREQUISITES:
• MATH G185: Calculus 2 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 C185: Calculus 2 with a minimum grade of C or better

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 [ ] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]

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]

Liberal Arts: Emphasis in Mathematics(Associate in Arts)
Mathematics(Associate in Science for Transfer)
Mathematics(Associate in Arts)

GE AND TRANSFER REQUIREMENTS MET:
MATH G285-Introduction to Linear Algebra and Differential Equations

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

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

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

1. Compute the row space, null space, and column space of a matrix or a system of linear equations.
2. Solve first or higher order ordinary differential equations with or without constant coefficients.
4. Prove theorems regarding vector spaces or subspaces.
5. Solve systems of linear differential equations using eigenvalues and eigenvectors.

COURSE OBJECTIVES:

1. Create and analyze mathematical models using ordinary differential equations
2. Verify solutions of differential equations
3. Identify the type of given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and selected higher order ordinary differential equations
4. Apply the existence and uniqueness theorems for ordinary differential equations
5. Find power series solutions to ordinary differential equations
6. Determine the Laplace Transform and inverse Laplace Transform of functions
7. Solve linear systems of ordinary differential equations
8. Find solutions of systems of equations using various methods appropriate to lower division linear algebra
9. Use bases and orthonormal bases to solve problems in linear algebra
10. Find the dimension of spaces such as those associated with matrices and linear transformations
11. Find eigenvalues and eigenvectors and use them in applications
12. Prove basic results in linear algebra using appropriate proof-writing techniques such as linear independence of vectors; properties of vector spaces or subspaces; linearity, injectivity and surjectivity of functions; and properties of eigenvalues and eigenvectors

COURSE CONTENT:

LECTURE CONTENT:

A. First order differential equations including separable, homogeneous, exact, and linear;
B. Existence and uniqueness of solutions;
C. Applications of first order differential equations such as circuits, mixture problems, population modeling, orthogonal trajectories, and slope fields;
D. Second order and higher order linear differential equations;
E. Fundamental solutions, independence, Wronskian;
F. Nonhomogeneous equations;
G. Applications of higher order differential equations such as the harmonic oscillator and circuits;
H. Methods of solving differential equations including variation of parameters, Laplace transforms, an series solutions;
I. Systems of ordinary differential equations
J. Techniques for solving systems of linear equations including Gaussian and Gauss-Jordan elimination and inverse matrices;
K. Matrix algebra, invertibility, and the transpose;
L. Relationship between coefficient matrix invertibility and solutions to a system of linear equations and the inverse matrices;
M. Special matrices: diagonal, triangular, and symmetric;
N. Determinants and their properties;
O. Vector algebra for \( \mathbb{R}^n \);
P. Real vector spaces and subspaces, linear independence, and basis and dimension of a vector space;
Q. Matrix-generated spaces: row space, column space, null space, rank, nullity;
R. Change of basis;
S. Linear transformations, kernel and range, and inverse linear transformations;
T. Matrices of general linear transformations;
U. Eigenvalues, eigenvectors, eigenspace;
V. Diagonalization including orthogonal diagonalization of symmetric matrices;
W. Dot product, norm of a vector, angle between vectors, orthogonality of two vectors in \( \mathbb{R}^n \); and
X. Orthogonal and orthonormal bases: Gram-Schmidt process.

METHODS OF INSTRUCTION:

A. Lecture:
B. Tutoring – noncredit:
C. Work Experience:
D. Direct Study/IS:
E. Dist. Ed – Delayed Interaction:
F. Video One Way – Audio Two Way:
G. Other simultaneous interactive:
H. Audio – One Way:
I. Other passive medium:
J. Field Experience:
K. Independent Study:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

Reading Assignments

A. Required Reading such as:

Textbook on ordinary differential equations and their applications.

Out-of-class Assignments

Optional computer assignments.

Writing Assignments

1. Tests and quizzes.
2. Homework assignments consisting mainly of problems from the textbook.

METHODS OF STUDENT EVALUATION:

Midterm Exam
Final Exam
Short Quizzes
Written Assignments
Essay Examinations
Objective Examinations
Report
Projects (ind/group)
Problem Solving Exercises
Oral Presentations
Skills Demonstration

Demonstration of Critical Thinking:

Each homework set, quiz, exam and computer assignment requires critical thinking and problem solving skills.

Required Writing, Problem Solving, Skills Demonstration:

1. Tests and quizzes. 2. Homework assignments consisting mainly of problems from the textbook.

TEXTS, READINGS, AND RESOURCES:

TextBooks:


LIBRARY:

Adequate library resources include:

Comments:

Attachments:

Attached Files