MATH 029: Linear Algebra and Differential Equations

Term: 2020 Winter Session Instructor: Staff Language of Instruction: English Classroom: TBA Office Hours: TBA
Class Sessions Per Week: 5 Total Weeks: 3 Total Class Sessions: 15 Class Session Length (minutes): 240 Credit Hours: 4

Course Description:

This course introduces linear algebra and systems of differential equations, as well as their applications in natural science and engineering. Topics cover chapter 1 to 4 and chapter 6- 9 in the textbook, including matrices, systems of linear equations, determinants, vector spaces, first order differential equations, linear transformations, eigenvalues and eigenvectors, higher order linear differential equations and systems of differential equations.

Learning Objectives

Upon completion students are expected to demonstrate abilities on:

1. solving systems of linear equations and interpret the results

2. understanding vector spaces as a framework for studying linear problems

3. solving first order separable or linear differential equations

4. solving eigenvalue/eigenvector problems

5. solving linear differential equations of order n and solve first order linear systems of differential equations.

Course Materials:

Textbook:

Differential Equations and Linear Algebra, 4th Edition, by Stephen W. Goode (Author), Scott A. Annin (Author)

Publisher: Pearson; 4 (December 27, 2015)

Language: English

ISBN-10: 9780321964670

ISBN-13: 978-0321964670

Course Format and Requirements:

Students are responsible for lecture notes, any course material handed out, and attendance in class, while attendance will not to be formally recorded. As Mathematics is a cumulative subject and each day builds on the previous day's material. If you have excessive absences, you cannot have a good command of this course. Active participation in the classroom is a great way to generate the discussion necessary to fully grasp the material.

Attendance

Students are expected to attend and participate in class. Strong attendance and participation are good indicators of success. Each student is responsible for all course material, announcements, quizzes and exams made in class, whether or not the student attended that day's class.

Grading Scale:

A+: 98%-100%
A: 93%-97%
A-: 90%-92%
B+: 88%-89%
B: 83%-87%
B-: 80%-82%
C+: 78%-79%
C: 73%-77%
C-: 70%-72%
D+: 68%-69%
D: 63%-67%
D-: 60%-62%
F: Below 60%

Course Assignments:

Daily Homework Assignment

Homework will be assigned on daily basis according sections covered in each class. Homework intends to help student have a review on key points in class and practice ability on solving questions. Even through homework will not be collected, but the quizzes questions are quite similar to Homework question. If students are diligent on homework questions, they will definitely have a good score on quizzes.

Quizzes

Quizzes will be assigned which count for 15% of the final grade. 6 quizzes will be given through the whole semester. The quizzes questions will be quite similar to homework questions. No make-up quizzes will be given.

Exams:

Midterm Exams

There will be two midterm exams in this course. The midterm exams will be based on concepts covered in class. They will be in-class, close-book and non-cumulative.

Final Exam

The final will be cumulative and close-book. Note that the final will not be taken during the normal class times. Exact time for final will be announced later.

Course Assessment:

Homework Assignment	10%
6 Quizzes	15%
Midterm Exams 1	20%
Midterm Exams 2	20%
Final Exam	35%
Total	**100%**

Course Schedule:

Week	Topics	Assignments
1	**Course introduction and course syllabus** **Matrics and systems of Linear Equations (Chapter 2)** -Review (Matrices Definition and Notation) -Matrix Algebra -Terminology for Systems of Linear Equations -Row-Echelon Matrices and Elementary Row Operations -Gaussian Elimination -The Inverse of a Square Matrix **Determinants(Chapter 3)** -The Definition and Properties of the Determinant -Cofactor Expansions **Vector Spaces (Chapter 4)** -Vectors in Rn -Defnition of a Vector Space -Subspaces -Spanning Sets	• Daily Homework Assignment • Quiz 1 • Quiz 2 • Midterm Exam 1
2	**Vector Spaces (Chapter 4)** -Linear Dependence and Linear Independence -Bases and Dimension -Row Space and Column Space -The Rank-Nullity Theorem **First-Order Differential Equations (Chapter 1)** -Differential Equations Everywhere -Basic Ideas and Terminology -The Geometry of First-Order Differential Equations -Separable Differential Equations	• Daily Homework Assignment • Quiz 3 • Quiz 4 • Midterm Exam 2

	-Some Simple Population Models -First-Order Linear Differential Equations -Modeling Problems Using First-Order Linear Differential Equations -Change of Variables -Exact Differential Equations -Numerical Solution to First-Order Differential Equations -Some Higher-Order Differential Equations	
3	**Linear Transformations, Eigenvalues and Eigenvectors (Chapter 6 +Chapter 7)** -Definition of a Linear Transformation -The Kernel and Range of a Linear Transformation -Additional Properties of Linear Transformations -The Matrix of a Linear Transformation -The Eigenvalue/Eigenvector Problem -General Results for Eigenvalues and Eigenvectors **Linear Differential Equations of Order n (Chapter 8)** -General Theory for Linear Differential Equations -Constant Coeffcient Homogeneous Linear Differential Equations -The Method of Undetermined Coeffcients: Annihilators **Systems of Differential Equations (Chapter 9)** -First-Order Linear Systems -Vector Formulation -General Results for First-Order Linear Differential Systems -Vector Differential Equations: Nondefective Coeffcient Matrix -Vector Differential Equations: Defective Coeffcient Matrix	• Daily Homework Assignment • Quiz 5 • Quiz 6 • Final Exam

	Review for final Exam	

Academic Integrity:

Students are encouraged to study together, and to discuss lecture topics with one another, but all other work should be completed independently.

Students are expected to adhere to the standards of academic honesty and integrity that are described in the Shanghai Normal University's *Academic Conduct Code*. Any work suspected of violating the standards of the *Academic Conduct Code* will be reported to the Dean's Office. Penalties for violating the *Academic Conduct Code* may include dismissal from the program. All students have an individual responsibility to know and understand the provisions of the *Academic Conduct Code*.

Special Needs or Assistance:

Please contact the Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material. Our goal is to help you learn, not to penalize you for issues which mask your learning.