MA 303 (001) Fall 2023 Linear Analysis

Instructor: Chao Chen

Email: chao_chen@ncsu.edu (Please include course number in the subject.)

Times: TuTh 3:00PM - 4:15PM

Location: 3216 Broughton Hall

Office hours: SAS 4236, TuTh 1:00PM - 2:00PM and by appointment

Textbook: N. J. Rose, *Introduction to Linear Analysis*, Department of Mathematics, NC State University, 1999 (hardcopy available at the bookstore)

Course Description

This course is about the analysis of discrete and continuous dynamical systems, or systems that change with time. Specific topics include

- linear difference equations of first and second order, compound interest and amortization
- linear differential equations of first and second order
- matrices and systems of linear equations, eigenvalues, diagonalization, systems of difference and differential equations.

Homework

Homework assignments will be given weekly, and students have one week to work on each assignment.

A single PDF file for each homework need to be uploaded to Moodle.

- Computer typeset papers (using, e.g., LaTeX) are preferred.
- Handwritten papers scanned to a PDF will be accepted as long as the handwriting is legible.
  - On an iPhone you can use the Notes app - tap the camera icon and choose Scan Documents.
  - On an Android phone, you can scan using the Google Drive app.

Homework assignments will be graded partially (one or two problems).

- Any imperfections in a submitted solution (except for minor typos) will render the entire solution incorrect (no partial credit).
- Grading requests must be initiated within one week after grades are released, if you believe a problem on the grade.

See Policy on Excused Absences & Missed Assignments and Absence Verification.

Exams

Three midterm exams (during class time): September 12 (Tuesday), October 12 (Thursday), and November 14 (Tuesday)

Final exam: December 12 (Tuesday) 3:30PM - 6:00PM

Grading

Numerical grade = homework (10%) + 3 x midterms (20%) + final (30%)

Letter grade

- 97 and above is A+, starting from 93 and below 97 is A, starting from 90 and below 93 is A-.
- Similar for the B, C, and D ranges.
- Anything below 60 is F.

Moodle

The Moodle page of this course is here.

Panopto

Lectures will be videotaped and made available via Panopto.

(Classroom attendance is recommended on the substance.)

Schedule

Week 1

- Aug. 22: Difference Equations
- AUg. 24: Difference Equations, Compound Interest

Week 2

- Aug. 29: Compound Interest
- Aug. 31: Mortgage Amortizations, 1st Order Difference Equation

Week 3

- Sep. 5: 1st Order Difference Equations
- Sep. 7: Complex Numbers

Week 4

- Sep. 12: Complex Numbers, Fibonacci Numbers
- Sep. 14: Midterm Test 1

Week 5

- Sep. 19: Wellness Day (no class)
- sep. 21: Properties of Solutions of 2nd Order Linear Difference Equations

Week 6

- Sep. 26: Homogeneous 2nd Order Linear Difference Equation
- Sep. 28: Non-homogeneous 2nd Order Linear Difference Equation

Week 7

- Oct. 3: Economic Model, Gambler's Ruin
- Oct. 5: Differential Equations

Week 8

- Oct. 10: Fall break (no class)
- Oct. 12: Separation of Variables

Week 9

- Oct. 16: 1st Order and 2nd Order Linear Differential Equations
- Oct. 19: Midterm Test 2

Week 10

- Oct. 24: Vectors and Matrices
- Oct. 26: Matrix Notation for Linear Systems, Properties of Solutions

Week 11

- Oct. 31: Elementary Operations
- Nov. 2: Solution of Linear Systems, Consistency of Linear Systems

Week 12

- Nov. 7: Matrix Algebra
- Nov. 9: Powers, Transposes, Inverses

Week 13

- Nov. 14: Inverses, Linear Dependence and Linear Independence
- Nov. 16: Midterm Test 3

Week 14

- Nov. 21: Determinants
- Nov. 23: Thanksgiving Holiday (no class)

Week 15

- Nov. 28: Eigenvalues, Eigenvectors
- Nov. 30: Systems of Differential Equations

Week 16

- Dec. 5: Solutions of Systems of Difference Equations

Special Needs

Accommodations will be made for students with special needs, who must be properly registered with the Disability Resource Office. (Please contact me as soon as possible.)

Academic integrity and honesty

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct 11.35.01 sections 8 and 9. Therefore, students are required to uphold the Pack Pledge: “I have neither given nor received unauthorized aid on this test or assignment.” Violations of academic integrity will be handled in accordance with the Student Discipline Procedures.

Please refer to the Academic Integrity web page for a detailed explanation of the University’s policies on academic integrity and some of the common understandings related to those policies.

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