CAAM 335 · MATRIX ANALYSIS
Spring 2017 · Rice University

Lectures: Section 1 (Pantić, Sanja): MWF 2:00–2:50PM, HRZ 212
Section 2 (Zhang, Yin): MWF 9:00–9:50AM, DCH 1064

Course Webpage: [http://www.caam.rice.edu/~caam335](http://www.caam.rice.edu/~caam335)

Instructors: Yin Zhang (yzhang @ rice.edu), Duncan Hall 3090, 713–348–5744
Office Hours: Wednesdays 2:00-4:00pm, Duncan Hall 3090.

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Office Hours: Tuesdays 2:00-4:00pm, Duncan Hall 3085.

Teaching Assistant: Information, once available, will be posted at the course webpage
Recitations: To be given weekly by the TA (see the course webpage for details)
Office Hours: (see the course webpage for details)

Course objectives: Students should learn how to characterize the solution of systems of linear equations and linear least squares problems, apply basic solution techniques to linear problems involving electrical circuits and planar trusses, compute the eigen-decomposition of matrices and apply it to solve linear dynamical systems, and compute the eigenvalue problem and Laplace transform via complex integration.

Outcomes:

• Apply the Fundamental Theorem of Linear Algebra to characterize solutions of linear systems.
• Solve linear systems and linear least squares problems, and apply these techniques to problems involving electrical circuits and planar trusses.
• Compute eigenvalues and eigenvectors of matrices.
• Apply the eigen-decomposition to solve linear dynamical systems.
• Compute the eigen-decomposition and inverse Laplace transform via complex integration.
• Compute the singular value decomposition and apply it to relevant problems.

Prerequisites: MATH 212 and CAAM 210
Less formally: you should be familiar with multivariable calculus and elementary matrix manipulations (matrix addition and multiplication, Gaussian elimination), and be able to write MATLAB programs.

Grading: 60% exams and 40% homeworks (class participation and improving performance on the exams will be considered when assigning borderline grades).

Exams: There will be 3 exams: Exams 1 and 2, and the Final. The two midterms are take-home, timed and closed-book. The Final is scheduled and comprehensive. These exams, in the above order, account for 15%, 20%, and 25% of the final grade, respectively. Each exam must be your individual, unassisted effort; indicate compliance by writing out in full and signing the honor code pledge. More information about the exams can be found at the course webpage.
Homeworks: Homeworks will be assigned roughly once a week. Typically a homework assignment is due one week after it has been posted. Unless otherwise stated, you may collaborate with other students, but you must write up your solutions separately. Transcribed solutions are unacceptable. You may not consult solutions from previous sections of this class.

Homework assignments will be posted at the Canvas course site: https://canvas.rice.edu/courses/1778. The lowest homework grade will be dropped.

Late Policy: Homeworks and exams must be turned in on time.

Required Reading: — Course notes “Linear Algebra in Situ” (Fall 2016 Edition) by Steven Cox. Available as a course pack from the campus store.
— Supplemental notes by Matthias Heinkenschloss. Available online as a PDF file at the Canvas course site.

Recommended Reading: Carl Meyer, Applied Matrix Analysis and Linear Algebra
Gilbert Strang, Introduction to Applied Mathematics
Lars Ahlfors, Complex Analysis, 3rd ed.
D. J. Higham & N. J. Higham, MATLAB Guide

Programming: Homework assignments may require MATLAB programming. Your solutions should adhere to good programming standards, and must not be copied from other students.

Coverage: Chap. 1: Orientation, sections 1–3
Chap. 2: Electrical Networks, sections 1–2
Chap. 3: Mechanical Networks, sections 1–3
Chap. 4: The Column and Null Spaces, sections 1–3
Chap. 5: The Fundamental Theorem and Beyond, sections 1–3
Chap. 6: Least Squares, sections 1–4
Chap. 8: Dynamic Systems, sections 1–4
Chap. 9: Complex Numbers, Vectors and Functions, sections 1–3
Chap. 10: Complex Integration, sections 1–3
Chap. 11: The Eigenvalue Problem, sections 1–2
Chap. 12: The Hermitian Eigenvalue Problem, sections 1–2
Chap. 13: The Singular Value Decomposition, sections 1–2

Materials in Chapters 11 to 13 (Eigenvalue Problems and Singular Value Decomposition) will be covered much earlier (roughly after Chap. 6 and before Chap. 8). Their coverage will follow the supplemental notes instead of the course notes.

Any student with a disability requiring accommodation in this course is encouraged to contact the instructor during the first week of class, and also to contact Disability Support Services in the Ley Student Center.