11310EE 203002 Linear Algebra (線性代數)

Fall 2024

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Units: 3
Lecture hours: **W3,W4,F3,F4**
Classroom: **Delta 217**
Office hours: 13:30-15:30, Tuesday and Thursday

Linear algebra is a branch of mathematics that deals with vector spaces and linear transformations. This theory is the foundation of many areas in pure and applied mathematics including functional analysis, differential geometry, multidimensional calculus, graph theory and etc. The concepts, tools and specifically the language of linear algebra are absolutely essential and widely used in engineering, physics, economics and social sciences, and natural sciences. For instance, optimization and artificial intelligence (AI) in general, and convex optimization (CVXopt) in particular heavily relies on the linear algebra, which, through logical reasoning, provides a great language to intelligently translate a non-CVXopt problem under consideration into a solvable CVXopt problem, thereby leading to optimal solutions together with insightful analysis. The main goal for this course is to build the foundation in linear algebra, that is essential to the innovative capability for solving challenging problems in extensive real-world applications.

Outline:

1. Vectors and Matrices (Chapter 1)
2. Solving Linear Equations (Chapter 2)
3. Four Fundamental Subspaces (Chapter 3)
4. Orthogonality and Determinants (Chapters 4 & 5)
5. Eigenvalues and Eigenvectors (Chapter 6)
6. Singular Value Decomposition (SVD) (Chapter 7)
7. Linear Algebra in Optimization (Chapter 9)

Textbook:

Gilbert Strang, *Introduction to Linear Algebra*, 6th Edition, Wellesley-Cambridge Press, 2023. (滄海書局 (04) 27088787)

References:

E. S. Meckes, and M. W. Meckes, *Linear Algebra*, Cambridge University Press, 2018. (滄海書局 (04) 27088787-1188)

G. Strang, *Linear Algebra and Learning from Data*, Wellesley-Cambridge Press, 2019.

Grading:

- Homework: **30 points**
- Mid-term exam: **30 points**; written examination in class.
- Final exam: **40 points**; written examination in class.

Notice:

1. Your course grade will be based on a nonlinear adjustment on the total score which will be determined after the final examination.
2. No make-up for mid-term and final examinations under any circumstance.
3. We are against plagiarism. Committing any form of plagiarism will lead to serious penalty. Moreover, you need to hand in the homework yourself in class on the due day. Otherwise, the score will be multiplied by a factor of 0.7 per day passing the deadline.

Teaching Assistants:

Name: To be determined

Office:

e-mail:

Office hours: