EECS205000 Linear Algebra
(線性代數)
Spring 2020

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Units: 3
Lecture hours: **W3,W4,F3,F4**
Classroom: **Delta 217**
Course website: http://www1.ee.nthu.edu.tw/cychi/teaching/courses.php
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 in general and convex optimization in particular is mainly based on the linear algebra and matrix analysis which provides a great language to translate a described optimization problem into mathematical formulations for further analysis. The main goals for this course are to understand the fundamental concepts in linear algebra from vector space to linear transformations and to enhance the students' critical thinking and reasoning by learning and writing logical proofs. Various applications of linear algebra in different areas will also be addressed, including artificial intelligence (AI), especially for machine learning and deep learning.

This course not only discusses fundamentals of linear algebra to strengthen the students' mathematical background but also provides an opportunity for students to train their mind to think and discuss with logical reasoning. This can lead them to learn: "how to do and write a neat mathematical proof?" To this end, students are expected to actively exercise writing mathematical proofs to make their own proofs in the homework assignments. We will briefly introduce the applications of linear algebra including "how to transform a practical problem into a mathematically formulated problem that can be solved optimally?"

Outline:

1. Vectors and Matrices
2. Systems of Linear Equations
3. Vector Spaces and Subspaces
4. Inner Products and Orthogonality
5. Matrix Inversion and Determinants
6. Diagonalization

7. Eigenvalues and Eigenvectors
8. Linear Transformations
9. Applications

Textbook:

G. Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 4th Ed., 2009 (歐亞書局 (02) 8912-1188)

References:

E. S. Meckes, and M. W. Meckes, *Linear Algebra*, Cambridge University Press, 2018.

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

Grading:

Your total score out of **110 points** is allocated as:
• Homework: **60 points** plus **10 points** for creative solutions;
• 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 final examinations under any circumstance.

Teaching Assistants:

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