Math 2111 Matrix Algebra and its Applications

Course Outline - spring 2024

1. Course Instructor

Name: Dr. Hon-Ming HO
Contact Details: Room 3419, Phone 34693032, e-mail: mastanho@ust.hk
Office Hour: Tuesday from 12:00 pm to 2:00 pm

2. Teaching Assistant

Name: CHENG Wing Cheong
Contact Details: Room 3012, e-mail: matcheng@ust.hk
Name: KONG Hoi Sang
Contact Details: Room 3012, e-mail: mahsk@ust.hk

3. Meeting Time and Venue

Lecture: L1: Wednesday, Friday 1:30 pm-2:50 pm Room 2465
Tutorials: T1a: Monday 3:00 pm-3:50 pm LSK1007
Tutorials: T1b: Friday 10:30 am-11:20 pm Room 4579
Lecture: L2: Monday 1:30 pm-2:50 pm and Friday 9:00 am-10:20 am, Room 2306
Tutorials: T2a: Thursday 5:00 pm-5:50 pm CYTG009B
Tutorials: T2b: Wednesday 12:00 pm-12:50 pm LG426(LIB)

4. Course Description

- Credit Points: 3 units
- Pre-requisite: A passing grade in AL Pure Mathematics/AL applied Mathematics; or Math 1014; or Math 1018; or Math 1020; or Math 1024
- Exclusion: Math 2121, Math 2131, Math 2350
- Brief Information/Synopsis:
  Systems of linear equations, vector spaces, linear transformations, matrix representation of linear transformations, eigenvalues, eigenvectors, inner product spaces.

5. Intended Learning Outcomes

Upon successful completion of this course, students should be able to do:

No.	ILOs
1	Develop an understanding of the core ideas and concepts of matrix algebra, linear transformations, eigenvectors and inner product spaces
2	Recognize the power of abstraction and generalization, carry out mathematical work with independent judgement,
3	Apply rigorous, analytical and numeric approach to analyze and solve problems using concepts of linear algebra,
4	Communicate problem solutions using correct mathematical terminology and good English.

6. Assessment Scheme

a) Examination duration: 2 hour **(provisional)** for mid-term examination, 3 hour **(provisional)** for the final examination.

b) Percentage of coursework, examination

Assessment	Assessing Course ILOs
15% by online homework assignment	1, 2, 3, 4
35% by mid-term examination	1, 2, 3, 4
50% by final examination	1, 2, 3, 4

c) The grading is assigned based on students' performance in assessment tasks/activities.

7. Student Learning Resources

- *Lecture notes*: Lecture notes will be distributed on every lecture.
- *Textbook*: **Linear Algebra and its Applications by David C. Lay, 5th edition. Pearson.**
- *Math Support Center:* Learning support provided by Mathematics Department (http://www.math.ust.hk/~support)

8. Teaching and Learning Activities

Scheduled activities: 3 hours (lecture) + 1 hour (tutorial).

Lecture will focus on illustrating the concepts of the course content, while tutorials will focus on examples and problem skills.

9. Course Schedule (provisional)

Week	Key Topics
1, 2, 3	Systems of linear equations, Row reduction and echelon forms, Homogeneous linear systems and solution structure, Matrix Transformations, Matrix operations, Matrix Inverses
4, 5, 6,7	Elementary Matrices, Determinants and its properties, Cramer's Rule and inverse formula, Areas and Volumes, Vector Spaces and Subspaces, Subspaces associated with matrices, Linear Independent Sets and Bases, Coordinate Systems and dimension
8 ,9, 10	Rank theorem, Eigenvectors, Eigenvalues and their applications, Homogeneous Systems of First Order Linear ODEs,
11 ,12, 13	Inner Product Spaces, Orthogonality and orthonormal sets, Orthogonal projections and Gram-Schmidt process, Least square solutions and Applications