Math 2350 Applied Linear Algebra and Differential Equations

Syllabus – Fall 2024

Instructor

Prof. J. R. Chasnov
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Office hours: by appointment

Lectures

L1: Mon, Wed 9:00-10:20am 4619
L2: Mon, 1:30-2:50pm 4619, Fri 9:00-10:20am 4619

Teaching Assistants and Tutorials

T1a: Fri 11:30am-12:20pm 6602 (Huang, Haohan/hhuangbu)
T1b: Mon 1:00-1:50pm 1104 (Huang, Haohan/hhuangbu)
T1c: Tues 12:00-12:50pm 5583 (Liu, Yonglin/yliuks)
T2a: We 3:30-4:20pm 1104 (Liu, Yonglin/yliuks)
T2b: Th 10:30-11:20am 6580 (Zhang, Yue/yzhangnl)
T2c: We 1:30-2:20pm 1104 (Zhang, Yue/yzhangnl)

Course Description

Credits: 3 units; Topic: Linear algebra and differential equations
Exclusions: MATH 2111, MATH 2121, MATH 2131, MATH 2351, MATH 2352
Prerequisites: AL Pure Mathematics/AL Applied Mathematics; or MATH 1014; or MATH 1018; or MATH 1020; or MATH 1024

Student Learning Resources

Course Lecture Notes can be obtained as a pdf file:
https://www.math.hkust.edu.hk/~machas/applied-linear-algebra-and-differential-equations.pdf
Textbooks (for reference): Linear Algebra and its Applications by David Lay; Elementary Differential Equations and Boundary Value Problems by Boyce & DiPrima.

Intended Learning Outcomes

Upon successful completion of this course, students should

1. Develop an understanding of the core ideas and concepts of linear algebra and ordinary differential equations;
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 and differential equations;
4. Demonstrate skills in reading, interpreting and communicating mathematical content which are integrated into other disciplines or appear in everyday life;
5. Develop the mathematical maturity to undertake higher level studies in mathematically related fields.

Assessment Scheme	**Assessing Course ILOs**
Worksheets: 10%	1, 2, 3, 4, 5
Midterm: 40%	1, 2, 3, 4, 5
Final: 50%	1, 2, 3, 4, 5

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Week 1:
0.14 Course introduction; complex numbers
Week 2:
1.1-1.8 Matrices, transposes, inverses, rotations, permutations
Week 3:
2.1-2.5 Gaussian elimination, reduced row echelon form, inverses, LU decomposition
Week 4:
3.1-3.4 Vector and inner-product spaces
Week 5:
3.5-3.7 Four fundamental vector spaces of a matrix, Gram-Schmidt
Week 6:
3.9-3.10, 4.1-4.4 Least squares, determinants, Cramer's rule
Week 7*:*
5.1-5.3 Eigenvalues and eigenvectors, diagonalization
Week 8
6.1, 7.1, 7.2, 7.3 Introduction to odes, Euler method, separable equations, linear equations
Week 9
7.4, 8.1- 8.3 Applications, Euler method 2D, superposition, Wronskian
Week 10
8.4-8.6 Homogeneous odes, difference equations, inhomogeneous odes
Week 11
8.8-8.9 Inhomogeneous odes, resonance, applications, damped resonance
Week 12
9, 10.1-10.4 Series solutions, systems of first-order linear odes
Week 13
10.5 Normal modes, Final exam review