

Linear Algebra 1

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|--------------------------|--------------------------------------|----------|---|------------------|------------------|-------------------|
| Course Name | Course type (credit/hours) | | Required course(4/5) | | Course code | G016 |
| | Target students Division/major/grade | | Mathematics/Sophomore | | Opening semester | 2020 1ST SEMESTER |
| | Class time and classroom | | Mon 16:30~18:00 (Pal311)Wed 7(Pal311) Wed 8(Pal311)Thu 16:30~18:00 (Pal311) | | English Grade | A(100%English) |
| Reference to this course | Prerequisite courses | | Calculus 1, Calculus 2 | | | |
| | Related basic courses | | | | | |
| | Recommended concurrent courses | | | | | |
| | Related advanced courses | | Linear Algebra 2, Modern Algebra 1,2 | | | |
| Instructor | Name (title/division) | | Park, Boram(Associate Professor, Mathematics) | | | |
| | Office Room Number | 팔달관 613호 | Office phone Number | 2561 | e-mail | |
| | Office hours | | | Homepage address | | |
| Teaching Assistant | Name (title/division) | | | | | |
| | Office Room Number | | Office phone Number | | e-mail | |

1. Introduction

- We study the basic operations of matrices and determinants. Then we and apply them to solve systems of linear equations.
- We study the relations between linear transformations on Euclidean spaces and the corresponding matrices.
- Futhermore, we study the eigenvalues and diagonalization of square matrices and the applications.

2. Course Objectives

- Representing and solving systems of linear equations via matrices
- Working with matrices, finding inverse matrices, factorizing matrices(LU)
- Euclidean spaces : subspaces, bases, dimensions
- Rank theorem
- Understanding the relation between linear transformations on Euclidean spaces and the corresponding matrices
- Understanding square matrices including determinants, eigen vlaues/eigen vectors/eigen spaces, diagonalization,spectral decomposition, and applications

3. Class types and activities

Lectures and recitations

4. Teaching Method

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| <input checked="" type="checkbox"/> lecture | <input type="checkbox"/> discussion and debate |
| <input type="checkbox"/> team project(presentation and case studies) | <input checked="" type="checkbox"/> experiments(role-playing,etc) |
| <input type="checkbox"/> designing and production | <input type="checkbox"/> on-site learning(on-site training) |
| <input type="checkbox"/> others | |

5. Support Systems in Use

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|--|---|---|
| <input checked="" type="checkbox"/> AjouBb | <input type="checkbox"/> automatic recording system | <input type="checkbox"/> web-based assignment |
| <input type="checkbox"/> cyber lecture | <input type="checkbox"/> online content | |
| <input type="checkbox"/> class behavior analyzing system | <input type="checkbox"/> others | |

6. Teaching Tools

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| <input type="checkbox"/> PBL(Problem Based Learning) | <input type="checkbox"/> CBL(Case Based Learning) | <input type="checkbox"/> TBL(Team Based Learning) |
| <input type="checkbox"/> UR(Undergraduate Research) | <input type="checkbox"/> FL(Flipped Learning) | <input type="checkbox"/> DSAL(Data Science Active Learning) |
| <input type="checkbox"/> others | | |

7. Knowledge and ability required for taking this course

Basic knowledges of Calculus 1 and Calculus 2

8. Method of Evaluation

| Evaluation Item | The Number of Times | Evaluation Proportion | Remarks |
|-----------------|---------------------|-----------------------|---------|
| Attendance | | 10 | |
| midterm exam | | 35 | |
| final exam | | 35 | |
| quiz | | | |
| presentation | | | |
| discussion | | | |
| homework | | 20 | 퀴즈 포함 |
| etc | | | |
| study hours | | | |

9. Textbook and supplementary material

| Main/Sub | Title (Web-site) | Writer | Publisher | Publication year |
|----------|---|----------------|---------------|------------------|
| Sub | Elementary Linear Algebra | Anton & Rorres | John Wiley | 1994 |
| Sub | Linear Algebra | Steven J. Leon | Prentice Hall | 2005 |
| Main | Linear Algebra A Modern Introduction, 3rd edition | David Poole | Brooks/Cole | 2006 |

10. Class system and Class shedule

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| <ol style="list-style-type: none"> 1. We use elementary operations on a matrix and find the sotutions of systems of linear equations. 2. We study matrix operations, inverse, and LU factorization of square matrices. 3. We study subspaces of Euclidean spaces, bases, dimensions. 4. We study the rank theorem of matrices. 5. We study the matrix representation of Linear transformation. 6. We study the eigenvalues and eigenvectors of Matrix and their applications. |
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< Class Schedule >

* language : K-korean, E-English

| Weeks | Topics | language | Instructor | Teaching Method | Evaluation Method | Matter to be prepared |
|-------|--|----------|-------------|-------------------|-------------------|-----------------------|
| 1 | The Geometry and Algebra of Vectors Length and Angle:The Dot Product and etc. Chap 1 Review(at most 1 1/2 classes including 1.4) | K/E | Park, Boram | Teaching and Lab | | |
| 2 | Introduction to the Systems of Linear Equations Direct Methods for Solving Linear Systems, page 87-89 | K/E | Park, Boram | Teaching and Lab | | |
| 3 | Spanning Sets and Linear Independence Applications Iterative Methods for Solving Linear Systems | K/E | Park, Boram | Teaching and Lab | | |
| 4 | Matrix Operations Matrix Algebra | K/E | Park, Boram | Teaching and Lab | | |
| 5 | Inverse of a Matrix The LU Factorization | K/E | Park, Boram | Teaching and Lab | | |
| 6 | Subspaces,Basis,Dimension, and Rank(First Part) | K/E | Park, Boram | Teaching and test | | |
| 7 | Subspaces,Basis,Dimension, and Rank(Second Part) | K/E | Park, Boram | Teaching and Lab | | |
| 8 | Midterm Exam | K/E | Park, Boram | Teaching and test | | |
| 9 | Introduction to Linear Transformations Applications(beginning part) | K/E | Park, Boram | Teaching and Lab | | |
| 10 | Applications(Second Part) | K/E | Park, Boram | Teaching and Lab | | |
| 11 | Introduction to Eigenvalues and Eigenvectors Determinants | K/E | Park, Boram | Teaching and Lab | | |
| 12 | Eigenvalues and Eigenvectors of $n \times n$ Matrices | K/E | Park, Boram | Teaching and test | | |
| 13 | Similarity and Diagonalization Iterative Methods for Computing Eigenvalues(First part) | K/E | Park, Boram | Teaching and Lab | | |
| 14 | Iterative Methods for Computing Eigenvalues(second Part) Applications and the Perron-Frobenius Theorem-Markov Chains | K/E | Park, Boram | Teaching and Lab | | |

< Class Schedule >

* language : K-korean, E-English

| Week s | Topics | lang uag e | Instructor | Teaching Method | Evaluation Method | Matter to be prepared |
|-----------|---|------------------|-------------|----------------------|----------------------|--------------------------|
| 15 | Population Growth – Discrete Linear Dynamical Systems | K/E | Park, Boram | Teaching and Lab | | |
| 16 | Final Exam | K/E | Park, Boram | Teaching and test | | |

11. Other items of notification