Collaborative Bachelor's Degree Program of Fire Protection and Safety Engineering Technology

between Southwest Jiaotong University and Oklahoma State University, U.S.A.

# Course Schedule

## Semester    Fall 2020

## 1. Course information:

| Course Code | FGEE001612 | Course name | Linear Algebra | | |
|---|---|---|---|---|---|
| **Credits** | 3 | **Type** | Compulsory course | **Cohort** | ? |
| **Department** | ? | **Instructor** | Lukun Zheng | | |

## 2. Course expected learning outcomes

1. Solve systems of linear equations with elementary row operations and master the solvability discrimination criteria

2. Understand major types of matrices and their properties, master matrix operations skills.

3. Develop matrix methods to solve real-life problems.

4. Compute determinants, inverses, eigenvalues and eigenvectors of n × n matrices.

5. Conduct linear transformations and analyze the relationship among a set of vectors in $R^n$.

6. Understand the concepts of quadratic forms and its related properties.

## 3. Teaching Calendar:

| Course Calendar | Teaching Contents | Requirement of students | Teaching time | | Extra-curricular Practice |
|---|---|---|---|---|---|
| | | | Lecture | Practice | |
| 11/23/2020 | 1.1 Linear Systems of Equations. 1.2 Gaussian Elimination(GE) Basics; | Sections: 1.1-1.2 | 130 minutes | 15 minutes | HW 1 |

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| 11/25/2020 | 1.3 General Procedure of GE. | Section 1.3 | 130 minutes | 15 minutes | |
|---|---|---|---|---|---|
| 11/26/2020 | 1.4 Applications. | Section 1.4 | 130 minutes | 15 minutes | HW2 |
| 11/30/2020 | 2.1 Matrix Addition and Scalar Multiplication; | Section 2.1 | 130 minutes | 15 minutes | HW 3 |
| 12/02/2020 | 2.2 Matrix Multiplication. | Sections: 2.2 | 130 minutes | 15 minutes | |
| 12/03/2020 | 2.3 Applications of Matrix Arithmetic. | Section 2.3 | 130 | 15 minutes | HW 4 |
| 12/07/2020 | 2.4 Special Matrices and Transposes. | Sections: 2.3-2.4 | 130 minutes | 15 minutes | HW 5 |
| 12/09/2020 | 2.5 Matrix Inverses; | Sections 2.5 | 130 minutes | 15 minutes | |
| 12/10/2020 | 2.6 Determinants; | Section 2.6. | 130 minutes | 15 minutes | Exercise 1 |
| 12/14/2020 | Exam 1; 3.1 Basic Concepts. | Section: 3.1. | 130 minutes | 15 minutes | HW 6 |
| 12/16/2020 | Exam 1 Review; 3.2 Subspaces. | Section 3.2. | 130 minutes | 15 minutes | |

| 12/17/2020 | 3.3 Linear Combinations. | Section 3.3. | 130 minutes | 15 minutes | HW7 |
| --- | --- | --- | --- | --- | --- |
| 12/21/2020 | 3.4 Subspaces associated with Matrices and Operators; | Section 3.4. | 130 minutes | 15 minutes | HW8 |
| 12/23/2020 | 3.5 Bases and Dimension. | Section 3.5. | 130 minutes | 15 minutes | |
| 12/24/2020 | 3.6 Linear Systems revisited. 3.7 Change of Basis and Linear Operators. | Sections 3.6-3.7. | 130 minutes | 15 minutes | Exercise 2 |
| 12/28/2020 | Exam 2 5.1 Basic Concepts. | Section 5.1. | 130 minutes | 15 minutes | HW9 |
| 12/30/2020 | Exam 2 Review; 5.2 Similarity and Diagonalization. | Section 5.2. | 130 minutes | 15 minutes | |
| 12/31/2020 | 5.3 Quadratic forms and their matrix representations. | Section 5.3. | 130 minutes | 15 minutes | HW10 |
| 01/04/2021 | 5.4 Orthogonal Canonical Reduction. | Section 5.4. | 130 minutes | 15 minutes | |
| 01/06/2020 | 5.5 Applications. | Sections: 5.5 | 130 minutes | 15 minutes | Exercise 3 |
| 01/07/2020 | Final Exam Preparation. | | 130 minutes | 15 minutes | No HW |

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| To be announced | Final exam | | | | |
|---|---|---|---|---|---|

## 2. Course expected learning outcomes

### Learning Objectives

1. Be able to solve systems of linear equations

2. Be able to prove fundamental theorems about matrices, n-dimensional space, linear transformations, vector spaces, and inner product spaces

3. Be able to apply matrix methods to solve certain practical problems

4. Be able to analyze linear transformations and sets of vectors in $R^n$.

5. Understand the concepts of one-to-one, onto, spanning, and linear independence.

6. Be able to compute determinants, inverses, eigenvalues and eigenvectors of n × n matrices.

7. Understand the concepts of quadratic forms and its related properties.

### Learning Outcomes

At the end of this course, students should be able to:

1. Solve systems of linear equations with elementary row operations and master the solvability discrimination criteria.

2. Understand major types of matrices and their properties, master matrix operations skills.

3. Develop matrix methods to solve real-life problems.

4. Compute determinants, inverses, eigenvalues and eigenvectors of n × n matrices.

5. Conduct linear transformations and analyze the relationship among a set of vectors in $R^n$.

6. Understand the concepts of quadratic forms and its related properties.

## 4. Textbooks and reference books:

Applied Linear Algebra and Matrix Analysis-2018-2nd Edition-By Thomas S. Shores, Springer.

## 5. Evaluation Forms and Scoring Standards:

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Final exam: 20 %, Others: 80 %. Others are consisted of the following parts:

| Evaluation Forms | Evaluation Content | Its Percentage of Others |
|---|---|---|
| Homework | 10 homework assignments | 20% |
| Quiz | 17 Quizzes | 20% |
| Exams 1 | Exam 1 | 20% |
| Exam 2 | Exam 2 | 20% |

## 6. Tips for student success:

Problems in the exams are similar to problems in the homework assignments and examples during the class.

## 7. Academic integrity:

"Students who commit any act of academic dishonesty may receive from the instructor a failing grade in that portion of the coursework in which the act is detected or a failing grade in the course without possibility of withdrawal." Although students may help each other on homework assignments, individual work is required on quizzes and exams.

## 8. Other course details:

Please refer to Syllabus.