

# MATH 0280: Introduction to Matrices and Linear Algebra

Spring, 2021-2022

**Instructor:** Kunpeng Wang

**E-mail:** [kunpeng.wang@scupi.cn](mailto:kunpeng.wang@scupi.cn)

**Office Hours:** Tue. 9:00-11:00 am, 1:00-4:00 pm, Thur. 10:00-11:00 am, 1:00-4:00 pm

**Office:** Room 3-317A SCUPI Building

## Course Description

This course is a self-contained introduction to Matrix Theory and Linear Algebra. Topics of this course include vectors, matrices, determinants, linear transformations, eigenvalues and eigenvectors, and selected applications.

**Section: 01**

Class Room: Room **3-101** SCUPI Building

Class Hours: Wednesday 8:15-9:00 am, 9:10-9:55 am, 10:15-11:00 am

**Teaching Assistant:** Guangcan Zhang

QQ/Wechat Group: 814089994

Email: [volcazhang@stu.scu.edu.cn](mailto:volcazhang@stu.scu.edu.cn)

Tutorials: Room: TBA, Wednesday 4:30-6:30 pm

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**Section: 02**

Class Room: Room **3-106** SCUPI Building

Class Hours: Wednesday 11:10-11:55 am, Thursday 8:15-9:00 am, 9:10-9:55 am

**Teaching Assistant:** Haojie Liu

QQ/Wechat Group: 793043612

Email: [2019141520189@stu.scu.edu.cn](mailto:2019141520189@stu.scu.edu.cn)

Tutorials: Room: TBA, Monday 4:30-6:30 pm

## Prerequisites

Advanced high school mathematics.

## Course Objectives

When students complete this course, they should be able to

1. Have a deep understanding of vectors in  $\mathbb{R}^n$  and fundamental notions of vector spaces including spanning sets, linear independence, subspaces, basis and dimension.
2. Solve a linear system of equations using the row reduction of matrices.

3. Understand a matrix from the perspective of row and column spaces as well as a linear transformation.
4. Compute eigenvalues and eigenvectors for square matrices and apply the concepts in solving certain ordinary differential equations.
5. Construct an orthonormal basis for a vector space employing the Gram-Schmidt process.
6. Apply linear algebra in solving problems of distances and approximations.

## Course Content

We will cover most of the material from Chapters 1-7 in the textbook.

## Class Structure

Lectures.

## Tutorials

Tutorials run by our TAs will start in Week 03. Students will complete quizzes in tutorials.

## Course Materials

**Textbook:** Linear Algebra - A Modern Introduction, 4th Edition, Cengage Learning, by David Poole.

## Blackboard

Please regularly log on and check <https://pibb.scu.edu.cn/>. We will post lecture notes, assignments, announcements and your grades on it.

## Course Assessment

Weekly assignments, quizzes, class activities, tests and final exam.

## Schedule of Exams, Assignments and Quizzes

### Exams

Date	Time	Location	Component
Week 04	TBA	TBA	Test 1
Week 09	TBA	TBA	Test 2
Week 13	TBA	TBA	Test 3
Final exam week	TBA	TBA	Final exam

### Assignments

Homework assignments will be given weekly. They will be due in the following week at the start of the class at 8:15 am in each section. Plagiarism will not be tolerated. However, discussions of the assignment problems will be permitted. Please also note each student must submit his/her individual assignment.

### Quizzes

Students will be asked to complete a quiz in each class. Normally, a quiz consists of a short-answer question.

### Grading Policy

The final grade will be computed according to the following scheme:

**Scheme:** Total grade= 18% Assignments + 12 % Test 1 + 15 % Test 2 + 15 % Test 3 + 30 % Final Exam + 10 % Quizzes, Class Activities and Attendance.

**Note:** All tests and final exam will be closed-book.

### Conversion of Numerical Grades to Final Letter Grades Follows the SCUPI Common Grade

A [90,100]	A- [85,90)	B+ [80,85)	B [76,80)	B- [73,76)	C+ [70,73)	C [66,70)
C- [63,66)	D+ [61,63)	D [60,61)	F (60,0)			

## Schedule and weekly learning goals

The schedule is tentative and subject to change. The listed objects below should be viewed as the key concepts you should grasp after each week, and also as a study guide before each test/exam, and at the end of the semester. Each test will base on material that was taught up until week prior to the exam, namely, Test 1 covers Weeks 01-03, Test 2 is based on Weeks 04-08, Test 3 is for Weeks 09-13. The final exam will cover all topics taught in this semester.

### Week 01, 02/21-02/25

- Cover Sections 1.0-1.2, Overview.
- Vector algebra, dot and cross products.

### Week 02, 02/28-03/04

- Cover Sections 1.3-1.4.
- Lines and planes.

### Week 03, 03/07-03/11

- Cover Sections 2.3 & 6.0-6.2.
- Spanning sets, linear independence, bases and dimensions.

### Week 04, 03/14-03/18 Test 1

- Test 1.
- Introduction to a system of linear equations.

### Week 05, 03/21-03/25

- Cover Sections 2.0-2.5.
- Continuing in solving a system of linear equations.

### Week 06, 03/28-04/01

- Cover Sections 3.0-3.3.
- Matrix algebra and its inverse.

### Week 07, 04/04-04/08

- Cover Sections 3.4-3.5 & 3.7.
- The LU factorization.

**Week 08, 04/11-04/15**

- Cover Sections 3.6 & 6.4-6.6.
- Linear transformations.

**Week 09, 04/18-04/22 Test 2**

- Test 2.
- Introduction to eigenvalue and eigenvectors.

**Week 10, 04/25-04/29**

- Cover Sections 4.0-4.4.
- Determinants.

**Week 11, 05/02-05/06**

- Cover Sections 4.5-4.6
- Eigenvalues and eigenvectors.

**Week 12, 05/09-05/13**

- Cover Sections 5.0-5.2
- Orthogonality.

**Week 13, 05/16-05/20 Test 3**

- Test 3.
- Cover Sections 5.3-5.4
- The Gram-Schmidt process.

**Week 14, 05/23-05/27**

- Cover Sections 6.3.
- Change of basis.

**Week 15, 05/30-06/03**

- Cover Sections 6.7 & 7.0-7.2.
- Inner product space.

**Week 16, 06/06-06/10**

- Cover Section 7.3.

- Least square approximation.

### Week 17, 06/13-06/17

- Cover Section 7.4
- The singular value decomposition.

Note: The following schedules are subject to change. Please follow the calendar to be given by the SCU.

**Week 18, 06/20-06/24 Review session**

**Week 19, 06/26-07/02 Final Exam Week**

## Course Policies

**There will be no special treatments for any students in this course!** For example, if you have a heavy course load, you should expect a steep learning curve and be prepared for it. You will not be exempted from any assignments.

### During Class

Computers may be allowed in class for the electronic recording of notes. But please refrain from using computers for any activities that are unrelated to the course. Phones are prohibited as they are rarely useful for anything in the course. Eating and drinking are allowed in class but please keep from it affecting the course.

### Attendance Policy

Attendance is expected in all lectures. Valid excuses for absence will be accepted before class. In extenuating circumstances, valid excuses with proof will be accepted after class.

### Policies on Late Assignments and Exams

Students should start their homework assignments immediately after the assignments are given, and **DO NOT** wait until the last minute to meet the deadlines. **Late assignments will be NOT accepted except for emergencies and health issues. Any other late assignments handed in will be marked but will be given 0.** At most **Two** extensions for assignments will be given in this course. All assignments will be counted in your total grade. **Late submission for previous assignments during the final exam period will NOT be accepted in any form for any excuses.**

All tests and the final exam are mandatory. There will be absolutely no makeup exam for each test. If you miss the final, a makeup exam may be given for the final exam if the student has the approval from the instructor or emergencies and health issues **with a valid proof**. I will not accept the student deceleration for absence form for the final exam.

## **Academic Integrity**

At Sichuan University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do.

Everyone at SCUPI is expected to treat others with dignity and respect. The Code of Student Conduct allows Sichuan University to take disciplinary action if students don't follow this community expectation.