

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	线性代数 A Linear Algebra A
2.	授课院系 Originating Department	数学系 Department of Mathematics
3.	课程编号 Course Code	MA107A
4.	课程学分 Credit Value	4 学分 4 Credits
5.	课程类别 Course Type	通识必修课程 General Education (GE) Required Courses
6.	授课学期 Semester	春季 Spring / 秋季 Fall
7.	授课语言 Teaching Language	英文 English / 中英双语 English & Chinese
8.	授课教师、所属学系、联系方式 (如属团队授课, 请列明其他授课教师) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	李才恒, 教授, 数学系 慧园 3 栋 528 邮箱: lich@sustc.edu.cn 电话: 0755-88018755 Caiheng Li, Professor, Department of Mathematics Room 528, Block 3, Wisdom Garden. email: lich@sustc.edu.cn phone: 0755-88018755 陈懿茂 数学系 慧园 3 栋 508 huy@sustech.edu.cn Yi mao Chen Department of Mathematics Block 3, Room 508, Wisdom Valley Chenym@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced

10. 选课人数限额(可不填) Maximum Enrolment (Optional)					
11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	64				64
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无/None				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	<p>后续课程为线性代数精讲、数值分析、常微分方程、偏微分方程等课程的先修课程，同时也是其他工程学科多门专业课的先修课程。</p> <p>Linear Algebra is a prerequisite for Advanced Linear Algebra. It's also a prerequisite for many mathematics curriculums including Numerical analysis, Ordinary differential equations, Partial differential equations and etc.</p>				
14. 其它要求修读本课程的学系 Cross-listing Dept.					

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程的教学目的是培养严谨的逻辑推理和抽象思维能力。讲述线性代数基本的概念和理论，包括线性方程组、矩阵代数、行列式、向量空间、线性变换、正交性理论、特征值和特征向量、奇异值分解以及二次型等相关理论，为进一步学习线性代数 II 的内容打下坚实的基础。本课程的重点包括矩阵运算、求解线性方程组、向量空间、线性变换的相关理论求解特征值和特征向量以及二次型。

To introduce the basic concepts in linear algebra including systems of linear equations, matrix algebra, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, singular value decomposition and quadratic forms. It is a prerequisite for Linear Algebra II. The emphasis is on operations with matrices, solving systems of linear equations, fundamental theory of vector spaces and linear transformations, solving eigenvalues and eigenvectors problems, and quadratic forms.

16. 预达学习成果 Learning Outcomes

通过对本课程的学习，学生可以理解和掌握线性代数的基本理论和技巧，能够熟练掌握行列式的基本理论和求解方法；熟练掌握矩阵的基本运算和矩阵的逆；熟练掌握求解线性方程组的方法；熟练掌握矩阵特征值和特征向量的计算；熟练掌握斯密特(Schmidt)正交化方法；理解向量线性相关性的理论、 n 维实空间的基和正交基、相似矩阵及矩阵可对角化、二次型的基本理论以及线性变换。

After completing this course, students should understand the basic methods and techniques in Linear Algebra. They should be able to compute determinants, manipulate matrices and do matrix algebra, solve systems of linear equations, compute eigenvalues and eigenvectors. After learning this course, students should be able to understand the basic concepts of linear independence and linear dependence, the basis and orthonormal basis of n -dimensional vector space, similar matrices and diagonalizable matrices, quadratic forms and linear transformations.

17. 课程内容及教学日历 (如授课语言以英文为主, 则课程内容介绍可以用英文; 如团队教学或模块教学, 教学日历须注明主讲人)

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Week 1:

- 1.1 Introduction
- 1.2 The geometry of Linear Equations
- 1.3 An example of Gaussian Elimination
- 1.4 Matrix Notation and Matrix Multiplication

第一周:

- 1.1 简介
- 1.2 线性方程的几何表示
- 1.3 高斯消元的一个例子
- 1.4 矩阵符号和矩阵乘法

Week 2:

- 1.4 Matrix Notation and Matrix Multiplication
- 1.5 Triangular Factors and Row Exchanges
- 1.6 Inverses and Transposes

第二周:

- 1.5 矩阵符号和矩阵乘法
- 1.6 三角分解因子和行交换
- 1.7 逆和转置

Week 3:

- 1.6 Inverses and Transposes
- 2.1 Vector spaces and subspaces

第三周:

- 1.6 逆和转置
- 2.1 向量空间和子空间

Week 4:

- 2.2 Solving $Ax=0$ and $Ax=b$

第四周:

- 2.2 求解 $Ax=0$ 和 $Ax=b$

Week 5:

- 2.3. Linear Independence, Basis, and Dimension



2.4 The Four Fundamental Subspaces

第五周:

2.3 线性无关性, 基和维数

2.4 四个基本子空间

Week 6:

2.6 Linear Transformations

第六周:

2.6 线性变换

Week 7:

3.1 Orthogonal Vectors and Subspaces

3.2 Cosines and Projections onto Lines

3.3 Projections and Least Squares

第七周:

3.1 正交向量和子空间

3.2 余弦和到直线上的投影

3.2 投影和最小二乘

Week 8:

3.3 Projections and Least Squares--cont'd

3.4 Orthogonal Bases and Gram Schmidt

第八周:

3.3 投影和最小二乘

3.4 正交基和 Schmidt 正交化

Week 9:

4.1 Introduction

4.2 Properties of The Determinant

4.3 Formulas for the Determinant

第九周:

4.1 简介

4.2 行列式的性质

4.3 行列式的公式

Week 10:

4.3 Formulas for the Determinant--cont'd

4.4 Applications of Determinants

第十周:

4.3 行列式的公式

4.4 行列式的应用

Week 11:

5.1 Introduction

5.2 Diagonalization of a Matrix

第十一周:

5.1 简介

5.2 矩阵的对角化

Week 12:

5.5 Complex Matrices

5.6 Similarity Transformations

第十二周:

5.5 复数矩阵

5.6 相似变换

Week 13:

5.6 Similarity Transformations--cont'd

6.1 Minima, Maxima, and Saddle Points

第十三周:

5.6 相似变换

6.1 极小值, 极大值, 和鞍点

Week 14:

6.2 Test for Positive Definiteness (Quadratic Forms)

第十四周:

6.2 正定性的判定 (二次型)

Week 15:

6.3 Singular Value Decomposition



第十五周:

6.3 奇异值分解

Week 16:

6.4 Minimum Principles

Review

第十六周:

6.4 最小值原理

学期复习

18. 教材及其它参考资料 Textbook and Supplementary Readings

教材 (Textbook) : Linear Algebra and Its Applications, 4th Edition, Gilbert Strang, Brooks/Cole Cengage Learning, ISBN-13: 978-0-03-010567-8.

推荐参考书 (Supplementary Readings) :

1. Linear Algebra with Applications, 9th Edition, Steven J. Leon, ISBN: 978-7-111-56150-7.
2. 高等代数, 北京大学数学系前代数小组编, 第4版, 高等教育出版社, 2013.

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		5		
课堂表现 Class Performance				
小测验 Quiz		15		
课程项目 Projects				
平时作业 Assignments		10		
期中考试 Mid-Term Test		30		
期末考试 Final Exam		40		
期末报告 Final Presentation				
其它 (可根据需要 改写以上评估方 式) Others (The above may be modified as necessary)				

20. 记分方式 **GRADING SYSTEM**

- A. 十三级等级制 **Letter Grading**
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 **REVIEW AND APPROVAL**

21. 本课程设置已经过以下责任人/委员会审议通过

This Course has been approved by the following person or committee of authority