课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	矩阵分析 Matrix Analysis and Its Applications
2.	**课程性质** **Compulsory/Elective**	专业必修课 Compulsory course
3.	**开课单位** **Offering Dept.**	机械与能源工程系 Department of Mechanical and Energy Engineering
4.	**课程学分/学时** **Course Credit/Hours**	48/3
5.	**授课语言** **Teaching Language**	中英文
6.	**授课教师** **Instructor(s)**	孔贺
7.	**开课学期** **Semester**	秋季学期
8.	**是否面向本科生开放** **Open to undergraduates or not**	是
9.	**先修要求** **Pre-requisites**	（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.） MA107A 线性代数 A Linear algebra

10. 教学目标
Course Objectives

矩阵理论是高等学校理、工科研究生的一门重要的基础课程，作为一门基础工具，矩阵论在工程科学与技术领域有广泛的应用。本课程主要针对理工科研究生和高年级本科生的知识结构背景，在其本科阶段所学的《线性代数》的基础之上深化和提高矩阵理论的相关知识，特别是通过本课程的学习，使其全面掌握线性空间与线性变换的本质与思想、了解和掌握矩阵的标准形、特征值与特征向量、矩阵分解、范数与矩阵函数、广义逆矩阵等重点内容，并用具体应用实例说明相关概念与工具在实际中的重要应用，为今后的进一步学习和研究打下扎实的基础。

Matrix theory is an important course for graduate students majoring in science and engineering. As a fundamental tool, matrix theory has a wide range of applications in the field of engineering science and technology. Based on the knowledge structure of postgraduate students and senior undergraduates in science and engineering, this course focuses on the key knowledge pillars of matrix theory. On the basis of Linear Algebra at the undergraduate stage, it comprehensively covers the following contents: linear space and linear transformation, standard forms of matrices, eigenvalue and eigenvector, matrix decomposition, norm and matrix function, generalized inverse matrix and other key contents. In this course, we will also use specific examples to illustrate related concepts and tools in applications such as optimization and data processing. Overall, the course will equip the students with the knowledge and tools in matrix analysis, and will lay a solid foundation for their future study and research.

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

无特别区分，对本科生的考核要求会相应较低一些
There is no differences - the course will have a lower marking requirement for undergraduate students.

11. 教学方法
Teaching Methods

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

课堂讲述+作业，讲授内容无特别区分
Lectures + homework. There is no difference for undergraduate students.

12. 教学内容
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

Section 1	线性空间与线性变换 6 个学时 Linear space and linear transformation 6 class hours
Section 2	矩阵的对角化与标准型 6 个学时 Diagonalization and standard forms 6 class hours
Section 3	内积空间 6 个学时 Inner product spaces 6 class hours
Section 4	矩阵分解 4 个学时 Matrix decomposition 4 class hours
Section 5	向量与矩阵的范数 4 个学时 Norms of vectors and matrices 4 class hours
Section 6	矩阵序列与矩阵微分 6 个学时 Matrix sequence and differentiation 6 class hours
Section 7	矩阵多项式 4 个学时 Matrix polynomial 4 class hours
Section 8	广义逆矩阵 4 个学时 Generalized matrix inverse 4 class hours
Section 9	矩阵分析在优化与数据处理中的应用 8 个学时 Applications in optimization and data processing 8 class hours

13. 课程考核
Course Assessment

（①考核形式 Form of examination；②.分数构成 grading policy；③如面向本科生开放，请注明区分内容。If the course is open to undergraduates, please indicate the difference.）

闭卷考试，75% 期末成绩 + 25% 平时作业，无区别
close-book examination, 75% exam marks + 25% homework, there is no differences for undergraduate students

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

G. Strang, Introduction to Linear Algebra, 5th Edition, MIT Mathematics, 2016
S. Boyd and L. Vandenberghe, Introduction to Applied Linear Algebra Vectors, Matrices, and Least Squares, Cambridge University Press, 2018
A. J. Laub, Matrix Analysis for Scientists and Engineers, SIAM, 2004.
L. Eldén, Matrix Methods in Data Mining and Pattern Recognition, The SIAM series on Fundamentals of Algorithms，2007.
张贤达, 矩阵分析与应用, 清华大学出版社, 2004.
史荣昌，魏丰，矩阵分析，第三版，北京理工大学，2010.