# 课程大纲
# COURSE SYLLABUS

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| **1.** | **课程代码/名称**<br>**Course Code/Title** | MAT7081 矩阵计算 Matrix Computations |
| **2.** | **课程性质**<br>**Compulsory/Elective** | 选修/Elective |
| **3.** | **课程学分/学时**<br>**Course Credit/Hours** | 3/48 |
| **4.** | **授课语言**<br>**Teaching Language** | 中英文， Chinese & English |
| **5.** | **授课教师**<br>**Instructor(s)** | 杨将副教授、Alexander Kurganov 教授<br>Jiang Yang, Associate Professor；Alexander Kurganov，Professor |
| **6.** | **是否面向本科生开放**<br>**Open to undergraduates or not** | 否/No |
| **7.** | **先修要求**<br>**Pre-requisites** | MA103b 203b 线性代数 I&II, MA305 数值分析<br>Linear Algebra I &II, MA305 Numerical Analysis |

**8.** **教学目标**
**Course Objectives**

Matrix is the key mathematical tool for describing the problems in science, engineering, economics, and industry. This course is for students interested in understanding or further developing stable and efficient algorithms for systems of linear equations, least squares problems, eigenvalue problems, singular value problems and some of their generalizations and applications. In this course, techniques for dense and sparse, structured problems, parallel techniques and direct and iterative methods will be covered. Students will come to appreciate many state-of –the –art algorithms or matrix methods, and will have the ability to quantify and analyze many practical applications and be far easier to deal with them by applying the matrix methods.

**9.** **教学方法**
**Teaching Methods**

By presenting the motivating ideas for each algorithm, we try to stimulate the students intuition and make the technical details easier to follow.

**10.** **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.）

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| **Section 1** | Matrix Multiplication Problems | 6 Hours |
| **Section 2** | Matrix Analysis | 4 Hours |
| **Section 3** | General Linear Systems | 5 Hours |

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| | **Section 4** | Special Linear Systems | 9 Hours |
| | **Section 5** | Orthogonalization and Least Squares | 8 Hours |
| | **Section 6** | Parallel Matrix Computations | 4 Hours |
| | **Section 7** | The Unsymmetric Eigenvalue Problem | 9 Hours |
| | **Section 8** | The Symmetric Eigenvalue Problem | 9 Hours |
| | **Section 9** | Lanczos Methods | 4 Hours |
| | **Section 10** | Iterative Methods for Linear Systems | 6 Hours |
| | **Section 11** | Functions of Matrices | 3 Hours |

**11.** **课程考核**
**Course Assessment**

Exercise (20%),
Quiz+Projects (30%)
examination (50%)

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

Textbook:

Gene H. Golub, Charles F. Van Loan, Matrix Computations, 3rd Edition, The John Hopkins University Press, Baltimore and London, 1996.

Supplementary Readings:

1. Gibert Strang, Introduction to Linear Algebra, 4th Edition, Wellesley-Cambridge and SIAM, 2009.

2. Carl D. Meyer ,Matrix Analysis and Applied Linear Algebra, SIAM.

3. David Watkins, Fundamentals of Matrix Computations, Wiley, 1991.