课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**MAE5032 高性能计算：方法与实践 High-performance computing: methods and practices**
2.	**课程性质** **Compulsory/Elective**	专业选修课
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	英文
5.	**授课教师** **Instructor(s)**	刘巨 助理教授
6.	**是否面向本科生开放** **Open to undergraduates or not**	否
7.	**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.） 线性代数，计算机编程。

8. 教学目标
Course Objectives

（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.）
本课程介绍工程与科学计算中的基础知识。内容涉及并行计算机的体系结构、Linux 系统入门、编译器使用、Makefile 和 CMake 简介、程序版本控制、并行计算原理、openMP 编程、MPI 编程、程序的调试和优化。通过学习本课程，学生将掌握并行计算的基本原理和技巧，为后续课程的学习以及实际工程计算软件的开发打下基础。

This course introduces basics in engineering and scientific computing. It covers parallel computer architectures, Linux commands, compilers, Makefile and CMake usage, version control, principles of parallel computing, openMP programming, MPI programming, and code optimization. Through learning this course, students are expected to gain the knowledge as well as practical skills in parallel computing. This will lay a foundation for the students to learn subsequent courses and develop scientific computing software.

9. 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.）
讲授 Lectures

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.）

Section 1	高性能计算绪论（2 学时） Introduction to high-performance computing (2 credit hours)
Section 2	并行计算机体系结构（4 学时） Architecture of parallel computer system (4 credit hours)
Section 3	Linux 操作系统（4 学时） Linux operating system (4 credit hours)
Section 4	软件的版本控制（2 学时） Version control of software (2 credit hours)
Section 5	程序的编译和跨平台编译工具（2 学时） Compilers and cross-platform compiling tools (2 credit hours)

	Section 6	并行计算的基本原理（4 学时） Basic principles of parallel programming (4 credit hours)
	Section 7	基于 OpenMP 的并行计算（6 学时） Parallel computing based on OpneMP (6 credit hours)
	Section 8	稠矩阵的代数运算及其并行实现（4 学时） Algebraic operations of dense matrices and parallel implementation (4 credit hours)
	Section 9	基于 MPI 的并行计算（6 学时） Parallel computing based on MPI (6 credit hours)
	Section 10	人工神经网络及其并行实现（4 学时） Artificial neural network and parallel implementation (4 credit hours)
	Section 11	CUDA 编程与 GPU 加速技术（2 学时） Programming in CUDA and GPU-accelerated computing (2 credit hours)
	Section 12	并行数据的输入输出（2 学时） Input and output of data on parallel computers (2 credit hours)
	Section 13	程序的调试与优化（2 学时） Code profiling and optimization (2 credit hours)
	Section 14	常用工程计算库的介绍（2 学时） Introduction to engineering computing libraries (2 credit hours)
	Section 15	工程计算结果的可视化（2 学时） Visualization of engineering computing results (2 credit hours)

11. 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.）
平时作业 Assignments 30%
期末报告 Final report 70%

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

Parallel programming in C with MPI and OpenMP, Michael J. Quinn, 2003.
Computer systems: A programmer's perspective, Randal Bryant and David O'Hallaron, 2002.
Unix in a nutshell. Arnold Robbins, 2006.