

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code / Title	MEE5301 先进制造基础 Fundamentals of Advanced Manufacturing Technology
2.	课程性质 Compulsory/Elective	专业基础课
3.	课程学分/学时 Credit Hours	3/48
4.	授课语言 Teaching Language	英文
5.	授课教师 Instructor(s)	赵永华助理教授 Associate Prof. Yonghua Zhao
6.	先修要求 Pre-requisites	工程图学，金属工艺学，机械原理，机械设计，理论力学，材料力学。
7.	教学目标 Course Objectives	
	<p>作为前沿制造领域的基础，课程主要讲授先进制造相关的基础方法、理论、工艺技术、制造理念的动态变化及未来发展趋势等方面的内容。本课程旨在使学生了解先进制造工艺的最新前沿，掌握技术原理、设计特点和应用特点，培养学生的工程设计和创新能力。课程完成后，学生将了解先进制造工艺的基本原理，了解制造科学不断变化的本质，了解科学与制造之间的紧密联系，了解先进制造业的范围及其对社会的影响，并掌握在制造相关领域取得成功所需的制造概念。同时培养学生的工程能力、创新思维习惯以及团队协作的复合能力。</p> <p>The course mainly teaches the basic methods, theories, process technologies, dynamic changes in manufacturing concepts and future development trends related to advanced manufacturing. The objective of this course is to enable students to learn about the latest frontiers of advanced manufacturing processes, master the principles of technology, design features and application characteristic, and cultivate students' engineering design and innovation abilities. Upon completion of FAMT, a student should understand the basic principles of the advanced manufacturing process; Understand the changing nature of manufacturing science; Understand the strong connection between science and manufacturing; Have a perspective of the scope of advanced manufacturing and its implications for society; Display mastery of those concepts of manufacturing needed to succeed in manufacturing-related areas. At the same time, this course aims to cultivate students' engineering abilities, innovative thinking and compound teamwork ability.</p>	
8.	教学方法 Teaching Methods	
	<p>课程将通过英文化授课、课程分组项目、多媒体教学、实验展示、翻转课堂等多维度师生互动等方法，在学生掌握专业知识的基础上，启发学生创新思维，培养学生创新能力，通过实践项目提高学生实际动手和思考能力，实现学生综合能力的培养和提升。</p> <p>Advanced teaching methods, such as English-based teaching, group-based course projects, multimedia</p>	

teaching, experimental demonstrations, and multi-dimensional teacher-student interaction, will be applied. The goal is to inspire students' mindsets, improve their practical and innovative abilities, realizing the cultivation of students' comprehensive abilities.

9. 教学内容 Course Contents

Section 1	Introduction to advanced manufacturing technology (Accuracy, concept) 先进制造技术简介（精度、理念）
Section 2	Fundamentals of material for manufacturing 材料基础
Section 3	Electrical discharge machining (EDM) principle and visualization 放电加工基本原理与可视化啊
Section 4	EDM pulse generator and servo control 放电加工脉冲电源与伺服控制
Section 5	Discharge plasma behaviour and characteristics 放电等离子体行为与特征
Section 6	EDM Characteristics and innovative techniques 先进放电制造技术
Section 7	Introduction of electrochemical machining 电化学加工基础
Section 8	Electric double layer, electrode potential and Gibbs energy 双电层，电极电位与吉布斯能
Section 9	Ultra-precision cutting process with a single crystal diamond tool 单晶金刚石超精密加工
Section 10	Preparing grinding wheels for use and Relevant aspects with respect to grinding processes Ultra-precision grinding using grinding wheels 砂轮及超精密磨削加工
Section 11	Ultra-precision polishing: methods and principles 超精密抛光：方法及原理
Section 12	Exercise1 （习题课）
Section 13	Micromachining 微细加工技术
Section 14	Exercise2 （习题课）
Section 15	Electron/Ion beam micro/nano machining 电子束/离子束微纳加工
Section 16	Plasma manufacturing 等离子体加工

Section 17	Exercise3 （习题课）
Section 18	Etching/Deposition 刻蚀/沉积
Section 19	Photon scattering with matter 光与物质相互作用
Section 20	Electron interaction with matter & Microscopy 电子与物质相互作用&显微学
Section 21	Scanning probe Microscopy & Nanofabrication 扫描显微术 & 纳米制造
Section 22	Exercise 4 & Review （习题课）
Section 23	Review （课程回顾）
Section 24	Final Examination （期末考试）
10.	课程考核 Course Assessment
	平时作业+项目报告：平时作业及实践成绩占 60%，考试占 40%。 Assignments + Project Report: Assignments and Practice account for 60%, Tests account for 40%.
11.	教材及其他参考资料 Textbook and Supplementary Readings
	Manufacturing Engineering and Technology, 6 th - ed. By S. Kalpakjian and S. R. Schmid, 2013