

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	复合制造技术前沿 Frontiers in Hybrid Manufacturing Processes
2.	课程性质 Compulsory/Elective	专业核心课 Core
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	双语授课+英文课件 Chinese-English Bilingual with English Teaching Materials
5.	授课教师 Instructor(s)	吴勇波 讲席教授 Prof. Yongbo Wu
6.	先修要求 Pre-requisites	
7.	教学目标 Course Objectives	
	<p>机械制造在制造业中占有非常重要的地位，且近年随着高端制造业的快速发展，传统的单一制造工艺已越来越难满足更精密更高效的要求。在此背景下，以某一工艺为主辅以另一种或多种工艺的复合制造技术成为当前高端制造业的一个重要发展方向。本课程的教学目标是使学生掌握常见复合制造技术的工艺原理和应用，并了解相关技术领域的最新进展。将教授的课堂讲授、学生的演讲讨论和现场参观进行有机的结合，在进行理论知识传授和现场认知的同时，培养学生就相关专业知识进行归纳、演讲的能力以及发现和解决问题的创新思维能力，为以后从事机械制造领域的工程技术工作、科学研究工作以及开拓新技术领域奠定坚实的专业基础。</p> <p>Mechanical manufacturing is important in manufacturing industry. Especially in recent years, with the rapid growth of advanced manufacturing industry, it become harder and harder for the traditional single manufacturing process to meet the requirement on the manufacturing accuracy and efficiency. Under this situation, hybrid manufacturing processes which combine two or more different manufacturing processes have been rapidly developed towards the level elevation of manufacturing technologies. The aim of this course is to enable students to master the principles and applications of typical hybrid manufacturing processes, and to understand the latest developments in related technical fields.</p> <p>This course combines the class-teaching with the discussion and technical tours. Students will learn the related theories, the ability to summarize and present relevant knowledge, and the skills to find out and solve problems. Through this course, students will have the potentiality which is important for them to perform well as an excellent scientist or engineer in advanced manufacturing industry.</p>	
8.	教学方法 Teaching Methods	
	以教授的课堂讲授，学生的演讲讨论和现场体验认知的方式进行本课程的学习。	
9.	教学内容 Course Contents	
		每部分 3 学时，3 credit hours per section.
	Section 1	Definition and classification of hybrid processes

	复合制造的定义和分类
Section 2	Assisted Hybrid Processes: Vibration- and Laser-assisted cutting 辅助制造技术: 振动/激光辅助切削
Section 3	Assisted Hybrid Processes: Media-assisted machining 辅助制造技术: 介质辅助加工
Section 4	Assisted Hybrid Processes: Vibration assisted grinding, polishing and EDM 辅助制造技术: 振动辅助磨削/抛光/电火花加工
Section 5	Assisted Hybrid Processes: Pulsed electrochemical machining – PECM 辅助制造技术: 脉冲电流加工
Section 6	Assisted Hybrid Processes: Air assisted jet electrochemical machining; Laser assisted chemical and electrochemical machining 辅助制造技术: 空气注射/激光辅助电化学加工
Section 7	Assisted Hybrid Processes: Vibration and Laser assisted forming 辅助制造技术: 振动/激光辅助成型加工
Section 8	Mixed or Combined Processes: Combinations of EDM/Grinding and ECM/Grinding 复合制造技术: 电火花/电化学磨削加工的复合
Section 9	Mixed or Combined Processes: Combination of ECM and EDM 复合制造技术: 电火花/电化学加工的复合
Section 10	Mixed or Combined Processes: Hybrid processes for polishing applications and others 复合制造技术: 复合加工在抛光中的理论和应用
Section 11	Mixed or Combined Processes: Combined deep drawing and cold forging Combination of hot extrusion and equal channel angular pressing (iECAP) 复合制造技术: 深冲压和冷锻造的复合, 热挤压和等通道转角挤压的复合
Section 12	Mixed or Combined Processes: Combination of spinning and bending for tube forming Combination of extrusion and bending (curved profile extrusion) 复合制造技术: 管材成型中弯曲和旋压的复合, 挤压和弯曲的复合 (曲面型材挤压)
Section 13	Mixed or Combined Processes: Combination of stretch forming and incremental sheet forming/Combination of controlled process mechanisms: Grinding hardening 复合制造技术: 拉伸成型和板材渐进成型的复合/可控技术复合: 磨削硬化的利用
Section 14	Combination of controlled process mechanisms: Combination of forming and hardening (hot stamping) 可控技术复合: 成型和硬化的复合 (热冲压)
Section 15	Combination of controlled process mechanisms: Combination of rolling and hardening 可控技术复合: 轧制和硬化的复合
Section 16	Final Examination 期末考试
10.	课程考核 Course Assessment
	出勤 Attendance: 5%, 课堂表现 Class Performance: 15%, 课程项目 Projects: 50%, 期末考试 Final Examination: 30%
11.	教材及其它参考资料 Textbook and Supplementary Readings
	以英文综述论文 “B. Lauwers et al, Hybrid processes in manufacturing, CIRP Annals-Manufacturing Technology 63(2014) 561-583” 及文中所列部分参考文献为基础自编。