

课程大纲

COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	3D 打印原理及应用 (MEE5219)
2.	课程性质 Compulsory/Elective	选修课
3.	开课单位 Offering Dept.	机械与能源工程系 Additive Manufacturing and Design
4.	课程学分/学时 Course Credit/Hours	3/48
5.	授课语言 Teaching Language	中英双语 English & Chinese
6.	授课教师 Instructor(s)	白家鸣 Jiaming Bai
7.	开课学期 Semester	春季 spring
8.	是否面向本科生开放 Open to undergraduates or not	否
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.)
10.	教学目标 Course Objectives	<p>(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.)</p> <p>教学目标</p> <ul style="list-style-type: none"> - 掌握不同类型 3D 打印工艺的基本原理及打印零件的特点。 - 理解各种 3D 打印材料的性能特点及其所适用的 3D 打印工艺。 - 了解 3D 打印技术在不同领域的应用, 如航空航天、医疗、先进制造、消费品等。 - 培养“增材设计”思维, 了解增材制造的设计理念及方法。 - 开展 3D 打印研究项目, 以探索 3D 打印技术的新领域和应用。 <p>Course Objectives:</p> <ul style="list-style-type: none"> - Master the basic principles of different types of 3D printing processes and the characteristics of printed parts. - Understand the performance characteristics of various 3D printing materials and their applicable 3D printing processes. - Understand the applications of 3D printing technology in different fields, such as aerospace, medical, advanced manufacturing, consumer goods, etc. - Cultivate "additive design" thinking and understand the design concepts and methods of additive manufacturing. - Carry out 3D printing research projects to explore new areas and applications of 3D printing technology.
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.)

本课程将结合理论和实践，采用以下教学方法：

- 授课讲解：教师通过课堂讲解、幻灯片演示和案例分析等为学生讲授详细的理论知识，介绍 3D 打印的原理、材料和应用，使学生建立坚实的理论基础。
- 实践实验：学生将有机会在实验室环境中亲自操作 3D 打印机，学习设置和打印过程，并解决可能出现的问题。这将有助于学生将理论知识应用到实际应用中。
- 小组讨论：学生将参与小组讨论，分享他们的见解和经验，讨论特定案例研究，以及解决 3D 打印相关的挑战和机遇。
- 嘉宾演讲：邀请领域内的专家或从业者进行客座讲座，分享他们在 3D 打印领域的实际经验和最新趋势。
- 研究项目：学生将选择一个与 3D 打印技术相关的主题，开展独立研究项目，进行设计、打印、测试、分析结果并展示他们的研究成果。
- 项目展示：学生将向同学和教师展示他们的研究项目，以提高他们的沟通和展示技能。

This course will combine theory and practice, using the following teaching methods:

- Lectures and explanations: Teachers teach students detailed theoretical knowledge through classroom explanations, slide presentations and case analyses, and introduce the principles, materials and applications of 3D printing, so that students can establish a solid theoretical foundation.
- Practical experiments: Students will have the opportunity to personally operate a 3D printer in a laboratory environment, learn the setup and printing process, and solve problems that may arise. This will help students apply theoretical knowledge into practical applications.
- Group Discussion: Students will participate in group discussions to share their insights and experiences, discuss specific case studies, and address challenges and opportunities related to 3D printing.
- Guest lectures: Invite experts or practitioners in the field to give guest lectures to share their practical experience and latest trends in the field of 3D printing.
- Research project: Students will choose a topic related to 3D printing technology, carry out an independent research project, design, print, test, analyze the results and present their research results.
- Project Presentation: Students will present their research projects to classmates and teachers to improve their communication and presentation skills.

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	3D 打印基础 3D printing fundamentals
Section 2	3D 打印的历史和发展 History and evolution of 3D printing technology
Section 3	3D 打印的成形原理 Basic principles of 3D printing
Section 4	3D 打印技术的分类 Classification of 3D printing
Section 5	3D 打印的工艺流程 Process chain of 3DP
Section 6	3D 打印标准工艺 (I) 3DP Standard Processes
Section 7	3D 打印标准工艺 (II) 3DP Standard Processes
Section 8	3D 打印标准工艺 (III) 3DP Standard Processes
Section 9	3D 打印设计 Design for 3D printing
Section 10	3D 扫描与逆向工程 3D Scanning and Reverse Engineering
Section 10	3D 打印的工业应用 Industrial Aspects of 3DP
Section 11	3D 打印的医疗应用 3DP for Medical applications
Section 12	3D 打印实验 3DP experiments

13.	课程考核 Course Assessment
	<p>(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.)</p> <p>出勤 Attendance 10%; 平时作业及期中报告 Assignments 50%; 期末项目 Final Project 40%</p>
14.	教材及其它参考资料 Textbook and Supplementary Readings
	<ul style="list-style-type: none"> - Gibson, Ian, Rosen, David, Stucker, Brent, Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, ISBN 978-1-4939-2113-3 - Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing : Principles and Applications, World Scientific Publishing Company, ISBN-10: 9814571407. - Tom Page, Design for Additive Manufacturing: Guidelines for cost effective manufacturing, ISBN-10 384732294X - Ulrich, K.T., Eppinger, S.D., Product Design and Development, 4th Edition, McGraw Hill, 2008