

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	材料失效与断裂力学 Failure Analysis and Fracture Mechanics of Engineering Materials
2.	课程性质 Compulsory/Elective	专业课 Professional Courses
3.	课程学分/学时 Course Credit/Hours	3/48
4.	授课语言 Teaching Language	中英文 Chinese-English bilingual
5.	授课教师 Instructor(s)	朱强讲席教授 Prof. Qiang Zhu
6.	是否面向本科生开放 Open undergraduates or not to	是 Yes
7.	先修要求 Pre-requisites	研究生：无 本科生：MAE202 材料力学/ MSE305 材料力学 Mechanics of Materials
8.	教学目标 Course Objectives	
	<p>中国制造 2025 作为国家战略已经开始实施，机械制造是实现中国制造的核心，《材料失效与断裂力学》是机械制造基础的重要组成部分，可以通过结构失效分析，确认失效机制，从而改进和优化制造技术，实现高端制造。本课程将教授具有一定先期学习基础的研究生和本科高年级学生断裂力学理论和材料失效技术。重点涉及到材料力学与机械性能理论、材料力学性能测试技术、材料失效分析技术以及基于失效分析的机械制造过程设计与质量控制等。通过课程学习，学生可以掌握基本的材料失效分析技术与断裂力学理论和测试技术，为未来在机械工程领域进一步深造研究或企业技术研发和管理打下好的基础。</p> <p>China Manufacturing 2025 program has launched as a national development strategy. Mechanical manufacturing is the key to implement this program. This course will teach technology of Failure Analysis and theory of Fracture Mechanics of Engineering Materials, which is an important part of the mechanical manufacturing fundamentals. This teaching course is designed for graduate or of later year undergraduate students. The students should have passed basic knowledge of manufacturing of materials as mentioned in section 12. The students are expected after the course learning to know well the basis of failure analysis technology and fracture mechanics theory, so to be able to use those for further study or working as an engineer in industry.</p>	
9.	教学方法 Teaching Methods	
	课堂讲授，以及课程报告（书面+口头） Classroom teaching , and class project (writing report +oral presentation)	
10.	教学内容 Course Contents	
	Section 1	材料失效与断裂力学概论 Introduction of material failure and fracture mechanics
	Section 2	断裂失效形式 Failure forms of fracture
	Section 3、4	裂纹与断口的分析手段

	Analysis method of cracks and fracture
Section 5、 6	裂纹分析 Crack analysis
Section 7、 8、 9	断口分析 Fracture analysis
Section 10	线弹性断裂力学 Linear elastic fracture mechanics
Section 11	弹塑性断裂力学 Elastic-plastic fracture mechanics
Section 12	时间效应断裂行为 Fracture behaviour of time effect
Section 13、 14	疲劳断裂行为 Fracture behaviour of fatigue
Section 15	断裂与环境交互作用 The interaction of fracture and the environment
Section 16	失效分析与断裂力学的工程应用 Engineering applications of failure analysis and fracture mechanics
11.	课程考核 Course Assessment
	出勤 Attendance 5%, 课堂表现 Class performance 5%, 课程项目 Projects 20%, 平时作业 Assignments 20%, 期末考试 Final exam 50%.
12.	教材及其它参考资料 Textbook and Supplementary Readings
	Metal Failures - Mechanisms, Analysis, Prevention, Arthur J. McEvily, John Wiley & Sons Fracture Mechanics: Fundamentals and Applications, T.L. Anderson, CRC Press