

## 课程详述

### COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	航空发动机结构完整性 (本科生和研究生) <b>Aero Engine Structure Integrity (Undergraduate and Graduate Student)</b>
2.	授课院系 Originating Department	力学与航空航天工程系 Department of Mechanics and Aerospace Engineering
3.	课程编号 Course Code	MAES002
4.	课程学分 Credit Value	2(含 0.5 实验学分)
5.	课程类别 Course Type	通识选修课程 General Education (GE) Elective Courses 专业选修课 Major Elective Courses
6.	授课学期 Semester	春季 Spring / 夏季 Summer / 秋季 Fall
7.	授课语言 Teaching Language	英文 English
8.	授课教师、所属学系、联系方式 (如属团队授课, 请列明其他授课教师) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	韩品连(Han Pinlian), 力学与航空航天工程系, 南方科技大学 Mobile: 18628441653 Email: hanpl@sustech.edu.cn
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	张亮、魏佐君、李娜娜、张坤、张自印、魏存驹、梁丙卓
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	24		16		40
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	NA				
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	NA				
14. 其它要求修读本课程的学系 Cross-listing Dept.	NA				

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

- 讨论航空发动机的结构完整性，简介先进航空发动机设计，内容包括航空管理局（如 FAA）对发动机的要求和发动机各部分的结构。学生将会获得下列方面的知识：
  - 1) 航空发动机是如何发展的；
  - 2) 对产品的主要关注点是什么；
  - 3) 如何分析及解决安全、可靠性及环境问题。
- 学生将会了解发动机结构完整性的基本要求以及如何通过恰当的工具分析并评估一个航空发动机. 以及如何成为一名胜任的工程师。
- Discussion of Structure Integrity of the advanced aero engine. Including a brief introduction of the advanced aero engine design, the requirement of airworthy authority like FAA, and the challenge of all major unit/part of the engine.
- Students shall understand that how the aero engine being developed, what is the major concern of the product and the basic requirement of structure integrity, how we analysis and solve those problems related to safety, reliability and environment, and how to analysis and evaluate an aero engine, as well as to find the right tool to do the job.
- How to become a qualified engineer.

#### 16. 预达学习成果 Learning Outcomes

学生可以理解基本的结构完整性要求，以及怎样分析、评估一台飞机发动机，同时能够使用正确的工具来完成工作。

Students should be able to understand the basic requirement of structure integrity, and how to analysis and evaluate an aero engine, as well as to find the right tool to do the job.

#### 17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

Section 1 (3 credit hours)	航空发动机概论: 航空发动机历史、现状、发展趋势以及面临的挑战。 An Introduction to Aero Engine, The History, Current Situation, Development Tendency and Facing Challenges.
Section 2 (3 credit hours)	航空发动机概论: 航空发动机原理(热力学定律、布雷登循环、活塞式发动机、涡扇发动机、涡喷发动机、涡轴发动机、涡浆发动机等, 载荷分析)。 An Introduction to Aero Engine, Engine Principle (Law of Thermodynamics, Brayton Cycle, Reciprocating Engine, Turbofan Engine, Turbojet Engine, Turboshaft Engine, Propeller Engine, etc., Load Analysis) .
Section 3 (3 credit hours)	航空发动机结构完整性综述: 对象、范畴、FAA 试航标准。 An Introduction to Aero Engine Structure Integrity, Object, Scope, FAA Code.
Section 4 (3 credit hours)	力学与运用基础: 破坏机制、载荷与受力。 The Fundamental of Mechanics and Applying, Failure Mechanism, Load and Stress.
Section 5 (3 credit hours)	力学与运用基础: 振动与疲劳、安全与寿命。 The Fundamental of Mechanics and Applying, Vibration and Fatigue, Safety and Life.
Section 6 (3 credit hours)	航空发动机主要零部件的结构完整性要求: 风扇、涡轮。 The Structure Integrity Requirement of the Key parts of Aero Engine, Fan, Turbine.
Section 7 (3 credit hours)	航空发动机主要零部件的结构完整性要求: 压气机。 The Structure Integrity Requirement of the Key parts of Aero Engine, Compressor.
Section 8 (3 credit hours)	航空发动机主要零部件的结构完整性要求: 燃烧室。 The Structure Integrity Requirement of the Key parts of Aero Engine, Combustor.
Section 9 (2 credit hours)	航空发动机主要零部件的结构完整性要求: 转轴、其他。 The Structure Integrity Requirement of the Key parts of Aero Engine, Spindle, etc.
Section 10 (2 credit hours)	未来的做法: 被动到主动、大数据的应用、多场全覆盖监测。 Future Work Method, From Passive to Active, Big Data, Multi-field Monitoring.
Section 11 (2 credit hours)	增材设计能带来哪些改进: 微观到宏观、材料到结构。 The Improvement from Additive Design, From Micro to Macro, From Material to Structure.

Section 12 (2 credit hours)	增材设计能带来哪些改进： 亚表面孔状结构工程力学。 The Improvement from Additive Design, Engineering Mechanics of Sub Surface Fine Web Structure
Section 13 (2 credit hours)	增材制造相关工具使用（实验课） 3D 打印机、打印材料。 Tools of Additive Manufacturing(Experimental Lesson), 3D Printing, Materials.
Section 14 (2 credit hours)	试样实验（实验课） 拉伸实验。 Sample Experiment (Experimental Lesson), Stretching Experiment.
Section 15 (2 credit hours)	试样实验（实验课） 三坐标扫描。 Sample Experiment (Experimental Lesson), Three Coordinate Measuring.
Section 16 (2 credit hours)	气动、燃烧、制图相关软件（实验课） SOLIDWORKS. Aerodynamic, Combust, and Cartographic Software(Experimental Lesson).

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

<p>Gas Turbine Construction: Including Operation and Maintenance</p> <p>The Gas Turbine - Development and Engineering</p> <p>Aircraft Gas Turbine Engine Technology</p> <p>微型燃气涡轮发动机设计与制造（自编中文教材）</p> <p>航空发动机原理与结构</p> <p>航空发动机结构分析</p> <p>航空发机构造与维修管理</p> <p>航空发动机装配工艺技术</p> <p>航空发动机结构强度设计问题</p> <p>典型航空发动机结构对比与分析</p>
---

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
-----------------------------------	--------------	----------------------------------	-----------------	-------------

出勤 Attendance	25		
课堂表现 Class Performance	25		
小测验 Quiz	10		
课程项目 Projects			
平时作业 Assignments	25		
期中考试 Mid-Term Test			
期末考试 Final Exam	15		
期末报告 Final Presentation			
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)			

20. 记分方式 GRADING SYSTEM

- A. 十三级等级制 Letter Grading  
 B. 二级记分制（通过/不通过） Pass/Fail Grading

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过  
 This Course has been approved by the following person or committee of authority

力学与航空航天工程系教学指导委员会  
 The commission of teaching instruction in department of mechanics and aerospace engineering

