

## 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 <b>Course Title</b>	航空结构强度 <b>Aircraft Structural Strength</b>				
2.	授课院系 <b>Originating Department</b>	力学与航空航天工程系 Department of Mechanics and Aerospace Engineering				
3.	课程编号 <b>Course Code</b>	MAE307				
4.	课程学分 <b>Credit Value</b>	3				
5.	课程类别 <b>Course Type</b>	专业核心课 Major Core Courses				
6.	授课学期 <b>Semester</b>	秋季 Fall				
7.	授课语言 <b>Teaching Language</b>	中文 Chinese				
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) <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	刘轶军, 讲座教授 力学与航空航天工程系 liuyj3@sustech.edu.cn  LIU Yijun, Chair Professor Department of Mechanics and Aerospace Engineering liuyj3@sustech.edu.cn				
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced				
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>					
11.	授课方式 <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
	学时数 <b>Credit Hours</b>	48				48

12. 先修课程、其它学习要求 <b>Pre-requisites or Other Academic Requirements</b>	MAE202 材料力学 MAE202 Mechanics of Materials
13. 后续课程、其它学习规划 <b>Courses for which this course is a pre-requisite</b>	无 NA
14. 其它要求修读本课程的学系 <b>Cross-listing Dept.</b>	无 NA

### 教学大纲及教学日历 SYLLABUS

#### 15. 教学目标 Course Objectives

本课程为航空航天本科专业核心课程，讲课内容涉及飞机外载荷分类、弹性力学基础、能量原理、杆梁与薄壁结构扭转、弯曲、稳定性、破坏理论与应用等。通过学习此课程，学生将掌握基本航空结构强度分析的原理和方法，为学习航空航天专业后继课程打下重要基础。

This is a core course for undergraduate students in aerospace engineering. Students will learn the basics of external loads on airplanes; basics of elasticity, energy methods; bar, beam and thin structures under torsion, bending, instability of structures; and failure theories and their applications in the analysis of aero-structures. Students will master the basic theories and methods in structural analysis and lay the foundation for learning subsequent courses.

#### 16. 预达学习成果 Learning Outcomes

通过本课程，学生将理解和掌握弹性力学和能量原理的基本内容，能够分析二维和三维空间中杆、梁及薄壁结构的扭转，弯曲及稳定性，理解和掌握结构破坏的各种理论并能应用于分析结构的强度问题。

Through this course, students will be able to understand and grasp the fundamentals of elasticity and energy methods; be able to analyse 2D and 3D bar, beam and thin shell structures under torsion and bending loads, and the instability of structures; and be able to understand and master the various failure theories to apply them in analysing the strength of structures.

#### 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.)**

1: 飞机外载荷（介绍飞机外载的分类及简化计算方法）（3学时）

Loads on Aircraft (Introduce the types of loads on an aircraft and the calculation methods) (3 credit hours)

2: 弹性力学基础 - I（介绍弹性体的位移、应变及其关系）（3学时）

Elements of Elasticity - I (Introduce the concept of displacement, strain and their relations) (3 credit hours)

3: 弹性力学基础 - II（介绍应力、平衡方程及本构关系）（3学时）

Elements of Elasticity - II (Introduce stress, equilibrium equations, and constitutive relation) (3 credit hours)

4: 能量原理 - I（介绍虚功原理及在结构力学中的应用）（3学时）

Energy Methods - I (Introduce the virtual work theorem and its applications) (3 credit hours)

5: 能量原理 - II（介绍势能原理及在结构力学中的应用）（3学时）

Energy Methods - II (Introduce the principle of potential energy and its applications) (3 credit hours)

6: 扭转 - I (讨论圆截面杆的扭转变形) (3 学时)

Torsion - I (Discuss torsional deformation of solid circular shaft) (3 credit hours)

7: 扭转 - II (讨论薄壁管状结构的扭转变形) (3 学时)

Torsion - II (Discuss torsional deformation of thin-walled tubes) (3 credit hours)

8: 期中复习 (3 学时)

Midterm Review (3 credit hours)

9: 弯曲 - I (讨论梁在外力作用下的弯曲变形及应力) (3 学时)

Bending - I (Discuss deformation and stress in beams under external forces and moments) (3 credit hours)

10: 弯曲 - II (讨论梁在外力作用下的剪力计算) (3 学时)

Bending - II (Discuss calculation of shear forces in beams under external loads) (3 credit hours)

11: 弯曲 - III (讨论梁在复合受力下的变形及应力计算) (3 学时)

Bending - III (Discuss deformation and stress in beams under combined loading) (3 credit hours)

12: 稳定性 - I (讨论梁在受压下的屈曲变形) (3 学时)

Stability of Structures - I (Discuss buckling of beams under compression load) (3 credit hours)

13: 稳定性 - II (讨论能量法在屈曲变形分析中的应用) (3 学时)

Stability of Structures - II (Discuss energy method in buckling analysis) (3 credit hours)

14: 破坏理论 - I (学习各种结构破坏模型及理论) (3 学时)

Failure Theories - I (Study various structural failure theories) (3 credit hours)

15: 破坏理论 - II (讨论破坏理论的应用) (3 学时)

Failure Theories - II (Discuss applications of failure theories) (3 credit hours)

16: 期末复习 (3 学时)

Final Review (3 credit hours)

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

1. Mechanics of Aero-Structures, Sudhakar Nair, Cambridge University Press, 2015.
2. 飞行器结构力学, 文立华, 西北工业大学出版社, 2015.

课程评估 ASSESSMENT

19. 评估形式                      评估时间                      占考试总成绩百分比    违纪处罚                      备注

Type of Assessment	Time	% of final score	Penalty	Notes
出勤 Attendance				
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		30	抄袭平时作业记 0 分 Cheating:0	
期中考试 Mid-Term Test		30	作弊本门课程记 0 分 Cheating:0	
期末考试 Final Exam				
期末报告 Final Presentation		40	抄袭平时作业记 0 分 Cheating:0	
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