

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	飞行器设计团队实践 Aircraft Design Group Practice				
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	MAE417				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业核心课 Major Core Courses				
6.	授课学期 Semester	秋季 Fall				
7.	授课语言 Teaching Language	中英双语 English & 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) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	刘宇, 副教授, 力学与航空航天工程系, liuy@sustech.edu.cn Liu Yu, Associate Professor Department of Mechanics and Aerospace Engineering liuy@sustech.edu.cn				
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced				
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	16		64		80

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	无（建议先修：空气动力学、航空结构强度、喷气推进） NA (Recommended pre-requisites: Aerodynamics, Aircraft Structural Strength, and Jet Propulsion.)
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	
14. 其它要求修读本课程的学系 Cross-listing Dept.	

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

- 系统掌握飞机总体设计的科学概念；
 - 理解飞机总体设计的基本方法；
 - 具备飞机初步设计及各分系统概念设计的能力；
 - 应用基本理论进行航模飞机、无人机、客机的初步设计。
 - To provide students with fundamentals of aircraft design;
 - To improve the understanding of methods of aircraft design;
 - To help students build the capability of preliminary and conceptual sub-system design phases of aircraft;
- To provide students with experiences of aircraft design, e.g. preliminary design of aeromodelling aircraft, UAVs, and passenger airplane.

16. 预达学习成果 Learning Outcomes

飞行器设计团队实践的基本知识在航空领域中有着广泛的应用，对学生将来从事飞机设计或开展相关研究具有极大帮助。通过本课程的学习，希望让学生认识和理解飞机构成和设计过程，理解飞机任务；开展简单功能性分析，给出飞机设计要求；对飞机进行概念设计，开展飞机前期尺寸设计，权衡各方面设计指标等。同时通过团队协作培养学生项目管理、团队意识与沟通技巧等技能。

Aircraft design group practice has a wide application in aeronautical engineering, and it is helpful for students to design aircraft or conduct relevant research in future. After completion of this course, students will be able to identify and explain the aircraft architecture and the conceptual design process; identify and explain aircraft missions; perform a simple functional analysis and generate a list of requirements; produce a conceptual aircraft design and perform a preliminary sizing of the aircraft; and perform a simple trade-off. It can also help students form the capability of project management, teamwork and communication, through working as a collaborative group.

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.)

理论讲授（共 16 课时）：

1. 设计流程介绍（2 课时）
2. 飞机设计的要求（2 课时）
3. 飞机概念设计：重量估算以及有效载荷-航程图（2 课时）
4. 飞机概念设计：翼载荷和推重比（2 课时）
5. 飞机构型分析（2 课时）
6. 飞机初步设计：机翼设计与发动机匹配（2 课时）
7. 飞机初步设计：机身设计（2 课时）
8. 飞机初步设计：起落架与安定面设计（2 课时）

设计实践（共 64 课时）：

4. 任务与市场分析、飞机设计要求拟定（4 课时）
5. 重量估算（4 课时）
6. 有效载荷-航程图、飞机翼载荷和推重比设计（4 课时）
7. 飞机气动布局确定（4 课时）
8. 机翼设计（4 课时）
9. 发动机匹配（6 课时）
10. 机身设计（6 课时）
11. 起落架设计、安定面设计（6 课时）
12. 飞机操纵性与稳定性分析（6 课时）
13. 操纵系统设计（6 课时）
14. 飞机结构分析（6 课时）
15. 飞机费用与效能分析（6 课时）
16. 报告陈述（2 课时）

Theory:

1. Introduction about the design process (2 credit hours)

2. Requirements of aircraft design (2 credit hours)
3. Aircraft conceptual design: weight estimation, Payload-range diagrams (2 credit hours)
4. Aircraft conceptual design: wing loading and thrust-weight ratio (2 credit hours)
5. Analysis of configurations (2 credit hours)
6. Aircraft preliminary design: wing design and propulsion system design (2 credit hours)
7. Aircraft preliminary design: fuselage design (2 credit hours)
8. Aircraft preliminary design: undercarriage design and empennage design (2 credit hours)

Practice:

4. Analysis of tasks and market; determination of design requirements (4 credit hours)
5. Weight estimation (4 credit hours)
6. Payload-range diagrams, wing loading and thrust loading (4 credit hours)
7. Determination of aerodynamic configuration (4 credit hours)
8. Wing design (4 credit hours)
9. Integration of propulsion system (6 credit hours)
10. Fuselage design (6 credit hours)
11. Undercarriage design and empennage design (6 credit hours)
12. Analysis of flight Control and stability (6 credit hours)
13. Design of control system (6 credit hours)
14. Structure analysis (6 credit hours)
15. Analysis of cost and effectiveness (6 credit hours)
16. Oral presentation (2 credit hours)

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

教材 (Textbook)

[1] 李为吉, 王正平, 艾剑良, 杨华保, 飞机总体设计, 西北工业大学出版社, 2004。

[2] Raymer, D.P., Aircraft design: A conceptual approach, 3rd edition, AIAA Education series, American Institute of Aeronautics and Astronautics, 1989.

参考资料 (References)

- [1] [Lloyd R. Jenkinson](#), [Paul Simpkin](#), [Darren Rhodes](#), Civil Jet Aircraft Design, AIAA Education series, Arnold, 1999.
- [2] Anderson, J.D., Aircraft Performance and Design, First Edition, Tata McGraw-Hill, 2012.
- [3] Torenbeek, E., Synthesis of Subsonic Airplane Design, Delft University Design, 1976.
- [4] Corke, T.C., Design of Aircraft, First Edition, Pearson, 2002.

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				
课堂表现 Class Performance		10		项目表现 Project performance
小测验 Quiz				
课程项目 Projects		80		1. 项目设计规范 Project Design Specification 10% (小组分数 Group mark) 2. 初步设计评估 Preliminary Design Review (PDR) 30% 3. 关键设计评估 Critical Design Review (CDR) 40%
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				
期末报告 Final Presentation	2 小时	10		(小组分数 Group mark)
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