**复合材料与结构课程教学大纲**

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| 课程基本信息（Course Information） | | | | | | | |
| 课程代码  （Course Code） | AV410 | \*学时  （Credit Hours） | 48 | \*学分  （Credits） | | 3 | |
| \*课程名称  （Course Name） | 复合材料与结构 | | | | | | |
| Introduction to Composite Materials and Structures | | | | | | |
| 课程性质  (Course Type) | 选修课，Elective Course | | | | | | |
| 授课对象  （Target Audience） | 大四本科学生，Senior Students | | | | | | |
| 授课语言  (Language of Instruction) | 中文，Chinese | | | | | | |
| \*开课院系  （School） | 航空航天学院，School of Aeronautics and Astronautics | | | | | | |
| 先修课程  （Prerequisite） | 材料力学，Mechanics of Materials | | | | | | |
| 授课教师  （Instructor） | 张晓晶  Xiaojing Zhang | | 课程网址  (Course Webpage) | | 无，None | |
| \*课程简介（Description） | 此课程是航空航天专业的专业教育课程，本课程主要介绍复合材料及其层压板结构强度和刚度的基本理论和分析方法，课程内容包含复合材料概论，各向异性弹性力学基础，单层复合材料的宏观力学分析以及层压板刚度和强度的宏观力学分析，层压板的湿热效应、层间应力,复合材料层压板的弯曲和屈曲分析,复合材料力学性能实验测定，湿热效应等，以及要求学生通过自学了解生产工艺和适航等若干专题的最新进展。通过本课程学习，学生应掌握复合材料设计的基础知识，培育结构强度与刚度定量分析和逻辑思维能力，并掌握利用基本算法解决实际问题的能力。 | | | | | | |
| \*课程简介（Description） | This course is for students majored in aerospace engineering. This course introduces fundamentals of strength and stiffness of composite materials and structures. The contents of the course cover principles of composite material mechanics, introduction to composite, lamina stress-strain relationship, effective moduli and strength of a continuous fiber-reinforced lamina, analysis of lamina hydrothermal behavior, analysis of laminates, hydrothermal effects in laminates, interlaminar stresses, deflection and buckling of laminates, mechanical testing of composites and their constituents. Moreover, the students are required to self-learn several lecture including manufacturing process and certification etc. After learning this course, the students should master the fundamental design knowledge of composite structures, cultivate the capabilities of quantitative analysis and logical thinking, and establish the ability of solving practical problems using algorithm design and computer programing. | | | | | | |
| 课程教学大纲（Course Syllabus） | | | | | | | |
| \*学习目标(Learning Outcomes) | 1)树立报国信念和创造未来的远大目标（A3.1/4）  2)掌握复合材料结构设计和分析的基础知识，并培育定量分析和逻辑思维能力（B2）  3)培育发现、分析和解决问题的能力（B6.2）  4)掌握利用算法设计和编程解决工程问题的能力,试验设计和分析能力（C7）  5)具备关于大型工程系统的复杂性的认识（D7）  6)具备关于社会因素和社会影响力在本专业中的重要性的认识（D8）  1)Establish a lofty goal of serving the country's beliefs and creating the future（A3.1/4）  2)Ability to master the fundamental design knowledge of composite structures, and cultivate the capabilities of quantitative analysis and logical thinking（B2）  3)Ability to discover, analyze and solve problems（B6.2）  4)Ability to solve practical problems using algorithm design and computer programing, design and analyse of experiments（C7）  5) Ability to has an understanding of the complexity of large engineering systems（D7）  6)Ability to has an understanding of the importance of social factors and social influence in the profession（D8） | | | | | | |
| \*教学内容  进度安排及要求  (Class Schedule & Requirements) | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 教学内容 | 学时 | 教学方式 | 作业及要求 | 基本要求 | 考查方式 | | 复合材料概论  Introduction of composite | 6 | 课堂教学和反转课堂  Lecture and Discussion | 讨论题  Discussion | 掌握授课内容并作报告  Mastering the teaching content and report | 课堂报告  Report | | 各向异性材料的应力-应变关系  Lamina Stress-Strain Relationships | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料单层的弹性特性  Effective Moduli of a Continuous Fiber-Reinforced Lamina | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料单层的强度理论  Strength of a Continuous Fiber-Reinforced Lamina | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料单层的湿热效应  Analysis of Lamina Hydrothermal Behavio**r** | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 层合梁的基本理论、耦合理论  Theory of Laminated Beams, Plates with Coupling | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料层压板的弹性特性和柔度系数  Stiffness Characteristics of Selected Laminate Configurations, Derivation and Use of Laminate Compliances | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料层压板的湿热效应、层间应力  Hydrothermal Effects in Laminates, Interlaminar Stresses | 2 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料层压板的强度分析  Laminate Strength Analysis | 4 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料层压板的弯曲和屈曲分析  Deflection and Buckling of Laminates | 3 | 课堂教学和自学  Lecture and Self-study | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料层压板设计方法及其在结构中的应用  Application of Laminate Analysis to Composite Structures | 3 | 课堂教学  Lecture | 作业题  Homework | 掌握授课内容并完成作业  Mastering the teaching content and finishing homework | 作业+考试  Homework and test | | 复合材料力学性能的实验测定  Mechanical Testing of Composite | 6 | 课堂教学,自学和反转课堂  Lecture, Self-study and Discussion | 讨论题  Discussion | 熟悉自学内容并作报告  Familiar with self-study content and report | 课堂报告  Report | | 复合材料机翼设计  Design of composite wing | 6 | 反转课堂  Discussion | 作业题  Homework | 完成机翼设计并报告  Finishing design of composite wing | 课堂报告  Report | | | | | | | |
| \*考核方式 (Grading) | 课堂出勤（占5%）  平时作业（占15%）  课程项目和自学（占30%）  期末考试（占50%）  全部 100%  Attendance and course notebook 5%  Homework 15%  Project and Presentation 30%  Final exam 50%  Total 100% | | | | | | |
| \*教材或参考资料(Textbooks & Other Materials) | [1]复合材料力学基础，张晓晶等译，上海交通大学，2019，第1版,ISBN：9787313206565  [2]复合材料力学，矫桂琼，贾普荣，西北工业大学出版社，2008，第1版,ISBN：9787561223321  [3]复合材料力学，沈观林，胡更开，清华大学出版社，2006,第1版, ISBN:9787302129868 | | | | | | |
| 其它（More） | None | | | | | | |
| 备注（Notes） | None | | | | | | |

备注说明：

1．带\*内容为必填项。

2．课程简介字数为300-500字；课程大纲以表述清楚教学安排为宜，字数不限。