

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.

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| 1. | 课程名称 Course Title | 海洋工程材料 Materials for Ocean Engineering |
| 2. | 授课院系 Originating Department | 海洋科学与工程系 Department of Ocean Science and Engineering |
| 3. | 课程编号 Course Code | OCE 208 |
| 4. | 课程学分 Credit Value | 3 |
| 5. | 课程类别 Course Type | 专业选修课 Major Elective Courses |
| 6. | 授课学期 Semester | 春季 Spring |
| 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 Instructor(s), Affiliation & Contact (For team teaching, please list all instructors) | 侯超 海洋科学与工程系 创园 9 栋 209, 0755-88015270 Dr. Chao Hou, Department of Ocean Sciences and Engineering Innovation Park 9-209, 0755-88018769 |
| 9. | 实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact | 无 NA |
| 10. | 选课人数限额(可不填) Maximum Enrolment (Optional) | |

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|---|----------------|-----------------------|------------------------|-------------------------------------|--------------|
| 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 |
| | 48 | | | | 48 |
| 学时数 Credit Hours | | | | | |
| 12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements | | | | | |
| 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

通过本课程的教学，使学生了解用以建造海洋工程结构的典型材料及其特性，掌握适用于海洋特殊环境的材料选用原则及设计理论，为毕业后从事海洋科学与工程研究、设计、施工等工作奠定基础，同时培养学生对材料性能、典型荷载和海洋环境作用进行耦合分析和计算的能力。

Through this course, students can enhance the understanding on typical construction materials for ocean engineering structures and their properties. Considering the unique ocean environment, fundamental principles of material selection and section design will be covered. This course helps students lay a foundation for ocean science and engineering related study in the future, and improves students' ability to conduct stress-strain analysis and capacity calculation on both traditional materials and innovative materials which have great potential to be used in ocean construction.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生将掌握以下内容：海洋工程结构对建筑材料的典型要求；传统建筑材料如木材、砖石、混凝土、结构用钢等材料的基本本构特性、力学行为与特点；纤维增强复合材料的基本本构特性、力学行为与特点；探讨不同材料的化学组分、微观结构和截面特性；由不同材料有机组合而成的新型组合结构的基本特点；海洋工程结构的选材原则与方法。

By taking this course, students will learn the following knowledge and skills: basic constitutive features, mechanical properties and characteristics of traditional building materials such as timber, masonry, concrete, steel and etc.; basic constitutive features, mechanical properties and characteristics of fiber reinforced plastics; discussion of the chemical structure, crystalline structure, microstructure and interface structure for materials; basic characteristics of composite structures composed of different materials; principles and methods of the material selection for ocean engineering 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.)

Section 1 课程与学科介绍：建筑材料的内容、发展、应用与重要性（2学时）

Introduction: main content, development, application and significance of construction materials (2 hours)

Section 2 课程与学科介绍：海洋工程结构的特点及其对建筑材料的要求（2学时）

Introduction: characteristics of emerging ocean engineering structures and their requirements for construction materials (2 hours)

Section 3 海洋工程材料科学理论基础 (2 学时)

结构工程材料的基本受力分析方法, 材料力学基本知识, 拉、压、弯、剪、扭及耦合作用等典型工况下材料的特性及抗力指标。

Basic scientific theory for the analysis of ocean engineering materials (2 hours)

Fundamental knowledge of the mechanics of materials. Typical analysis method for the behaviour of construction materials under common loading conditions including compression, tension, bending, shear, torsion and combined loading.

Section 4 木材的基本力学性能及典型木结构分析 (3 学时)

木材作为建筑材料时的优缺点, 木材基本构造与成分, 木材分类, 木材的含水量与环境影响, 典型木结构分析, 木结构耐久性及其维护。

Basic mechanical properties of timber and analysis of typical timber structures (3 hours)

The advantage and disadvantage of timber as construction material, the structure of wood, the classification of timber, the moisture effects of timber, analysis of typical timber structures, the durability and preservation of typical timber structures.

Section 5 砖石结构的基本力学性能及典型砌体结构分析 (3 学时)

砖石结构的特点及优缺点, 砖石结构的分类及制造方式, 砖石结构的耐久性分析, 典型砌体结构案例讨论。

Basic mechanical properties of masonry bricks and analysis of typical masonry structures (3 hours)

Characteristics of masonry bricks as well as their advantage and disadvantage as construction material, the classification and fabrication of masonry bricks, the durability of masonry structures, analysis of typical masonry structures.

Section 6 混凝土结构的基本力学性能及典型钢筋混凝土结构分析 (8 学时)

混凝土简介, 水泥及其基本特性, 混凝土的组分、配合比与和易性, 混凝土水化过程, 混凝土的长期性能与耐久性, 钢筋混凝土简介, 典型钢筋混凝土结构分析。

Basic mechanical properties of concrete and analysis of typical reinforced concrete structures (8 hours)

Introduction of the concrete material, characteristics of cement, composition of concrete mixture, typical mixture designs and workability of concrete, long-term effects of concrete with or without sustained loading, durability of concrete and typical degradation effects, reinforced concrete, analysis of typical reinforced concrete structures.

Section 7 钢材等金属材料的基本力学性能及典型钢结构分析 (6 学时)

金属材料简介, 金属材料的晶体结构, 钢材的力学行为, 钢材的强化与硬化, 钢材的腐蚀, 钢材的工程应用, 典型钢结构分析。

Basic mechanical properties of metals and analysis of typical steel structures (6 hours)

Introduction of metal materials, the crystal structure of metal materials, the mechanism and stress-strain behaviour of steel, the strengthening and hardening of steel, corrosion of steel, the application of steel in construction, analysis of

typical steel structures.

Section 8 复合材料的基本力学性能（6 学时）

复合材料简介，复合材料的分类及特点，复合材料的结构与力学行为，复合材料的加工成型，复合材料在工程中的应用，典型复合材料结构分析。

Basic mechanical properties of composite materials (6 hours)

Introduction of metal materials, the classification and characteristics of composite materials, the structure of composite materials, the mechanism and stress-strain behaviour of composite materials, the fabrication of composite materials, the application of composite materials in construction.

Section 9 复合材料在海洋环境中的应用（2 学时）

复合材料在海洋工程中的应用现状及应用前景。

Application of composite materials in ocean practices (2 hours)

The current application and potential of composite materials in ocean engineering practices.

Section 10 组合结构的基本力学原理与应用（6 学时）

组合结构的基本概念，组合结构的工程应用优势，组合结构的典型形式，组合结构的受力特性，截面应力分析，典型组合结构分析。

Performance and application of composite structures (6 hours)

Introduction to composite structures, advantages of composite structures, typical forms of composite structures in practice, performance of composite structures under typical loading conditions, the stress-strain analysis of composite cross-sections, analysis of typical composite structures.

Section 11 适用于海洋环境的新材料与新型结构介绍（2 学时）

Introduction to new materials and innovative structures suitable for ocean environment (2 hours)

Section 12 课程展示与讨论（4 学时）

学生将从一系列备选主题中自选题目，进行思考、展示与课堂讨论。

In-class presentation and debate: (4 hours)

Students are encouraged to present and debate on a list of potential topics related to the content learnt in this course.

Section 13 课程总结与串联（2 学时）

梳理课程内容；绘制知识图谱；复习与串联。

Review of the course: (2 hours)

Review of the topics covered in this course; knowledge map; revision and reflection.

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

参考资料:

1. 建筑材料, 张君等主编, 清华大学出版社, 2008
2. FRP 加固混凝土结构, 滕锦光, 陈建飞等著, 李荣等译, 中国建筑工业出版社, 2005.
3. 土木工程材料, 杰克逊 著, 卢璋, 廉慧珍 译
4. Construction Materials –their nature and behavior, J.M., Illstoned., E & FN Spon, 1994
5. Concrete: Structure, Properties and Materials, by Mehta P.K. et al., Prentice Hall.

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 | | 10 | | |
| 课堂表现 Class Performance | | 15 | | |
| 小测验 Quiz | | | | |
| 课程项目 Projects | | | | |
| 平时作业 Assignments | | 15 | | |
| 期中考试 Mid-Term Test | | 20 | | |
| 期末考试 Final Exam | | 40 | | |
| 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

海洋科学与工程系本科教学委员会
 Department of Ocean Science and Engineering Undergraduate Committee