

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	海洋工程材料与结构实验 Ocean Engineering Materials and Structure Lab Sessions
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	OCE324
4.	课程学分 Credit Value	1
5.	课程类别 Course Type	专业核心课 Major Core Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	中英双语 Chinese and 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)	魏振华, 侯超, 林观: 海洋科学与工程系 Wei, Zhenhua Hou, Chao Lin, Guan Department of Ocean Science and Engineering
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)	

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
			32		32
学时数 Credit Hours					
12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	OCE208 海洋工程材料				
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

钢和混凝土材料与结构在海洋工程中被广泛应用，本课程引导学生动手实操 6 组钢和混凝土材料与结构有关的实验，使学生对海洋环境下普通及超高性能混凝土材料的收缩与开裂、钢筋混凝土构件、FRP 筋增强混凝土构件、钢材腐蚀及组合结构特性等有比较深入的理解。

Steel and concrete materials and structures are widely used in marine engineering applications. This course is designed to involve students in 6 different experiments related to steel and concrete materials and structures, which are intended to further their understanding of the shrinkage and cracking behaviors of ordinary Portland cement based concrete and ultra-high performance concrete, reinforcing concrete structures using steel or fiber-reinforced polymer (FRP) reinforcement, steel corrosion and characteristics of composite structures.

16. 预达学习成果 Learning Outcomes

通过课堂教学，使学生具有进行一般材料及结构试验设计能力，了解工程材料与结构试验基本过程和目前方法存在的局限性。通过实验教学，要求学生能够掌握材料及结构试验基本加载设备和仪器的使用，具有完成简单结构静力试验的能力，并能把试验结果与实际结构联系起来。

Through classroom teaching, students are equipped with the ability to design general material and structural tests, understand the basic processes of testing engineering materials, as well as the limitations of current testing methods. Through experimental teaching, students are required to master the use of basic loading equipment and instruments for material and structural tests, have the ability to complete static tests of simple structures, be able to use the test results for assessing the performance of in-service materials and 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.)

本课程以中英双语授课，帮助学生更好理解内容。

Section 1 混凝土材料收缩实时监测实验（5 学时）

熟悉混凝土材料收缩基本原理和测试方法，对比不同配合比的混凝土在不同养护条件下的收缩程度和速率，设计减缓混凝土收缩的方法。

The fundamental principles and testing methods of shrinkage in concrete materials, the extent and rate of shrinkage occurring in concrete materials of different mixture proportions and curing conditions, and design of methods for mitigating concrete shrinkage (5 hours)

Section 2 混凝土材料约束收缩开裂实时监测实验（5 学时）

设计约束状态下混凝土材料干缩双圆环实验，揭示不同类型骨料对普通混凝土和超高性能混凝土在约束条件下干缩开裂行为的影响，探索减缓混凝土开裂的方法。

Design of concrete annular specimen under restrained conditions using dual rings made of Invar steel, examining different types of aggregates on the drying shrinkage cracking behavior of normal concrete and ultra-high performance concrete, exploration of new methods for concrete cracking mitigation (5 hours)

Section 3 钢材在腐蚀环境中的性能劣化实验（5 学时）

掌握中性盐雾金属腐蚀试验的基本原理和方法，对比不同腐蚀周期下实验室加速腐蚀对钢材性能的劣化影响；掌握金属拉伸试验的基本方法，了解电阻应变计的工作原理、使用方法和局限性；培养对试验结果分析对比的能力。

The basic principle and operation method for neutral salt spray corrosion test of steel. Analysis on the degradation effects of lab accelerated corrosion on steel. The basic principle and operation method for tensile test of steel coupons. The usage and limitation of strain gauges. The ability to conduct comparative analysis on the test data (5 hours)

Section 4 组合结构中材料间组合作用的基本原理实验（5 学时）

通过纸筒-面团承重实验、海绵-塑料袋承重实验、泡沫板-FRP 筋受弯实验等系列实验，初步揭示组合结构中材料相互约束、优势互补的特性；指导学生利用提供的材料探索设计可以反映组合作用原理的实验。

The revealing of effective material interaction and composite action in typical composite structures through a series of demonstrating experiments including paper tube-paste loading test, sponge-plastic bag loading test and foam-FRP rebar flexural test. Students are further encouraged to design more demonstrating experiments to illustrate composite actions by using the provided materials. (hours)

Section 5 钢筋混凝土梁受弯静载试验（5 学时）

进行钢筋混凝土梁的材料准备、材料性能测试、试件浇筑、试件养护、受弯加载制度、裂缝观测、破坏模态观测、绘制荷载-位移曲线，分析梁截面承载力及荷载-位移响应。

Material preparation, material tests, casting specimen, curing specimen; understanding the loading scheme; observation on cracks and failure modes; plotting load-displacement curves; calculation of

sectional capacity and load-displacement responses (5 hours)

Section 6 FRP 筋增强混凝土梁受弯静载试验 (5 学时)

进行 FRP 筋混凝土梁的材料准备、材料性能测试、试件浇筑、试件养护、受弯加载制度、裂缝观测、破坏模态观测、绘制荷载-位移曲线，分析梁截面承载力及荷载-位移响应，对比钢筋混凝土梁与 FRP 筋混凝土梁的异同。

Material preparation, material tests, casting specimen, curing specimen; understanding the loading scheme; observation on cracks and failure modes; plotting load-displacement curves; calculation of sectional capacity and load-displacement responses; comparing the difference in behaviour between steel-RC beams and FRP-RC beams (5 hours)

Section 7 课程报告 (2 学时)

Course report (2 hours)

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. 土木工程材料, 杰克逊 著, 卢璋, 廉慧珍 译
3. Construction Materials –their nature and behavior, J.M., Illstoned., E & FN Spon, 1994
4. Concrete: Structure, Properties and Materials, by Mehta P.K. et al., Prentice Hall.
5. Design of Reinforced Concrete, by McCormac, J.C. and Brown, R.H. John Wiley & Sons, 9th Edition, 2015
6. Reinforced Concrete with FRP Bars: Mechanics and Design, by Nanni, A., De Luca, A., & Zadeh, H. J. 2014.

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		20		
小测验 Quiz				
课程项目 Projects		60		
平时作业 Assignments				
期中考试 Mid-Term Test				
期末考试 Final Exam				

期末报告 Final Presentation		10		
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

