

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 | 结构设计 Structural Design |
| 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 | OCE338 |
| 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 | 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) | 林观, 海洋科学与工程系, 工学院南楼 208, ling@sustech.edu.cn Dr. Guan LIN, Department of Ocean Sciences and Engineering, College of Engineering 208, ling@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) | |

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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 | 结构力学 I (OCE322) Structural Mechanics I (OCE322) | | | | |
| 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

本课程涵盖海洋工程两大主要结构，即钢筋混凝土结构与钢结构的计算与设计方法，属于海洋工程与技术专业学生的专业核心课。经过本课程的学习，学生将能对常见的海洋工程钢筋混凝土结构及钢结构构件进行计算与设计，将对海洋工程结构物的设计荷载、传力路径、承载力计算、结构响应等具有较为深刻的理解。学生通过课堂学习与作业练习，培养思考能力和自主学习能力，对学生今后继续从事相关研究及工作具有重要的基础作用。

This course, which is a major core course of the major Ocean Engineering and Technology, covers the calculations and design methods of two main ocean engineering structures, i.e., reinforced concrete structures and steel structures. At the end of this course, the students should be able to understand the design loads, load path, capacity calculation, structural responses, etc. of common ocean engineering structural members. Through learning in class and exercises in assignments, this course will enhance the thinking and self-learning abilities of students. The knowledge and skills achieved through attending this course would form part of the foundation of the students' future professional career.

16. 预达学习成果 Learning Outcomes

通过本课程的学习，学生将能够：

1. 了解和学会使用典型海洋工程钢筋混凝土结构及钢结构构件的设计概念、原理和方法；
2. 认识钢筋混凝土构件（梁、板、柱）的典型破坏模态，能够采用合适的方法计算其设计承载力；
3. 设计典型荷载（例如压、拉、弯及其组合）作用下的常见钢结构构件；
4. 认识现有钢筋混凝土结构和钢结构设计理论存在的问题和局限性；
5. 提升思考和自学能力、解题实际问题的能力。

Upon completion of this course, students should be able to:

1. Explain and apply the concept, principles, and procedures of structural design for typical marine reinforced concrete and steel structural members;
2. Identify typical failure modes and determine appropriate approaches to calculate the design strength of reinforced concrete members (beams, slabs and columns);
3. Design simple steel members under various situations such as compression, tension, flexural, and combined loads;
4. Indicate the problems and limitations of the current theory on reinforced concrete and structural steel elements;
5. Enhance the ability to think and learn independently, and the ability to solve practical problems.

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.)

本课程分为三部分 / this course includes the following three parts:

1. 设计原理、荷载、材料特性 / Design principles, loads and material properties: 6 学时 / 6 hours
 2. 钢筋混凝土结构设计 / Design of reinforced concrete structures: 19 学时（包括 2 学时期中考试） / 19 hours (including 2 hours for mid-term test)
 3. 钢结构设计 / Design of steel structures: 23 学时（包括 3 学时复习） / 23 hours (including 3 hours for review)
- 总计/ Total: 48 学时 / 48 hours

Part 1 设计原理、荷载、材料特性（6 学时）
Design principles, loads and material properties (6 hours)

题目 1 设计原理（3 学时）

Topic 1 Principles of structural design (3 hours)

设计概念，极限状态设计，正常使用状态设计，可靠度设计

Design concept, ultimate limit state design, serviceability limit design, reliability design

题目 2 海洋工程结构设计荷载、材料特性（3 学时）

Topic 2 Design loads and material properties (3 hours)

海洋工程结构设计荷载，混凝土与钢材料特性

Design loads of ocean engineering structures, material properties of concrete and steel

Part 2 钢筋混凝土结构设计（19 学时）

Design of reinforced concrete structures (19 hours)

题目 1 受弯构件正截面抗弯承载力（梁、板）（4 学时）

Topic 1 Bending capacity of flexural members (beams, slabs) (4 hours)

受弯构件破坏模态，超筋和少筋混凝土构件，平截面假定，抗弯承载力

Failure modes of flexural members, over-reinforced and under-reinforced concrete members, plane section assumption, bending moment capacity

题目 2 受弯构件抗剪承载力（4 学时）

Topic 2 Shear capacity of flexural members (beams, slabs) (4 hours)

剪切破坏模态，主应力，剪跨比，配箍率，抗剪承载力

Shear failure modes, principal stresses, shear span-to-depth ratio, reinforcement ratio of stirrups, shear capacity

题目 3 受扭构件承载力（2 学时）

Topic 3 Torsional behavior of reinforced concrete members (2 hours)

受扭破坏模态，纯扭，弯-剪-扭，抗扭承载力

Torsional failure modes, pure torsion, bending-shear-torsion, torsional capacity

题目 4 受压构件承载力（4 学时）

Topic 4 Loading capacity of compression members (columns) (4 hours)

轴压构件，偏压构件，小偏心，大偏心，二阶效应，承载力

Centrally-loaded member, eccentrically-loaded member, small eccentricity, large eccentricity, second-order effect, load-carrying capacity

题目 5 变形和裂缝宽度计算（3 学时）

Topic 5 Deflection and crack width of reinforced concrete members (3 hours)

正常使用极限状态, 正常使用设计荷载, 刚度, 极限变形, 裂缝宽度
Serviceability limit state, serviceability design loads, stiffness, deflection limit, crack width

期中考试 (2 学时)

Mid-term test (2 hours)

Part 3 钢结构设计 (23 学时)

Design of steel structures (23 hours)

题目 1 受压构件 (4 学时)

Topic 1 Compression members (4 hours)

弹性受压构件, 非弹性受压构件, 屈曲, 约束受压构件

Elastic compression members, inelastic compression members, buckling, restrained compression members

题目 2 受拉构件 (2 学时)

Topic 2 Tension members (2 hours)

轴心受拉构件, 应力集中, 截面屈服, 截面断裂

Centrally loaded tension members, stress concentration, gross-section yielding, net-section fracture

题目 3 受弯构件 (4 学时)

Topic 3 Flexural members (4 hours)

弯曲理论, 屈服弯矩, 塑性弯矩, 塑性分析, 弯曲应力, 正常使用设计

Flexural theory, yield moments, plastic moments, plastic analysis, bending stresses, serviceability design

题目 4 钢结构连接 (4 学时)

Topic 4 Connection of steel structures (4 hours)

连接布置, 螺栓连接设计, 焊接设计

Connection layout, design of bolts, design of welds

题目 5 梁侧向稳定 (3 学时)

Topic 5 Lateral buckling of beams (3 hours)

侧向失稳, 有效长度, 约束梁

Lateral buckling, effective length, restrained beams

题目 6 拉弯与拉压构件 (3 学时)

Topic 6 Flexural-tensile and flexural-compressive behavior of members (3 hours)

整体稳定, 局部屈曲, 强度和刚度, 截面设计, 构造要求

Global stability, local buckling, strength and stiffness, section design, detailing

复习 (3 学时)

Review (3 hours)

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

There is no set book in this course. The following reference books and reading materials are recommended:

- Wight, J.K. and Macgregor, J.G. 2012, Reinforced Concrete: Mechanics and Design, 6th Edition, Pearson, Boston.
- McCormac, J.C. and Brown, R.H. 2015, Design of Reinforced Concrete. John Wiley & Sons, 9th Edition.
- GB50010-2010 《混凝土结构设计规范》, 中国建筑工业出版社.
- Trahair, N.S., Bradford, M.A., et al. 2017, The Behaviour and Design of Steel Structures to EC3. CRC Press, 4th Edition.
- Salmon, C.G., Johnson, J.E. and Malhas, F.A. 2009. Steel Structures, Design and Behavior, Emphasizing Load and Resistance Factor Design. Pearson International Edition, 5th Edition.
- GB50017-2017 《钢结构设计标准》, 中国建筑工业出版社.

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 | | 5 | | |
| 课堂表现 Class Performance | | | | |
| 小测验 Quiz | | | | |
| 课程项目 Projects | | | | |
| 平时作业 Assignments | | 20 | | |
| 期中考试 Mid-Term Test | | 15 | | |
| 期末考试 Final Exam | | 60 | | |
| 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) | | | | |

Southern University of Science and Technology

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