

1. Department, course number, title  
ORE 411 Buoyancy and Stability

2. Designation

Required Core course

3. Course Catalog Description

Buoyancy and Stability (3) Ship nomenclature and geometry, hydrostatic principles of surface ships and underwater vehicles in free-floating, partially water-borne and damaged conditions. Subdivision of ships. Launching. Pre: CE 270 or equivalent. **DP**

4. Prerequisites

Calculus

Applied Mechanics

5. Textbooks and/or other required material

Lecture Notes by R.C. Ertekin

Reference books

1. Rawson, K.J. and Tupper, E.C., "Basic Ship Theory", Vol. 1, Longman Scientific and Technical, 1983.
2. Papanikolaou, A. "Buoyancy and Stability", J.K.K. Look Lab., Rep. No. 52, 1981.
3. Benford, H. "Naval Architecture for Non-Naval Architects, 1991.
4. D'Arcangelo, A.M., "Ship Design and Construction," SNAME, 1969.
5. Semyonov-Tyan-Shansky, V. "Statics and Dynamics of the Ship," Peace Publishers, Moscow.
6. Lester, A.R., "Merchant Ship Stability," Butterworths, 1985.
7. "Principles of Naval Architecture," Soc. of Naval Arc. and Marine Engr., Vol. 1, 1988

6. ABET Course Learning Outcomes

1. Understand the mathematical principles of buoyancy and stability of floating and submerged bodies,
2. Understand the design principles of intact or damaged ships, offshore platforms, or submersibles to overcome external forces that can overturn them, and
3. Understand the safety of vessels during drydocking and grounding, and their longitudinal strength in calm waters.

7. Topics Covered

1. INTRODUCTION
2. IRREGULAR SHAPES AND NUMERICAL METHODS
3. BUOYANCY AND STABILITY
4. LIST AND BALLAST FREE-SURFACE AND DENSITY EFFECTS
5. STABILITY AT LARGE ANGLES OF INCLINATION
6. LONGITUDINAL STABILITY, TRIM AND HYDROSTATIC CURVES
7. DRY DOCKING AND GROUNDING
8. STABILITY IN DAMAGED CONDITION (or BILGING)

- 9. HYDROSTATICS OF OFFSHORE PLATFORMS
- 10. STABILITY OF SUBMERSIBLES
- 11. STABILITY CRITERIA AND STANDARDS
- 12. LONGITUDINAL STRENGTH CALCULATIONS (PRIMARY STRENGTH)
- 13. LAUNCHING

#### 8. Schedule

Two 1.25-hour sessions per week.

#### 9. Contribution of course to meeting the requirements of Criterion 5

##### Assessment

9 Assignments (30%)

Midterm Exam (35%)

Final Exam (35%)

##### Usage of Engineering Tools and Computers

MS Excel Spreadsheet usage for calculations used in homeworks

Use of ship hydrostatics and stability program SHCP to determine hydrostatic and stability features of an actual seagoing vessel

##### Contribution to Professional Component

Engineering science: 1 credit

Engineering design: 2 credits

#### 10. Relationship of the Course to Program Outcomes

Program Outcome 2: Basic science, mathematics, & engineering

Program Outcome 3: Ocean engineering core

Program Outcome 5: Use of latest tools in ocean engineering

Program Outcome 6: Problem formulation & solution

Program Outcome 9: Professional issues

#### 11. Prepared by

R.C. Ertekin – April 13, 2009

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##### Course Objectives

To familiarize students with the hydrostatics and stability of floating and underwater vehicles.