

ME168 MECHANICS OF OFFSHORE SYSTEMS

FALL 2017

UNIVERSITY OF CALIFORNIA, BERKELEY

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Office: 6111 Etcheverry Hall,
Office Hour: Mondays 2:00pm-3:00pm, or By Appointment

COURSE DESCRIPTION This course covers basics of mechanics of offshore structures. It includes wave, wind, and current forces on the structure and the response of the structure to these forces. It also covers mooring dynamics, and discusses wave and current forces on mooring cables. Underwater acoustics and issues offshore structures face in the arctic environment will be covered to some extent. The aim is to present students with analytical and (some) computational background necessary to model and analyze offshore structures in the ocean and the arctic environment, and to make them prepared to tackle real challenges the industry is facing today.

LECTURES Tuesdays and Thursdays 2:00pm-3:30pm,
3113 Etcheverry Hall.

RECOMMENDED READINGS

- Water Wave Mechanics for Engineers and Scientists, Dean and Dalrymple.
- Wave Forces on Offshore Structures by Turgut 'Sarp' Sarpkaya (Feb 26, 2010)
- Dynamics of Offshore Structures by James F. Wilson
- Offshore Structure Modeling (Advanced Series on Ocean Engineering ; V. 9) by Subrata Kumar Chakrabarti (Feb 21, 1994)
- Construction of Marine and Offshore Structures, Third Edition by Ben C. Gerwick Jr. (Mar 5, 2007)
- Sea Loads on Ships and Offshore Structures (Cambridge Ocean Technology Series) by O. Faltinsen
- Offshore Structures: Design, Construction and Maintenance, Mohamed A. El-Reedy
- Underwater Acoustics: Analysis, Design and Performance of Sonar by Richard P. Hodges (Jul 19, 2010)
- An Introduction to Underwater Acoustics: Principles and Applications (Springer Praxis Books /Geophysical Sciences) Xavier Lurton
- Fundamentals of Ship Acoustics by Harrison T. Loeser (Jan 6, 1999)
- Underwater Acoustic Modeling and Simulation Third edition by Paul C. Etter
- Arctic Offshore Engineering by Andrew Palmer and Ken Croasdale (Dec 4, 2012)

GRADING (TENTATIVE) Homework (30%),
Midterm exam (30%),
Final exam (40%).

SYLLABUS

- Introduction
 - Characteristics of Offshore and Coastal Systems, Maritime Operations,
- Ocean Wave Environment
 - Linear Potential Theory, A Review,
 - The equation of motion and Response Amplitude Operator, Review,
 - Shallow water hydrodynamics,
 - Bathymetry effects,
 - Some nonlinear effects,
- Loads on Offshore Structures
 - Cantilever beams
 - Beam vibration & natural modes,
 - Transient response,
 - Wind and Current loads on offshore structures,
 - Vortex induced vibration,
 - Extreme environment,
- Cables & mooring
 - Basic catenary in air,
 - Catenary in water,
 - Mooring systems configuration and design,
 - Wave-drift forces,
 - Low frequency damping,
 - Dynamic Positioning,
 - Numerical computations,
- Underwater Acoustics
 - Introduction to Sonar (Acoustic Waves, Doppler shift, intensity and Decibels), Sonar Equations,
 - Transducers, Directionality and Arrays,
 - Ambient noise,
 - Underwater guidance and navigation,
- Arctic Marine Structures
 - Ice structure,
 - Arctic Stratification,
 - Ice load on structures,
 - Wave-ice interactions,