

EAU934 - WATER WAVE MECHANICS

Timing: Winter semester 2015 **Lectures:** 3 Cr | **Room:** 202/Labos Lourds | **Professor:** J.B. Frandsen

SYNOPSIS This graduate course is a fundamental course in a series of courses to be offered in coastal engineering. We begin with classical inviscid water wave mechanics to form the background for studying coastal processes and interaction with structures. The governing equations for free-surface flows will be presented followed by wave transformation effects and further wave propagation into shallow water. Students will learn to choose the appropriate wave theories ranging from deep to shallow water, that is, in lakes/reservoirs/harbours (standing wave/sloshing), rivers and the ocean. Based on regular and random seas, students will practice establishing MetOcean conditions based on wind/wave data sets including tides and currents effects for operational and extreme seas for input to design of structures, environmental assessments, etc. Students will also be able to estimate wave forces on structures.

The course has an analytical focus but coarse assignments, handouts and articles will also give highlights of using physical model scale and field data, computational techniques and code of practice based design including the Coastal Engineering Manual.

The course should attract student with interest in mathematical physics, fluid dynamics, river mechanics, ocean/coastal science and engineering.

PRE-REQUISITES

Fluid mechanics and partial differential equations courses or equivalents.

LECTURE SYLLABUS

Introduction	Shallow depth theories
Linear wave theory	Random seas
Nonlinear wave theory	MetOcean conditions
Wave transformation effects	Wave forces and applications

REFERENCE TEXTS

- Lecture notes and handouts.
- Dean, R.G. and Dalrymple, R. A. (1991). "Water waves mechanics for engineers and scientists". World Scientific.
- Svendsen, I. (2006). "Introduction to nearshore hydrodynamics". World Scientific.
- Coastal Engineering Manual – Part II, US Army Corps of Engineers (Download: <http://chl.erdc.usace.army.mil>)
- References of parts of books and articles in the general literature.

Students are recommended to obtain the book by Dean & Dalrymple. For further support, a comprehensive bibliography list will be provided.