

**Middle East Technical University
Department of Civil Engineering**

CE 593 STATISTICAL ANALYSES IN COASTAL ENGINEERING

COURSE DESCRIPTION

This course is aimed to describe random nature of sea waves and to introduce statistical and spectral tools for engineering application of random sea waves. Statistical theory of waves, harmonic analysis, energy density spectrum, probability distribution of waves, measurement and analysis of waves, measurement techniques, and definitions of height and period of irregular waves, spectral analysis, and examples of statistical analysis of coastal engineering problems are the main topics of this course.

COURSE OUTLINE

1. DESCRIPTION OF RANDOM SEA WAVES
 - a. Waves in the sea
 - b. Concept of a simple sinusoidal wave
 - c. Random sea wave profiles
2. WAVE DATA: MEASUREMENT AND STATISTICAL ANALYSIS
 - a. Measurement of sea waves
 - b. Statistical quantities of digital wave data
 - c. Definition of representative waves
 - d. Distributions of individual wave heights and periods
 - e. Wave Grouping
3. WAVE CLIMATE STATISTICS
 - a. Definitions
 - b. Long-term wave statistics
 - c. Long-term distribution of individual wave heights
 - d. Extreme wave statistics
 - e. Distribution functions for extreme waves
 - f. Return period and return value
 - g. Estimation of best-fitting distribution function
 - h. Estimation of return value and its confidence interval
 - i. Encounter probability
 - j. Selection of design wave height
4. SPECTRA OF SEA WAVES
 - a. Spectra of sea waves
 - b. Relationship between wave spectra and characteristic wave dimensions
 - c. Parameters derived from the wave spectra
 - d. Common parametric expressions for wave spectra
 - e. Theory of spectral analysis
 - f. Directional spectra of random sea waves
5. ENGINEERING APPLICATIONS
 - a. Wave transformation
 - b. Design of coastal structures

TEXT BOOK

Goda, Yoshimi. (2010), Random Seas and Design of Maritime Structures', Advanced Series of Ocean Engineering, Vol. 33, World Scientific.

REFERENCES

Holthuijsen, L. H. (2007), Waves in Oceanic and Coastal Waters, Cambridge University Press, ISBN 0-521-86028-8, 387 pgs.
Kamphuis, J.W. (2000), Introduction to Coastal Engineering and Management, Advanced Series on Ocean Engineering, Vol.16, World Scientific.
Stanislaw R. M. (1996), Ocean Surface Waves: Their Physics and Prediction, Advanced Series on Ocean Engineering, Vol.15, World Scientific.
Newland, D.E. (2005), An Introduction to Random Vibrations, Spectral and Wavelet Analysis, Dover Publications.

CONDUCTION OF THE COURSE

Homeworks + midterm exam + term project + Final exam (Attendance will be plus ☺)