EOC 4631C OCEAN ENGINEERING DATA ANALYSIS

ABET Course Syllabus

1. **Course number and name:** EOC 4631C Ocean and Environmental Data Analysis

2. **Credits and contact hours:** 3 credits / Two 80-minute lectures each week

3. **Instructor's or course coordinator's name:** Dr. J. VanZwieten

4. **Textbook, title, author, and year:**
   (i) Cooper and McGillem, "Probabilistic Methods of Signal and System Analysis", 3rd ed., Oxford, ISBN 0-19-512354-9, 1999
   (ii) Lecture notes provided by Dr. VanZwieten

5. **Specific course information:**
   (a) Brief description of the content of the course (catalog description): Fourier transform applications to the processing of ocean engineering related types of signals. Introduction to probability and statistics. Digital processing techniques. Laboratory work involving analysis of ocean engineering-related signals using modern data acquisition systems.
   (b) Prerequisites: EGN4323 (Vibration Synthesis and Analysis) and EOC3130L (Ocean Engineering Laboratory) (both with a grade of C or above). EGN4323 may be taken concurrently.
   (c) Indicate whether a required, elective, or selected elective course in the program: Required

6. **Specific goals for the course:**
   (a) Specific outcomes of instruction (course specific objective): The objective of the course is to provide the students with a basic and applied knowledge of probabilistic and statistical methods to analyze random phenomena, with an emphasis on ocean environmental data study.
   (b) Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course. The learning outcomes of the course (and related ABET Criterion 3) outcomes are:
      i. An ability to design and conduct experiments, as well as to analyze and interpret data, including good laboratory safety procedures, formulation of plans for data gathering to achieve objectives, documentation of collected data, experimental procedures, analysis and interpretation of data and determination of measurement errors. (6)
      ii. An ability to study ocean phenomena as random events and understand the concept of estimation and accuracy. (1)
      iii. A thorough understanding of time and frequency analysis of random phenomena, with an emphasis on ocean physics. (1,6)
      iv. An ability to associate a confidence level to any numerical estimate, from probability density function and time coherence to power spectral density (Fourier) analysis. (1,6)
      v. An ability to measure the correlation between two physical phenomena, such as ocean ambient noise and surface wave activity for example. (1,6)
      vi. An ability to make such environmental measurements as ambient acoustic noise, surface waves or sound velocity profiles, followed by a thorough data analysis. (1,6)

7. **Brief list of topics to be covered:**
   - Introduction to probability.
   - Experimentation: planning, collection, analysis of data.
   - Random variables fundamentals.
   - Extension to multiple random variables.
   - Elements of statistics.
   - Classification of random processes.

- Time and space correlation functions.
- Spectral density function, Fourier analysis.
- Applications: wave spectral analysis, bathymetric survey.