EOC 3123 OCEAN ENGINEERING FLUID MECHANICS

ABET Course Syllabus

1. **Course number and name:** EOC 3123 Ocean Engineering Fluid Mechanics

2. **Credits and contact hours:** 4 credits / Two 110 minute lectures each week

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

4. **Text book, title, author, and year:**
   1. D. F. Elger, B. A. LeBrett, C. T. Crowe and J. A. Roberson, *Engineering Fluid Mechanics*, 12th Edition, John Wiley & Sons, 2019

5. **Specific course information:**
   (a) Brief description of the content of the course (catalog description): Study of incompressible-fluid flow and its application to ocean engineering with emphasis on fluid properties, hydrostatic forces, buoyancy and stability of floating bodies including metacentric height concepts, fluid dynamics, dimensional analysis, modeling, real flows in closed conduits and open channels, boundary-layers, lift and drag, turbo-machines, computational and experimental methods, resistance and propulsion of marine vehicles, and design problems. A grade of "C" or better is required for the major
   (b) Prerequisites: EGN 3321, Dynamics; EGN 3343 Engineering Thermodynamics; EOC 3130L OE Lab; MAC 2313 Calculus-Analytic Geometry 3 (all with a grade of C or above).
   (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 basic foundation in fluid mechanics in preparation for the study of particular fluid dynamic applications that will be presented in graduate level Ship Hydrodynamics.
   (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:
      1. An understanding of the basic properties of fluids with emphasis on seawater. (1)
      2. The ability to calculate forces associated with hydrostatic pressure, buoyancy and an understanding of stability criteria for floating bodies. (1)
      3. An understanding of the constitutive equations of fluid flow. (1)
      4. The ability to calculate forces associated with momentum changes in fluid flows. (1)
      5. A useful working knowledge of dimensional analysis, similarity and modeling which can be applied to a wide spectrum of engineering analyses. (1)
      6. A fundamental understanding of the role of viscosity in real flows with emphasis on the calculation of skin friction for external flows and pressure gradients for internal flows. (1)

7. **Brief list of topics to be covered:**
   - **Introduction:** Fluid properties and modeling
   - **Fluid Statics:** Statics pressure, buoyancy, stability
   - **Flow Kinematics:** Eulerian and Lagrangian descriptions of flow; Flow acceleration; vorticity, Equation of continuity.
   - **Fluid Pressure:** Pressure field in accelerating flows; Eulers equations; Bernoulli's equation; Applications of Bernoulli's equation; Cavitation.

- **Momentum Principle:** Integral form of balance of linear and angular momentum; Applications of momentum principle; Navier-Stokes equations.
- **Dimensional Analysis:** Dimensional homogeneity; Pi theorem; Similitude; Non-dimensional parameters; Model studies and laboratory-scale experiments; Froude's method of determining ship resistance.
- **Resistance:** Boundary-layer flows; Surface resistance; Boundary-layer control.
- **Flow in Pipes:** Laminar flows in pipes; Hagen-Poiseuille solution; Criterion for laminar or turbulent flow in a pipe; Turbulent flow in pipes.