Unsteady Body Motion, Wave-Structure Interaction, Wave Energy Extraction, Forward-Speed Effects, Hydrofoil Theory

Course Syllabus

A. Unsteady Body Motion in an Infinite Fluid
   General formulation & moving frame of reference
   Unsteady hydrodynamic forces and moments
   Kirchoff’s decomposition, added mass theory
   Solution representation by singularity distribution
   Steady versus unsteady flows about bodies
   Empirical modeling of viscous effects

B. Body Motion in Waves and Ocean Energy
   Coordinate systems and general consideration
   Linearization of body boundary condition
   Mode decomposition in time-harmonic problems
   Hydrodynamic forces and moments
   Added masses and damping matrices
   Radiation and diffraction potentials; examples
   Hydrostatics, body inertia, and equations of motion
   Response characteristics
   Forward-speed effects and ship-motion theory
   Reciprocity Relations
   Wave-energy extraction principles
   Energy devices and analysis

C. Hydrofoil Theory
   Complex variables, complex potential, conformal mapping
   Blasius theorem, circle theorem, circulation
   Two-dimensional thin-wing theory
   Thickness and Lifting problems, Applications
   Vortex theorems in three dimensions
   Three-dimensional wings, lifting-line theory
   Induced drag, Circulation Distribution
   Cavitating Flows.

Homework problems: (50%), Midterm-Quiz: (15%) Final Exam: Either 1-hour oral or 3-hour written (35%)
Textbook & references: Lecture-Notes & Handouts,
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