

Course Name:

Fluid-Structure Interaction

Course Number: 20-258	Credit: 3
Program: Graduate	Course Type: Technical Selective
Prerequisite: -	Corequisite: -

Course Description (Objectives):

The aim of this course is to familiarize students with the formulation of the dynamic behavior of structures considering structure-water interaction effects. It also covers analytical and numerical solution methods, including the finite element method, for analyzing this behavior.

Course Content (outline):

- Chapter 1: Review of Structural Dynamic Analysis and Fundamentals of Hydrodynamics
- Chapter 2: Derivation of Governing Equations in Water
- Chapter 3: Analytical Calculation of Hydrodynamic Pressures in Simplified Cases
- Chapter 4: Numerical Solution of the Wave Equation in 2D and Discussion on the 2D Semi-Infinite Element
- Chapter 5: Interaction of Structure-Water System for Incompressible Water Model
- Chapter 6: Introduction to 3D Semi-Infinite Element Fluid Finite Element Interface Element and Their Combination
- Chapter 7: Time-Domain Solution Method Using Exact and Approximate Added Mass Matrices (Modified Westergaard)
- Chapter 8: Formulation of Structure-Water Interaction for Compressible Water Model (in Frequency Domain) with Various Boundary Conditions
- Chapter 9: Frequency-Domain Analysis Method Including: Fluid Finite Elements – Semi-Infinite Element and Combination of Both Domains
- Chapter 10: Time-Domain Analysis Method Governing Equations Using Nodal Pressures Application of Velocity Potential



References:

- Zhao Y., Su X., Computational Fluid-Structure Interaction: Methods, Models, and Applications. Academic Press.
- Brebbia C.A., Rodriguez G.R., Fluid Structure Interaction VII. Wit Pr/Computational Mechanics
- Bathe J.K., Finite Element Procedures
- Hall J.F., Chopra A.K., Dynamic Response of Embankment Concrete-Gravity and Arch Dams Including Hydrodynamic Interaction.