수치선박유체역학
(Computational Marine Hydrodynamics)

2019학년도 1학기, 서울대 조선해양공학과 464.519

(Spring 2019, Dept. NAOE, SNU, 464.519)

1. Course Description

The course is prepared for graduates who are interested in the singularity distribution and vortex methods. The subject will be dealt with mathematical basis for implementation the associated numerical schemes to perform the inviscid and viscous flow analysis. We will focus on vorticity and vortex dynamics and how to combine the panel methods with the vortex methods to understand the complex vortical flow characteristics.

2. References

(1) Cottet & Koumoutsakos, *Vortex methods-theory and practice, 2000.*

(2) Batchelor, G. K., *An Introduction to Fluid Dynamics*, 1967.

(3) Aris, R., *Vectors, Tensors and the Basic Equations of Fluid Mechanics*, Prentice Hall, 1962.

(4) Newman, J. N., *Marine Hydrodynamics* , MIT, 1977(수정판 1997).

(5) Rosenhead, L., *Laminar Boundary Layers*, Oxford Univ., 1963.

(6) Wu, J.-Z, Ma, H.-Y. and Zhou, M.-D., *Vorticity and Vortex Dynamics, Springer*, 2006.

3. Course contents

1 wk: Outlines of Lecture, Fundamentals of Mathematics

2 wk: Fundamentals of Hydrodynamics

3 wk: Mathematical Modeling (Laplace equation)

4 wk: Singularity Distribution Methods

5 wk: Potential-Based Panel Methods

6 wk: Numerical Schemes

7 wk: Extension to 3-D Flows

8 wk: Vorticity-Based Methods

9 wk: Finite Volume methods

10 wk: Lagrangian Vortex Particle Methods
11 wk: Numerical Implementation of VIC
12 wk: Application to Cylinders and Spheres
13 wk: Extension to Turbulent Flows
14 wk: Extension to Bubble Dynamics
15 wk: Presentation/Discussion