

MULTISCALE COMPUTATIONAL FLUID DYNAMICS (4461.515)

Prerequisites: Numerical Analysis for Engineering Applications (4461.530)

Text

Computational Methods for Fluid Dynamics by Ferziger & Peric, Springer, 3rd Ed.

References

Fundamentals of Engineering Numerical Analysis by Moin, Cambridge University Press.

Computational Techniques for Fluid Dynamics by Fletcher, Springer-Verlag.

Computational Fluid Dynamics by Roache, Hermosa Pub.

Computational Methods for Fluid Flow by Peyret & Taylor, Springer-Verlag.

Numerical Heat Transfer and Fluid Flow by Patankar, McGraw Hill.

Spectral Methods in Fluid Mechanics by Canuto, Hussaini, Quarteroni & Zang, Springer.

Topics

- 1) Basic concept of fluid flow
- 2) Introduction to numerical methods
- 3) Finite difference methods
- 4) Finite volume methods
- 5) Solution of linear equation systems
- 6) Method for unsteady problems
- 7) Solution of Navier-Stokes equations
- 8) Complex geometries (including Immersed boundary method)
- 9) Turbulent flows
- 10) Compressible flow
- 11) Efficiency and accuracy improvement
- 12) Some special topics

Homeworks and Project

Approximately three to four homework will be given.

- 1 Do not present your source code.
- 2 Present results in graphical form whenever possible. When it is appropriate to include raw data (usually never!) or listings, place them in appendices.
- 3 State any conclusions reached; comment on unusual or unexpected behavior. Discuss the significance and limitation of results.

Grade: Exam (60%), Homework (30 %), Attendance (10 %)

Office Hours:

Choi, Haecheon 880-8361 choi@ # 301-1506 TBA