
Course Title: Large Eddy Simulation
Prerequisite: Viscous Flow, CFDI

Number of Credits: 3
Lecturer: Dr. Mohammad Saeedi

Course Description:

Providing basic skills in students to conduct large-eddy simulation

Course Topics:

- Overview of time/phase averaging and RANS models
- Unsteady simulation of turbulent flows (URANS and LES/DNS)
- Scale separation and faltering in LES
- Implicit and explicit filtering concept
- Subgrid scale modeling
- Constant, dynamic and multi dynamic coefficient models
- Modeling of Kinetic energy forward/backward scattering
- A priori/A posteriori analysis
- Wall modeling in LES
- Hybrid RANS-LES and detached eddy simulation (DES)
- Synthesized inlet turbulence (stochastic reconstruction techniques)
- Physical inlet turbulence (rescaling and precursor methods)
- Interpretation of LES results
- Frequency spectrum analysis

The course aims to:

Provide basic skills in students to conduct large-eddy simulation

Reading Resources:

- A practice towards large-eddy simulation of incompressible turbulent flows, M. Saeedi, Amirkabir University Press, Tehran, 2016.
- Turbulence Modeling for CFD, D. C. Wilcox, DCW Industries, 2007.
- Turbulent Flows, S. B. Pope, Cambridge University Press, 2000.
- Statistical Theory and Modeling for Turbulent Flows, P. A. Durbin and B. A. Petterson Reif, John Wiley & Sons, 2001.
- Large Eddy Simulation for Incompressible Flows, P. Sagaut and M. Germano, Springer Verlag, 2002.
- Turbulence, J. O. Hinze, McGraw-Hill, 1959.
- A First Course in Turbulence, J. L. Lumley and H. Tennekes, MIT Press, 1972.
- Different articles from Journal of Fluid Mechanics and Physics of Fluids.

Evaluation:

80% Assignments
20% Final written exam