ME 695 TURBULENT FLOWS (3-0-0-6)

Pre-requisite:
ME 501 (Advanced Engineering Mathematics) and ME 520 (Fluid Mechanics)

Syllabus:
High Reynolds number flows, tensor algebra and calculus, fluid flow equations, mean and fluctuating motion, scaling, energy cascade, homogeneity and isotropy, Kolmogorov's hypotheses, statistical description, random processes, correlation, PDFs, structure function, evolution and kinetic energy of Fourier modes, triad interaction, spectra, turbulent transport, universal and dissipation range, free and wall bounded flows, flows in stratified medium, direct numerical simulation (DNS), accuracy, resolution, cost, large-eddy simulation (LES), filtering, sub-grid scale models, RANS and URANS, eddy viscosity, algebraic and two equations model, wall effects, Reynolds stress model.

Textbook/References:
1. Stephen B. Pope, Turbulent Flows, Cambridge University Press, 2000.
2. P. A. Davidson, Turbulence, Oxford University Press, 2004.
3. H. Tennekes and J. L. Lumely, A First Course in Turbulence, The MIT Press, 1972.
4. G. Biswas and V. Eswaran, Turbulent Flows: Fundamentals, Experiments and Modeling, Narosa Publishing House, 2002.
5. Jean Mathieu and Julian Scott, An introduction to Turbulent Flow, Cambridge University Press, 2000.
6. R. J. Garde, Turbulent Flow, New Age International Publishers, 2000.
7. Uriel Frisch, Turbulence, Cambridge University Press, 1999.
8. Pierre Sagaut and Claude Cambon, Homogeneous Turbulence Dynamics, Cambridge University Press, 2008.
9. Pierre Sagaut, Large Eddy Simulation for Incompressible Flows, Springer, 1998.