ME 647 Numerical Prediction of Industrial Fluid Flows (3-0-0-6)

Introduction. What is a prediction method? Brief Outlines of Industrial applications, Importance of a prediction method, Mathematical description of flow problems; Discretisation methods in primitive variables, Diffusion and Convection, Various Upwind schemes, Generalized formulation, False Diffusion; Calculation of the flow field- The SIMPLE algorithm- Staggered grid, Momentum equation, Pressure and Velocity correction, Pressure correction equation, Sequence of operation, Discussion of the pressure correction equation, The relative nature of pressure, A revised algorithm: SIMPLER; Turbulence modelling- Introduction, Closure problem, Algebraic models, Application to the free shear flows and wall bounded flows. Turbulence energy equation models-One equation model, two equations model, low-Reynolds numbers effects, Second order closure models-Direct numerical and large eddy simulations; Mini Project on numerical solution of practical problems.

Textsbooks:

[1] S. V. Patankar, *Numerical Fluid Flow and Heat Transfer*, Hemisphere Publishing Corporation, 1980. ,

[2] D. C. Wilcox, *Turbulence Modelling for C.F.D.*, D.C.W. Industries Inc., 1993