OE5450: NUMERICAL TECHNIQUES IN OCEAN HYDRODYNAMICS

Course content:

Revisit Fluid Dynamics fundamentals. Numerical solution of Diffusion, Advection and Burgers' equations . Requirements of numerical solutions - Lax theorem; linear stability analysis. Introduction to CFD concepts: Pressure elimination, Pressure correction and Split algorithms; modeling of turbulence; introduction to LES, DES and DNS. Computations in solution of PDEs, Pressure elimination and Pressure correction. Introduction to computations using unstructured meshes. Introduction to Numerical Marine Hydrodynamics: Partial differential equations of inviscid hydrodynamics; Code development and computations of hydrodynamics of wave-structure interaction for fixed and floating bodies using BIEM, BEM and FEM techniques; Application of Fast methods; Time domain computation - non-linear velocity potential and acceleration potential approaches. Free surface computation in viscous models - VOF and Levelset. Computation of the motions of ships in waves. Forward speed problem and computation. Integral boundary layer equations and numerical solutions. Introduction to Parallel Machines and High Performance Computing.

Text Books:

1. **Anderson, D.** Computational Fluid Dynamics, McGraw Hill International Editions, 1995.

Reference books:

1. **Tannehill, C., Anderson, D and Pletcher, R.** Computational Fluid Mechanics and Heat Transfer, 1997.
2. **Newman, JN.** Marine Hydrodynamics, MIT Press, Cambridge, MA, 1977.
3. Journal and thesis publications and prescribed by teacher.

Prerequisite:

NIL