MS 615: Hydrodynamic Modeling of Estuarine and Coastal Waters
Instructor: Harry Wang (x 7215); email: wang@vims.edu

Primary Texts:

Course description:
This course will survey numerical methods for the solution of partial differential equation describing the estuarine and coastal water motion and transport. Topics include stability, accuracy, consistency and convergence analysis of numerical scheme, formulation of primitive and scalar transport equations, and the pre- and post- processing for numerical computational models. The course will involve classroom lectures, seminar readings, and hands-on application of models in the coastal and estuarine environment.

Contents:
1. Classification of partial differential equation
2. Finite difference methods
3. Diffusion equations
4. Elliptic equations
5. Convective-dominated problems
6. Navier-Stokes equation
7. Flows governed by reduced Navier-Stokes equations
8. Scalar equation for salt and temperature
9. Coordinate transformation of governing equation for fluid motion
10. Turbulent flow models and calculation
11. Initial, boundary conditions, pre- and post-processes for numerical model
12. Survey of Numerical models applied in estuarine and coastal waters  
   a. POM (Princeton Ocean Model) 
   b. HEM3D (Hydrodynamic Eutrophication model three-dimension) 
   c. CH3D (Curvilinear Hydrodynamic three-dimension)

Time and Place: Newport Hall, Monday and Thursday, 10:00 – 11:30 am
Course grade: 5 homeworks (75%); final examination (25%)

References:
1. Development and verification of a three-dimensional numerical hydrodynamics, salinity, and temperature model of Chesapeake Bay (1991) by B. H. Johnson et. al. Technical report HL-91-7, Waterways Experiment Station, Army Corps of Engineers