

**Introduction to modeling in Oceanography**  
*TENTATIVE SYLLABUS*

**UNIT 1: EXCHANGES OF ENERGY AND MASS AT MICROSCOPIC SCALES**

1-Oct Thursday

- *Prelude*: Course Introduction
- *Computer Lab*: Molecular transport mechanisms 1: background, introduction and exploration of an individual-based model (IBM).

6-Oct Tuesday

- *Due on WebQ*: Background and interest survey
- *Due on Collect It*: Key Questions 1 on molecular transport
- *Prelude*
- *Discussion*: Key Questions from the molecular transport IBM

8-Oct Thursday

- *Prelude*
- *Computer Lab*: Molecular transport mechanisms 2: Mini-Study

13-Oct Tuesday

- *Due on Collect It*: Essay on Mini-Study 1
- *Prelude*
- *Discussion*: Insights and conclusions from the molecular transport IBM

**UNIT 2: VERTICAL MOVEMENT AND WATER COLUMN STRUCTURE**

15-Oct Thursday

- *Prelude*
- *Computer Lab*: Active and passive motion of particles 1: background, introduction and exploration of a micro-scale hydrodynamic model

20-Oct Tuesday

- *Due on Collect It*: Key Questions 2 on particle movement
- *Prelude*
- *Discussion*: Key Questions from the micro-scale hydrodynamic model

22-Oct Thursday

- *Prelude*
- *Computer Lab*: Active and passive motion of particles 2: Mini-Study

27-Oct Tuesday

- *Due on Collect It:* Essay on Mini-Study 2
- *Prelude*
- *Discussion:* Insights and conclusions from the molecular transport IBM

### UNIT 3: INTERACTIONS AMONG CHEMICAL AND BIOLOGICAL SPECIES

29-Oct Thursday

- *Prelude*
- *Computer Lab:* Reaction, consumption and conversion in the plankton 1: background, introduction and exploration of a coupled ordinary differential equation (ODE) model

3-Nov Tuesday

- *Due on Collect It:* Key Questions 3 on plankton/nutrient dynamics
- *Prelude*
- *Discussion:* Key Questions from the plankton ODE model

5-Nov Thursday

- *Prelude*
- *Computer Lab:* Reaction, consumption and conversion in the plankton 2: Mini-Study

10-Nov Tuesday

- *Due on Collect It:* Essay on Mini-Study 3
- *Prelude*
- *Discussion:* Insights and conclusions from the plankton ODE model

### UNIT 4: DYNAMICS IN TURBULENCE

12-Nov Thursday

- *Prelude*
- *Computer Lab:* Movement and interaction in turbulence 1: background, introduction and exploration of a Direct Numerical Simulation (DNS) of turbulence.

17-Nov Tuesday

- *Prelude*
- *Due on Collect It:* Key Questions 4 on movements in turbulence
- *Discussion:* Key Questions from the turbulence DNS

19-Nov Thursday

- *Prelude*
- *Computer Lab:* Movement and interaction in turbulence 2: Mini-Study

24-Nov Tuesday

- *Due on Collect It:* Essay on Mini-Study 4
- *Prelude*
- *Discussion:* Insights and conclusions from the turbulence DNS

26-Nov Thursday

- HOLIDAY – THANKSGIVING

## **UNIT 5: FLUSHING AND RETENTION IN ESTUARIES**

1-Dec Tuesday – NOTE ROOM CHANGE

- *Prelude*
- *Computer lab:* Dynamics of coastal environments 1: a tidally-averaged partial differential equation (PDE) estuarine flow model

3-Dec Thursday

- *Due on Collect It:* Key Questions 5 on estuarine flows
- *Prelude*
- *Discussion:* Key Questions from the estuary PDE model

8-Dec Tuesday – NOTE ROOM CHANGE

- *Prelude*
- *Computer Lab:* Dynamics of coastal environments 1: Mini-Study

10-Dec Thursday

- *Prelude*
- *Due on Collect It:* Essay on Mini-Study 5
- *Discussion:* Insights and conclusions from the estuary PDE model