Earth System Science 227: Geophys Fluid Dynamics I (Winter 2009)
(http://www.ess.uci.edu/~yu/ess227.html)

Professor Jin-Yi Yu   ***Tuesdays & Thursdays 11:00-12:20, CH1103***
CH3315, 824-3878, jyyu@uci.edu

COURSE ESCRIPTION
This course Introduces the student to atmospheric and oceanic fluid dynamics. Equations of motion for a rotating stratified fluid. Scaling analysis, potential vorticity dynamics, linear waves, energetics and instability theory with applications to the mean circulation and variability.

TEXTBOOKS
Marshall and Plumb: Atmosphere, Ocean and Climate Dynamics: An introductory text, Academic Press.
J.R. Holton An introduction to Dynamic Meteorology, Academic Press.

GRADES
Homework (40%); midterm (60%)

HOMEWORKS
Issue and due every Thursday

SYLLABUS

Week 1   1/5 & 1/7   **Introduction and Review of Mathematical Tools**
Review of useful mathematical tools
Estimating with scale analysis
Fundamental and apparent forces

Week 2   1/12 & 1/14   **Basic Conservation Laws**
Conservation of momentun: The equations of mortion
Conservation of energy: The thermodynamic energy equation
The continuity equation
Primitive equations

Week 3   *1/21 & 1/22*   **Applications of the Equations of Motion**
Vertical coordinates: pressure and potential temperature
Balanced (geostrophic, inertial, cyclostrophic, gradient) flows
Thermal wind balance
trajectories and streamlines

Week 4   1/26 & 1/28   **Circulation, Vorticity, and Divergence**
The Circulation theorem
Vorticity and potential vorticity
The relationship between vorticity and divergence
Velocity potential and stream function

Week 5   2/2 & 2/4   **Baroclinic Instabilities**
Angular momentum budget
Available potential energy
Energetics of baroclinic waves

Midterm   2/12 (Friday)

ESS229: GEOPHYS FLUID DYNAMICS II