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

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Tuesdays & Thursdays 11:00-12:20, CH1103

COURSE DESCRIPTION
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

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 momentum: The equations of motion
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)

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