

Earth System Science 228: Geophys Fluid Dynamics (Winter 2011)
(<http://www.ess.uci.edu/~yu/ess228.html>)

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Tuesdays & Thursdays 09:30-10:50, 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

J.R. Holton: An introduction to Dynamic Meteorology, Academic Press.
Adrian E. Gill: Atmosphere-Ocean Dynamics, Academic Press.

GRADES

Homework (30%); midterm (35%); Final (35%)

HOMEWORKS

Issue and due every Thursday

SYLLABUS

Week 1	1/10 & 1/12	Introduction and Review of Mathematical Tools Mathematical tools and estimating with scale Fundamental and apparent forces
Week 2	1/17 & 1/19	Basic Conservation Laws Equations of motion, thermodynamic energy equation, Continuity equation
Week 3	1/24 & 1/26	Applications of the Equations of Motion Balanced (geostrophic, inertial, cyclostrophic, gradient) flows Thermal wind balance
Week 4	1/31 & 2/2	Circulation, Vorticity, and Divergence The Circulation theorem Vorticity and potential vorticity
Week 5	2/7 & 2/9	Waves in the Atmosphere Perturbation method Gravity wave, Rossby wave, Kelvin wave
Midterm	2/14	
Week 6	2/16	Adjustment Under Gravity In a non-rotating system
Week 7	2/21 & 2/23	Adjustment Under Gravity In a density-stratified fluid Effect of rotation
Week 8	2/28 & 3/1	Midlatitude Dynamics: Baroclinic Instabilities Concept of normal mode Continuously stratified atmosphere Energetics of baroclinic waves
Week 9	3/6 & 3/8	Ocean Circulation Wind-driven circulation Western Boundary currents
Week 10	3/13 & 3/15	Tropical Dynamics Scale analysis of large-scale tropical motions Equatorial wave theory
Final	3/22 (8:30am-10am)	