AOS 310
Introduction to Dynamics of the Atmosphere and Ocean

Fall 2002

Instructor: Prof. Jonathan Martin
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Meeting Times: MW 11:00 AM, Rm. 823 AOSS

T.A.: Blaine Thomas, Rm. 1421 AOSS, 265-9196

Course Description: This course is an introduction to the dynamics of the fluid atmosphere and ocean. We will derive the equations that govern the flow in these media and interpret the physics of that flow by making appropriate assumptions about it. We will learn about basic kinematics, vector representations of the equations of motion, fundamental and apparent forces, and geostrophic flow.

Course Content: We will basically work through Holton’s book chapters 1-3 with slight detours along the way.

Exams and Grading: 3 - 1 hr exams 40%
7 homework sets 42%
Final Exam 18%

Required Text: An Introduction to Dynamic Meteorology: Third Edition
Perhaps other texts as yet undecided.

Office Hours: Wednesday, 1:30-3:00 P.M. (or by appointment)

COURSE CALENDAR

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Subject</th>
<th>Reading</th>
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<tbody>
<tr>
<td>1</td>
<td>Sept. 4</td>
<td>Review of Vector Calculus</td>
<td>Handout</td>
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<tr>
<td>2</td>
<td>Sept. 9</td>
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<td>2</td>
<td>Sept. 11</td>
<td>Kinematics of Fluid flow</td>
<td>Handout</td>
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<td>3</td>
<td>Sept. 16</td>
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<td>3</td>
<td>Sept. 18</td>
<td>Fundamental Forces</td>
<td>Holton, p. 1-11</td>
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<td>(HW 1 due,</td>
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<td></td>
<td>HW 2 out)</td>
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<td>4</td>
<td>Sept. 23</td>
<td>Apparent Forces (Coriolis and Gravity Forces)</td>
<td>Holton, p. 11-22</td>
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<td>4</td>
<td>Sept. 25</td>
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5  Sept. 30
5  Oct. 2  (HW 2 due, HW 3 out)

EXAM 1

5  Oct. 2  (HW 2 due, HW 3 out)
6  Oct. 7  Hypsometric Equation
6  Oct. 9  Total differentiation Holton, p. 27-31
Class notes
7  Oct. 14  Lagrangian vs. Eulerian derivatives
7  Oct. 16  (HW 3 due, HW 4 out) Advection
8  Oct. 21  Differentiation in rotating coordinates Holton, p. 31-41
8  Oct. 23  
9  Oct. 28  
9  Oct. 30  (HW 4 due, HW 5 out) Scale Analysis
10  Nov. 4  Geostrophic Balance
10  Nov. 6  Rossby number, vertical eq. of motion Holton, p. 41-47
Handout
11  Nov. 11  Continuity eq.
11  Nov. 13  (HW 5 due, HW 6 out) Isobaric coordinates Holton, p. 58-67
12  Nov. 18  
12  Nov. 20  Natural coordinates
13  Nov. 25  EXAM 3
13  Nov. 27  Gradient Wind Holton, p. 64-82
14  Dec. 2  (HW 6 due, HW 7 out) Inertial flow
14  Dec. 4  Cyclostrophic flow
15  Dec. 9  Trajectories and Streamlines
15  Dec. 11  Thermal Wind

FINAL EXAM; MONDAY DECEMBER 16 at 2:45 PM

The final will be comprehensive but not nit-picky. In other words, you will not be surprised when you see the questions!

LABORATORY EXERCISES

We will schedule at least two laboratory exercises near the end of the term in which we will investigate issues surrounding the balanced flows that we have covered in lecture. These labs will meet at the same time as your regular AOS 330 lab. More detail on this later.