SIOC 217B (Winter 2017)

Atmospheric and Climate Sciences II: Atmospheric Dynamics

Instructor: Joel Norris MESOM 327 822-4420 *jnorris@ucsd.edu*

Instructor Absence: I do not plan to have any absences.

Office Hours: Students are welcome to stop by my office at any time, but I recommend checking with me ahead of time to make sure I will be in.

Attendance Expectations: Students are expected to attend every class with exceptions only for illness and direct time conflicts such as out-of-town conferences.

Grading Option: Letter grade required for first year SIO graduate students. S/U is permissible for all other students.

Grading Criteria: 50% final exam, 40% homework exercises, 10% reading quizzes

Textbook: An Introduction to Dynamic Meteorology, 4th Edition by J. R. Holton
UCSD only: http://www.sciencedirect.com/science/bookseries/00746142/88

Website: On TritonEd. You should frequently check the website for class information, supplemental notes, homework assignments, and assigned reading.

Homework Exercises: Homework assignments must be completed on time and extensions will be granted only in exceptional circumstances. Incorrect homework may be returned for revision.

Collaboration: Students are encouraged to collaborate on homework exercises so long as each student does his or her own work. No collaboration is allowed on exams.

Reading quizzes: A short quiz may be administered at the beginning of class to test knowledge of the assigned reading.

Examinations: There will be a final exam.

Course Topics:

1. Conventions; Lagrangian vs. Eulerian frame; advection (Holton 1.1, 1.2, 1.3, 2.1.0)
2. Navier-Stokes equation; fundamental forces (Holton 1.4)
3. Hydrostatic balance; hypsometric equation; pressure + density vertical profiles (Holton 1.6)
4. Rotating reference frame; oblate shape of Earth; Coriolis force (Holton 1.5. 2.1.1, 2.2, 2.3)
5. Momentum equations; geostrophic and other wind balance (Holton 2.4, 3.1.1, 3.2)
6. Trajectories and streamlines (Holton 3.3)
7. Continuity equation; vertical velocity (Holton 2.5, 3.1.2, 3.5, 3.6)

8. Mechanical and thermodynamic equations; static stability (Holton 2.6, 2.7, 3.1.3)
9. Thermal wind (Holton 3.4)
10. Circulation; sea breeze generation (Holton 4.1)
11. Relative, planetary, and absolute vorticity; vorticity equation (Holton 4.2, 4.4)
12. Potential vorticity; barotropic vorticity (Holton 4.3, 4.5, 4.6)
13. Boundary layer; turbulent flux; surface layer; Ekman layer (Holton 5.1, 5.2, 5.3, 5.4)
14. Fronts and related weather; cyclone structure; cloud conveyor belt (Holton 6.1)
15. Quasigeostrophic system of equations; quasigeostrophic vorticity (Holton 6.2)
16. Geopotential tendency equation; quasigeostrophic potential vorticity (Holton 6.3)
17. Omega equation; Q-vector formulation (Holton 6.4, 6.5)
18. Properties of waves (Holton 7.1, 7.2)
19. Shallow water equation; barotropic Rossby waves (Holton 7.7.1)
20. Forced topographic Rossby waves (Holton 7.7.2)

Other topics in Holton are covered in SIOC 250, *Advanced Atmospheric Dynamics*