

## Syllabus - MAE578 Geophysical & Environmental Fluid Dynamics - Spring 2017

Monday/Wednesday 12:15-1:30 pm, ECG 215

Instructor: Huei-Ping Huang, hp.huang@asu.edu

Office:ERC359 Office hours: Monday 2:00-3:30, Tuesday 2:00-3:30, or by appointment

Course website: <http://www.public.asu.edu/~hhuang38/MAE578.html>

### Textbook

"*Atmosphere, ocean, and climate dynamics, an introductory text*", J. Marshall and R. A. Plumb, Academic Press, **Required**

The first 8 chapters of the textbook will be used extensively in this class. Lecture notes will be provided to supplement the textbook.

Other recommended textbooks:

*For GFD of large-scale flows:*

- (1) "Atmospheric and oceanic fluid dynamics", G. K. Vallis, Cambridge University Press
  - (2) "Atmosphere-ocean dynamics", A. E. Gill, Academic Press
  - (3) "Geophysical fluid dynamics", J. Pedlosky, Springer-Verlag
  - (4) "An introduction to dynamic meteorology", J. R. Holton, Elsevier-Academic Press
- All are excellent and slightly more advanced than Marshall & Plumb.

*For environmental flows at smaller scales:*

- (1) "An introduction to boundary layer meteorology", R. B. Stull, Springer
  - (2) "Turbulence and diffusion in the atmosphere", A. K. Blackadar, Springer
- They are among the few textbooks on the subject that are friendly to beginners. Unfortunately, (2) might be out of print; Try to borrow a copy from the library.

### Course outline

1. Overview (1 lecture)
2. Energy balance of large-scale atmospheric circulation (3 lectures)
3. Stratified flow: vertical structure, static stability, and convection (4 lectures)
4. Water vapor, moist convection, and precipitation (2 lectures)
5. Survey of 3-D momentum and energy equations of fluid flows (2 lectures)
6. The effect of earth rotation (5 lectures)
7. Atmospheric boundary layer & near-surface processes (4 lectures)
8. Effect of topography and gravity waves (1 lecture)
9. Global-scale circulation of the atmosphere and oceans (4 lectures)
10. Issues related to numerical weather prediction (2 lectures)
11. Issues related to observation/measurement (2 lectures)

Grade will be based on homework assignments (60%), a term paper (30%), and an oral exam (10%). Depending on availability of time, the oral exam might be replaced by an extra homework assignment, a bonus task for the term project, or a final presentation.

Attendance is required. Excessive absence will result in a failing grade.

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### Useful links

Please make sure that you are familiar with **ASU policies on academic integrity** and campus safety:

ASU policy on academic integrity: <https://provost.asu.edu/academicintegrity>

Campus safety and security: <https://provost.asu.edu/University-Safety-Security>

Grade and grading policies, contacts of SEMTE advising office:

Grade and grading policies: <https://students.asu.edu/grades>

SEMTE advising: <http://semte.engineering.asu.edu/advising/>

ASU website for software:

<https://apps.asu.edu> (login required)