

Syllabus

Atm Sci 240 Introduction to Meteorology

TR 11am - 12:15pm

Engineer & Math Sciences E140



Instructor: Austin Harris

PhD Candidate

Atmospheric Science

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Office Hours: TR 12:30 – 3:00; by appointment*

*I am always happy to meet, but making an appointment rather than relying on serendipity/office hours for a face-to-face meeting is a good idea.

Course Description

Quantitative approach to understanding fundamental concepts in meteorology. Radiation, heat balance of the atmosphere, thermodynamics, horizontal motions, general circulation, atmospheric observations, clouds, weather map analysis. Whenever possible, we will highlight connections between abstract theoretical concepts and easily observable properties and behavior of the atmosphere.

Pre-requisites

Physics 209 (P) & 214 (P); Math 232 (C).

Required Textbook

A First Course is Atmospheric Thermodynamics by G.W. Petty, Sundog Publishing, 2008

Required Materials

Laminated Skew-T/Log-P diagram. Prof Harris will provide the diagram – you “rent” for \$5 deposit. Buy a set of erasable transparency markers on your own (4 different colors).

Grading

The grades will be determined by one of the following two schemes, whichever is most advantageous to you:

<i>Item</i>	<i>Option 1 (exam heavy)</i>	<i>Option 2 (hw heavy)</i>
Exam #1	15%	10%
Exam #2	15%	10%
Exam #3 (final, non-cumulative)	15%	10%
Problem Sets (9)	37%	52%
Wx Map Exercises (2)	8%	8%
Subjective Component	10%	10%

Exams are open-notes. Lowest score is excluded with the problem-sets. Late assignments not accepted. Subjective component includes attendance, effort, improvement.

Grades will be assigned based on the following scale:

A 92.5-100% **A-** 90-92.49% **B+** 87.5-89.99% **B** 82.5-87.49% **B-** 80-82.49%
C+ 77.5-79.99% **C** 72.5-77.49% **C-** 70-72.49% **D+** 67.5-69.99% **D** 62.5-67.49% **D-** 60-62.49%
F 0-59.99%

A grade of an “A” is intended to reflect your mastery of the presented material. Grades of “B” and “C” are intended to reflect minor and major deficiencies, respectively, in your mastery of the presented material. Grades of “D” and “F” reflect no mastery of the presented material. Minor deficiencies include incomplete attribution while major deficiencies include incorrect attribution.

Important Policies

University policies that you should be aware of can be found at:
<http://www.uwm.edu/Dept/SecU/SyllabusLinks.pdf>

Drop/audit policies: Last day to change to audit (2/3), last day to drop without “W” grade (2/17), last day to drop (4/5).

Schedule

Week	Dates	Topic	Assigned Reading
KEY PRINCIPLES			
1	1/21, 1/23	Introductions/Maps; Atm Composition	Ch 1 (1-13)
2	1/28 ^{**} , 1/30	Atm Structure; Eqn of State	Ch 1 – 3
3	2/4 ^{1,2} , 2/6	Hydrostatics; Virtual Temperature	Ch 4 (83-87)
4	2/11, 2/13 ^{3,4}	Geopotential/Hypsometric; Sea Level	Ch 4
5	2/18, 2/20	Review; EXAM #1	
THERMODYNAMICS			
6	2/25, 2/27	1st Law Thermo; Dry Adiabatic Process	Ch 5 (129-141)
7	3/3, 3/5	Potential Temp/Skew-T; Moisture	Ch 1 (44-47); Ch 3 (72-75)
8	3/10, 3/12 ⁵	Moisture; Saturated Adiabatic Process	Ch 7 (167-178, 187-191)
9	-----	<i>Spring Break</i> -----	
10	3/24 ⁶ , 3/26 ⁷	Equivalent/Potential T, Static Stability	p 201-209; Ch 8 (239- 245)
11	3/31, 4/2	Review; EXAM #2	
DYNAMICS			
12	4/7, 4/9	Coriolis Force; PGF, Friction	W&H: 276-280
13	4/14, 4/16	Equation of Motion; Geostrophic Wind	W&H: 280-282
14	4/21, 4/23	Gradient Wind; Thermal Wind	W&H: 282-285
15	4/28 ⁸ , 4/30 ⁹	Intro to Micrometeorology	n/a
16	5/5, 5/7	Review; EXAM #3	
17	-----	<i>Finals Week: No Meeting</i> -----	

Notes: Assignment due dates indicated by footnote. ** Weather map exercises due. Schedule may be subject to change. **We will not meet during finals week / no “final exam.”** W&H is an alternate textbook provided on Canvas.

Summary of Exams

Exam #1 (2/20): KEY PRINCIPLES

- *Topics covered:*
Isoplething, evolution of the atmosphere, vertical distribution of temperature and pressure, equation of state, hydrostatic equilibrium, densities of moist and dry air, geopotential and geopotential height, hypsometric equation
- *Derivations:*
Hydrostatic equation, virtual temperature, hypsometric equation.

Exam #2 (4/2): THERMODYNAMICS

- *Topics covered:*
First law of thermo, adiabatic processes and lapse rates, potential temperature, equivalent temperature, equivalent potential temperature
- *Derivations:*
Meteorological form of the first law of thermodynamics, dry adiabatic lapse rate, potential temperature, saturated adiabatic lapse rate, equivalent temperature
- *Moisture Parameters:*
Vapor pressure, saturation vapor pressure, specific humidity, mixing ratio, saturation mixing ratio, relative humidity, dew point temperature

Exam #3 (5/7): DYNAMICS

- *Topics covered:*
Stability, dynamics including: inertial and non-inertial reference frames, apparent forces and real forces, Coriolis force, pressure-gradient force, friction force, equations of motion, scale analysis, geostrophic wind, gradient wind
- *Derivations:*
Pressure-gradient force, geostrophic wind, gradient wind (cyclones and anticyclones), thermal wind