ATS 640: Synoptic Meteorology
Fall 2015
TR, 1:00-2:50 PM, ATS Room 101

Course Description and Prerequisites

This course will serve three primary purposes. The first is to provide an introduction to the structure and dynamics of the atmosphere for students without an undergraduate background in meteorology. The second is to examine the dynamic and thermodynamic characteristics of synoptic-scale weather systems. The third is to provide practical applications of meteorological principles and concepts for both research and weather forecasting.

The course is scheduled for four hours per week, which will nominally include one hour of lecture and one hour of lab each day of class, although this will vary throughout the semester.

There are no prerequisites for this course, but concurrent registration in ATS 601 (or having previously completed ATS 601) or permission of the instructor is required.

Learning Outcomes

Upon completion of this course, students will be able to:

- Understand the basic characteristics of the atmosphere and the tools used to analyze and forecast the weather
- Describe the basic theories describing synoptic-scale weather phenomena
- Apply the theories to observed weather phenomena through analysis of recent and historical weather events

Instructor Information

Name	Dr. Russ S. Schumacher
E-mail	russ.schumacher@colostate.edu
Phone	970.491.8084
Office hours	By appointment; please send e-mail to set up time
Office location	ATS Room 413
Course websites	http://schumacher.atmos.colostate.edu/teaching/ats640/ http://canvas.colostate.edu

Teaching assistant

Name	Stacey Hitchcock
E-mail	smhitch@rams.colostate.edu
Phone	970.491.8393
Office hours	Thursdays, 3-5pm (or by appointment)
Office location	ATS Room 412

Readings

Required textbook: Gary Lackmann, *Midlatitude Synoptic Meteorology,* 2011, American Meteorological Society

Required readings: Lecture notes, which will be posted on Canvas online. These notes were originally developed by Dr. Sue van den Heever and modified by Dr. Schumacher.

Other useful texts (not required):
C.D. Ahrens, *Meteorology Today*, 9th edition or later.
Howard B. Bluestein, *Synoptic-Dynamic Meteorology in Midlatitudes, Volume II: Observations*

and Theory of Weather Systems, Oxford University Press, 1993.

Other supplemental material will be made available either on the class website, Canvas, or via e-mail.

Grading Policies

Course grading will be based on a combination of lab exercises, a midterm exam, and a final exam. The lab assignments will be worth 40%, the midterm exam will be worth 25%, and the final exam will be worth 35% of your final grade. Plus/minus grading will be used in the course.

Lab exercises

There will be a lab exercise assigned almost every week of class. These will involve applying the concepts discussed in class, and will often involve analyzing interesting recent synoptic-scale weather events. In general, the lab exercises will be handed out on Tuesdays and will be due on Fridays, although this schedule may vary during some weeks of the semester. On Tuesdays some initial discussion of the exercises will take place, and then on Thursdays there will be time set aside for working on the labs and for questions. Labs will be due on Fridays at 3 pm, and for every weekday that a lab is late 10% will be deducted from the grade. Any changes to this schedule will be announced in class.

Weather discussions

After each lecture but before the lab time, 15-20 minutes will be devoted to a class discussion of current or recent weather phenomena that have been covered in class. Each student will be responsible for preparing and leading the discussion in class twice over the course of the semester. Furthermore, the student leading the discussion in class is also responsible for posting a brief written discussion in the online forum on Canvas. Weather discussions should be focused on understanding of physical/dynamical processes, not on forecasting rules. All students are also expected to participate in the daily discussions by asking questions or suggesting items of interest.

Class forecast contest

A class forecast contest will be conducted, with two separate “tournaments” separated by the midterm exam. Your forecasting performance will not affect your grade, but participation is expected. Forecasts will be made each day of class. More details will be provided in class.

Special needs

If you have special learning needs that should be accommodated in this class, please see the instructor during the first two weeks of the semester, and refer to http://rds.colostate.edu/accommodation-process for more information.

Copyright policy

All materials used in this class are copyrighted. These materials include but are not limited to syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless permission is expressly granted.

Academic Integrity and Plagiarism

Academic integrity is a crucial part of the vibrant learning community at Colorado State University and in the Department of Atmospheric Science. We expect all students to conduct their academic work with integrity, and particularly to avoid plagiarism. As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writings, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that

person. Plagiarism is a violation of the University rules on academic integrity. If you plagiarize in your work you could lose credit for the plagiarized work, fail the assignment, or fail the course. Plagiarism could result in expulsion from the university. Each instance of plagiarism, classroom cheating, and other types of academic dishonesty will be addressed according to the principles published in the CSU General Catalog (see http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf).

In this course, students are generally allowed (and encouraged!) to discuss the lab assignments with each other, but each student is expected to do his or her own work and turn in his or her own assignment.

Tentative* Schedule for ATS640 (TR 1:00-2:50pm)

Dates	**Topic**	**Lab exercise**
25, 27 August	Syllabus; Introduction; Definitions; Basic variables and equations; Observing systems	Surface/upper-air data and analysis
1, 3 September	Atmospheric thermodynamics	Temperature and thickness
8, 10 September	Atmospheric thermodynamics continued	Skew-T diagrams and stability
15, 17 September	Atmospheric dynamics	Isentropic analysis
22, 24 September	Atmospheric dynamics continued **(Stacey teaching)**	Wind balances
29 Sept, 1 Oct	Clouds and precipitation	Thermal wind
6, 8 October	Air masses and fronts; **midterm review**	Radar and satellite observations
13, 15 October	**Midterm exam (specific date TBD)** Air masses and fronts, continued	**NONE**
20, 22 October	Upper-level flow patterns; jets and jet streaks	Fronts and frontogenesis
27, 29 October	Upper-level flow patterns; jets and jet streaks cont'd **(Stacey teaching)**	Trough and ridge dynamics
3, 5 November	Quasi-geostrophic theory, vertical motion	Jets and jet streaks
10, 12 November	Extratropical cyclones	Vertical motion; Q-G diagnostics
17, 19 November	Extratropical cyclones, continued	Extratropical cyclones
24, 26 November	**NO CLASS – Thanksgiving break**	**NONE**
1, 3 December	Miscellaneous flows	Case study
8, 10 December	Other unfinished topics; **final exam review**	**NONE**
Thursday 17 December	**FINAL EXAM, 9:40-11:40 am**	

*Other topics may also be inserted into the schedule as time and student interest allow. It is also possible that topics will be rearranged if a particularly interesting weather event occurs that relates to one of the topics. If major changes are to be made during the semester, an updated version of the schedule will be provided.