Syllabus

Spring 2014 — Department of Earth & Climate Sciences

METR 104: Our Dynamic Weather

(Lecture with Lab)

Lecture:
Tuesday
9:35–11:25 am

Lab:
Thursday
9:35 am –12:15 pm

604 Thornton Hall

Prerequisites:	None
Credit:	Three semester units (2 units lecture, 1 unit lab)
Satisfies:	Segment II GE Physical Science and Lab/Field requirements
Text:	*Introduction to the Atmosphere and the Science of Meteorology*, Lutgens & Tarbuck, 2010 (Note: this is an abridged version of *The Atmosphere: Introduction to Meteorology*, 11th Edition, Lutgens & Tarbuck, 2010, custom assembled for METR 104 to reduce the cost; a copy should be on 2-hour reserve in the SFSU library.)
Clicker:	iClicker 2 remote "clicker" for use with a student response system in class. Available for purchase at the SFSU Bookstore.

Instructor:	Dr. Dave Dempsey, Professor of Meteorology
Office:	610 Thornton Hall
Office hours:	MWF 11-12 pm; Tues 11:30-12:30; or by appt.
Phone:	338-7716
E-mail:	dempsey@sfsu.edu

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Meteorology: the science of the atmosphere and atmospheric phenomena; study of weather, including weather forecasting (Webster's New World College Dictionary online)

I. Objectives of METR 104

METR 104 satisfies SFSU's Segment II General Education Physical Science requirement and the Segment II GE Lab/Field requirement. The University defines learning objectives for the Segment II GE Physical Science requirement as follows:

After completion of a lower division course in a physical science, students will be able to:

1. gather and interpret scientific information from a variety of sources and use that information to discuss scientific issues;
2. describe ethical or sociological dilemmas arising out of scientific research and applications, which may include those related to social justice, and may have implications for local and/or global communities;
3. use scientific theories and methods of inquiry to explain phenomena observed in laboratory or field settings; and
4. discuss the relevance of major scientific theories and/or research to modern day life.

In addition, the University defines learning objectives for the Segment II GE Lab/Field requirement as follows:

After completion of a lower division laboratory activity related to a course in physical science or life science, students will:

1. apply appropriate methods of analysis to raw data;
2. carry out common laboratory procedures correctly and adhere to instructions on laboratory safety; recognize hazardous situations and act appropriately;
3. maintain a timely, comprehensive laboratory notebook, including outside research, with sufficient detail to permit repeatability of experiments and to recognize how seemingly minor oversights can have serious consequences;
4. relate laboratory work to bigger questions in science and to recognize the applicability of scientific principles to situations outside of the laboratory;
5. explain the scientific method, including concepts of hypothesis and experimental controls, and why objectivity is essential; and
6. apply critical thinking in the laboratory and recognize whether results and conclusions make sense.

The way that the process of science works differs in some ways from one discipline to another; we will try to address a number of the learning objectives above in the context of meteorology.

In addition to understanding more about how the process of science works, after completing METR 104 you should also be able to demonstrate an understanding of aspects of the broad concepts of atmospheric science listed below (see Atmospheric Science Literacy: Principles and Fundamental Concepts of Atmospheric Science).

1. The earth has a thin atmosphere that sustains life.
2. Energy from the sun drives atmospheric processes.
3. Atmospheric circulations transport matter and energy.
4. The earth's atmosphere changes over time and space, giving rise to weather and climate.
5. The earth's atmosphere continuously interacts with the other components of the earth system.
6. We seek to understand the past, present, and future behavior of the earth's atmosphere through scientific observation and reasoning.
7. The earth's atmosphere and humans are inextricably linked.

II. Scope and Theme of METR 104

METR 104 will be organized around the theme of *forecasting*, starting with forecasting of weather and, if time permits, extending to forecasting climate change. The development of meteorology as a science has been driven largely by the important practical problem of predicting future weather, for anywhere from a few hours to many decades into the future. The problems of weather and climate forecasting are really hard; progress toward solving them has required advances both in technology (measuring instruments, communications technology, computers, and computer models) and in theoretical understanding of the physical principles that govern the behavior of the atmosphere. Hence, the theme of forecasting, including some looks back at the past, encompasses most of what we might want to learn about the process of science as it applies to the discipline of meteorology and about the major concepts of atmospheric science.

III. Style and Organization of METR 104

Each two-hour lecture session will typically consist of a mixture of lecture and small-group problem-solving followed by whole-class discussion. To participate constructively in the small-group problem solving, you will need to come to class prepared, which sometimes means having completed previously assigned reading on-line or from the text and having submitted responses to an associated pre-class quiz on iLearn.

Lab sessions will typically consist of a limited amount of lecture plus one or more exercises that are Web-based, computer-based, paper-based, and/or involve physical materials, designed to engage you more deeply than the lecture can with basic concepts needed to understand how the atmosphere behaves and how meteorologists develop scientific understanding of it. You will often work in small teams or groups.

Much of both lecture and lab will support an online weather forecasting exercise administered by Iowa State University. This assignment is described in "Guidance for the Forecasting Assignment". Twice during the semester in lab, you will present a weather briefing. Your first briefing will present your forecast for one of the questions in the forecasting assignment, while the second briefing the following week will summarize how your forecast fared.

Lab Fee: The Department of Geosciences charges a $10 lab fee to cover the extra costs of printing that labs typically entail. If you don't pay this fee by the end of the second week of instruction, then your access to University services (library, registration, etc.) will presumably be suspended until you do. You can pay the fee in either of two ways: (1) online through the Bursar's office Web site (http://www.sfsu.edu/~bursar) if you have a MasterCard, DiscoverCard, or American Express credit card or can pay by electronic check (see detailed instructions [PDF file]); or (2) in person at the Bursar's office (ADM 155) or at One-Stop Student Services, using the METR 104 Lab Fee form [PDF file].

iClickers: We will use a student response system (also known as "clickers") made by iClicker (in particular, the iClicker 2 model) in both lecture and lab. You will need to buy an iClicker 2 clicker from the SFSU bookstore as soon as possible. The price is $46.75 new ($35 used, or $23 for a one-semester rental). The bookstore will buy it back from you when you no longer need it for half the original price (as long as it is still being used on campus). The University has standardized use of the iClicker 2 across campus, so you might discover that you need it in other classes, too. Once you've purchased your iClicker, you will need to register it for METR 104 on iLearn. For instructions, see http://atcentral.sfsu.edu/clickers/students#register.

IV. Assignments and Grading

(Tentative: subject to revision)

Forecasting assignment: Your 20 best forecasts (submit forecasts as often as you want, up to one per day)	**20%**
Pre-class, on-line quizzes on reading assignments (administered via iLearn)	**10%**
Short, in-class written quizzes (four total; worst one dropped)	**10%**
In-class "clicker" questions (scored responses to frequent "clicker" questions in class; worst two dropped)	**5%**
Participation (unscored responses to regular "clicker" questions in class; one day's worth dropped)	**5%**
Lab exercises	**30%**
Weather forecast briefing to the class, and follow-up	**5%**

Final project	**15%**
Total possible for the course	**100%**

Pre-class, on-line quizzes will consist of a small number (2 to 9) of multiple choice and/or multiple answer questions, administered via iLearn. They will be based on reading assignments from the text or supplementary material. You will typically need to submit your responses to pre-class quiz questions online no later than 5 minutes before the lecture class meeting following posting of the quiz. You will typically be informed by email about the availability of pre-class quizzes on iLearn at least two days before the day on which you must submit your responses.

In-class written quizzes will comprise short answer questions and will mostly test your knowledge of facts and understanding of concepts. They will last 20-30 minutes each at most. I will provide a prospectus for each quiz no later than two days before the quiz. Your worst quiz score will be dropped automatically. (With some exceptions requiring advance notice, you're allowed make-up quizzes only for a medical emergency.)

In-class "clicker" questions will also consist mostly or entirely of multiple choice questions, administered regularly (in at least half of all class sessions) via "clickers". They will address material covered during the current or previous week's class sessions. Some will be scored, while others will not be scored. Your worst two responses over the course of the semester to the scored questions will be dropped automatically. Clicker questions also determine your participation score; you'll get credit for participation in a class session by responding to all scored and unscored "clicker" questions posed during that session. You can miss one class session's worth of clicker questions and still get full participation points for the semester.

Most **lab exercises** will be due at the end of the lab session in which they were assigned, or if several lab sessions are allotted to a particular exercise, at the end of the last such session. However, several lab exercises ask you to submit responses on-line (via iLearn) within several days after the lab session ends.

Weather forecast briefings will consist of short oral presentations to the class about particular questions from the ongoing forecasting exercise. At the next class meeting you will give a brief follow-up presentation to discuss how well your forecast went.

I aim to grade on an absolute scale:

90–100%	A's
80–89.9%	B's

70–79.9%	C's
60–69.9%	D's
below 60%	Never mind

However, if for some reason the assignments seem too difficult for the class, I reserve the right to grade on a curve instead, which should effectively raise the grade for many people. In the past, the median grade in the course has been around C+ though the median course percentage is typically in the low 70's.

V. Schedule of Quizzes and Assignments

The schedule of quizzes and assignments is subject to frequent change.

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