MET 200: Atmospheric Processes and Phenomena

Fall Semester 2013 Location: HIG: Room 309 10:30pm-11:45 AM Tues, Thurs

Instructors:
Steven Businger, businger@hawaii.edu Office Hours: after class or by appt.
Phone: 956-2569 9 AM - 5 PM please HIG Room 334
Teaching Assistants: HIG Room 370
Ms. Shannon McElhinney, email: slm6@hawaii.edu Office Hours: Wednesday 9:30-11:30 or by appt.
Mr. Thomas Winning, Jr., email: twinning@hawaii.edu Office Hours: Monday 1:00-3:00 PM or by appt.

Student Outcomes

Atmospheric variables, gas laws, radiation processes, thermodynamics, conservation laws, laws of motion, clouds and precipitation, convection, atmospheric circulations, mid-latitude and tropical weather systems, forecasting, and climate. This class is designed to convey an understanding of the science of the Earth's atmospheric processes and weather phenomena. During the first half of the class the focus will be on becoming a good observer and understanding the relationship between the relatively few variables important to the weather in Hawaii. These include temperature, pressure, density, and humidity of the air. We will clarify the roll of sunlight and invisible infrared radiation leaving the Earth in warming the atmosphere and fueling storms, such as hurricanes. Forces that control wind will be explained, including those that arise because the Earth rotates and the impact of the Hawaiian Islands on the wind. During the second half of the class a variety of weather phenomena that result from the interplay of radiation, wind, and water will be explored. These include global-scale circulations that influence Hawaii's weather, such as jet streams and the Hadley circulation, and island-scale circulations such as sea breezes. The structure and source of energy for storms, like kona lows, winter storms, and thunderstorms, will be explained. The impact of destructive storms on society leads to the need for accurate forecasts. Finally, since climate is the sum of all weather events, the mechanics of climate change and global warming will be described, with a focus on Hawaii.

Some Tips for Success:

Come to class! Participation counts and questions are encouraged during lecture. Send me an email if you plan to be absent from class explaining why. Email me with a link when you find interesting weather or climate events in the news.

Read the assigned material. Preparation helps in understanding new concepts and terms.

Take notes. Note taking that does not interfere with understanding the lecture helps the memory when preparing to take the exams.

Review the previous lecture notes. Lectures (PDF format) are posted on the web following classes at the following link: http://www.soest.hawaii.edu/MET/Faculty/businger/courses/met200.html. Help for answering most homework questions will be available in these lecture notes.

Prepare for exams in advance. Quiz yourself and reread the sections in the book on a confusing topic. If you have any questions that remain after consulting the text and your notes, please ask me at the end of lecture or email me or the TA's Shannon and Tom. Or make an appointment and come to see us!

SYLLABUS

This syllabus is intended as a guide to course structure, lectures, and readings; *changes may occur*. There are roughly 16 weeks in the semester of which roughly one week is taken up by holidays. A background in algebra is expected in this class and fundamental equations will be introduced in lecture and homework, and exams will include some quantitative problems.

Required Text: *Meteorology Today* by C. D. Ahrens (10th edition, older editions are fine).

Date	Lecture Topics	Reading (Ahrens Text)
8/27	Intro lecture, scientific method, observing the atmosphere	Chapter 1
8/29	Weather maps, satellites, temperature and pressure	Chapter 2 + p 198-204
9/3	Nature of radiation, heat balance	Chapter 2
9/5	Seasons and diurnal cycles in Hawaii	Chapter 3
9/10	Water, heat capacity, latent heat, hydrological cycle	Chapter 4
9/12	Cloud formation	Chapter 4
9/17	Cloud forms	Chapter 5
9/19	Hawaiian cloud forms/Review/**Quiz #1**	Chapter 5
9/24	Stability, convection, latent heat release	Chapter 6

9/26	Precipitation processes and types	Chapter 7
10/1	Laws of motion and wind	Chapter 8
10/3	Hawaii local winds	Chapter 9
10/8	Global circulation	Chapter 10
10/10	El Niño – impact on Hawaiian weather	Chapter 10/Lecture notes
10/15	Review/**Quiz #2**	Lecture notes
10/17	Atmospheric optics	Chapter 19
10/22	Hurricane formation and structure	Chapter 15
10/24	Hurricanes near Hawaii, impacts and forecasting	Chapter 15/ Lecture notes
10/29	The simple science of flight	Lecture notes
10/31	Air masses/air-mass modification/Fronts	Chapter 11/12
11/5	Midlatitude cyclones and their hazards	Chapter 12
11/12	High Winds over the Pacific and Ocean Hazards	Lecture notes
11/14	Weather Forecasting in Hawaii /**Quiz #3**	Chapter 13
11/19	Hawaiian Weather Hazards /Air Mass Thunderstorms	Chapter 14
11/21	Hawaiian Floods	Lecture notes
11/26	*Thanksgiving Holiday*	
11/28	Severe thunderstorms, Water spouts, and tornadoes	Chapter 14
12/3	Air pollution/ozone hole/acid rain	Chapter 18
12/5	Past climate/ice ages/climate change	Chapter 16
12/10	Evidence for Global warming: the current situation	Chapter 17
12/12	Global warming: looking ahead	Chapter 17
12/19	**Quiz #4**	**9:45 – 11:45 PM**

There will be a brief current weather discussion at the beginning of most lectures to highlight interesting weather and to introduce practical applications in weather forecasting. Access to updated weather and ocean data and imagery is available via the UH Meteorology **weather server at: http://weather.hawaii.edu.**

Grading

Homework is composed of short answer questions and numerical problems that emphasize important concepts from the lectures and reading. Homework will be *due on the date of the subsequent quiz*. If you wish to have homework graded and returned for study purposes, please turn it in two lectures (one week) prior to the quiz and plan to pick it up the following lecture. To encourage attendance, graded homework or quizzes that are not picked up will be noted against the participation grade. Similarly, late homework will be noted and counted against the participation grade.

Exams: The quizzes will be composed of multiple choice and short answer questions, largely taken from lecture and homework. The quiz grade will be calculated from the three best quiz scores. The lowest quiz will be dropped. All four quizzes must be taken. The following are approximate weights used in computing the final grade.

4 Quizzes	50%
Homework	45%
Participation	5%
	100%

You cannot depend on your eyes if your imagination is out of focus. – Mark Twain