ATMO 412: Meteorological Analysis and Forecasting

Semester:	Spring 2020		
Location:	HIG room 310	Class time:	13:30-17:30 T & Th
Instructor:	Prof. Giuseppe Torri	Office Hours:	by appointment
Email:	gtorri@hawaii.edu	Phone:	6-2564
TA:	Jan van der Veken	Email:	jjvander@hawaii.edu
TA:	Zachary Menzo	Email:	menzo@hawaii.edu

During this semester the science and art of synoptic analysis and forecasting will be emphasized in this capstone class. The course will be divided in two alternating components: a series of frontal lectures, in which basic concepts of synoptic meteorology will be presented, and laboratory sessions that will utilize VisionLab in HIG 310. The laboratory will use the Unidata Integrated Data Viewer (IDV) software that closely resembles the one used by NWS to produce operational forecasts. The frontal lectures will have a heavy forecasting perspective.

Students will prepare and deliver weather map briefings at the end of each lecture/lab period, and a forecast contest will provide first-hand experience in predicting near term (nowcasting) and short-range weather forecasts (1-5 days), using all available real-time operational weather data, satellite imagery, and over prognostic products. Students will also acquire a critical understanding of weather forecasting through a number of written assignments.

Attendance of WSFO-HNL weather briefings at 10:30 AM is required on Tue & Fri (barring class conflicts). Guest speakers from the WSFO at HNL will be invited to give special insights into forecast problems facing operational forecasters and also to give an introduction to weather forecasting, illustrating the main techniques and challenges that a forecaster faces.

Student Learning Objectives

Upon completion of the course, the student should be able to:

1. Demonstrate familiarity with basic terminology of Synoptic Meteorology.
2. Demonstrate familiarity with the tools used for weather diagnostics and forecasts (e.g., weather maps, radar data, soundings, etc.).
3. Understand Quasi-Geostrophic theory and its implications for midlatitude weather.
4. Understand the structure of extratropical cyclones.
5. Identify on a weather map the main synoptic features in any midlatitude location.
6. Synthesize available data to discuss the past and present weather in a particular location.
7. Have a qualitative understanding of the evolution of the weather at a given location given past and present conditions and model predictions.

Grading

Oral Weather Briefings	25%	O
Written Lab Assignments	30%	W
Forecast Contest	15%	W
Four Exams	30%	W
Total	100%	

This class is *Oral Intensive*. See www.hawaii.edu/gened/oc/oc.htm. Oral weather briefings will be presented at the end of each lab period. The weather briefings will be critiqued and graded for clarity and accuracy in presentation and quality of delivery. Students must adequately complete all oral communication assignments to pass the course with a D grade or better. Students who do not complete all oral communication assignments will not earn O Focus credit.

This class is also *Writing Intensive*. See manoa.hawaii.edu/mwp/. The writing assignments will include written lab assignments and 4 written sections in take-home exams. Each of these will be graded for the quality of the technical writing (content and clarity). The instructor will give oral and written feedback so that students can revise the lab reports and the term paper. Grades for each step are logged and used to determine a final writing grade for the course. Students must adequately complete all writing assignments to pass the course with a D grade or better. Students who do not complete all writing assignments will get a D- or an F and will not earn W Focus credit.

Main Reference Texts

G. Lackman, *Midlatitude Synoptic Meteorology*, AMS (recommended)
G. Lackman, B. Mapes, K. Tyle, *Synoptic-Dynamic Meteorology Lab Manual*, AMS
T. Vasques, *Weather Analysis & Forecasting*, Weather Graphics Technologies

Calendar (lab days are highlighted in blue)

01/14 Math review
01/16 Lab 0
01/21 Geopotential, thickness, thermal wind
01/23 Vorticity equation and Rossby waves
01/28 Lab 1
01/30 QG theory
02/04 Lab 2
02/06 Isentropic analysis
02/11 Lab 3
02/13 Review and **First Exam**

02/18 PV framework
02/20 Lab 4
02/25 The Heady problem
02/27 Atmospheric instabilities

03/03 Visit to KHON2 news station
03/05 Review and **Second Exam**

03/10 Extratropical cyclones
03/12 Lab 5
03/17 Spring Recess
03/19 Spring Recess
03/24 Fronts
03/26 Kuhio Day
03/31 Lab 6
04/02 Baroclinic instability
04/07 Cold-air damming
04/09 Lab 7
04/14 Review and **Third Exam**

04/16 Winter storms
04/21 Lab 8
04/23 Fair-trade weather
04/28 Mesoscale Convective Systems
04/30 Lab 9
05/05 Numerical Weather Prediction
05/07 Robert Ballard's (NWS) lecture
05/12 Review and **Fourth Exam**

Title IX Statement:

The University of Hawai'i is committed to providing a learning, working and living environment that promotes personal integrity, civility, and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual harassment, gender-based harassment, domestic violence, dating violence, and stalking. If you or someone you know is experiencing any of these, the University has staff and resources on your campus to support and assist you. Staff can also direct you to resources that are in the community. Here are some of your options:

As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need.

If you wish to remain ANONYMOUS, speak with someone CONFIDENTIALLY, or would like to receive information and support in a CONFIDENTIAL setting, use the **confidential resources available at the following web address:** http://www.manoa.hawaii.edu/titleix/resources.html#confidential

If you wish to directly REPORT an incident of sex discrimination or gender-based violence including sexual assault, sexual harassment, gender-based harassment, domestic

violence, dating violence or stalking as well as receive information and support, contact: Dee Uwono Title IX Coordinator (808) 956-2299 t9uhm@hawaii.edu.