ATMOSPHERIC SCIENCES 5910-2/6910-6 - Spring 2010. 3 Semester Units
703 WBB. Lecture. M 9:40-10:30 AM. Lab: M 2-4:30 PM or T 2-4:30 PM

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Recommended Text: *Meteorological Measurement Systems*. Fred Brock and Scott Richardson
Class website: http://www.chpc.utah.edu/~u0035056/5910/.
Facebook: Join the group ATMOS 5910-2 UU Spring 2010 as that is how I will make announcements

Course Overview
You will be participating in the development of a new instrumentation course for both undergraduate and graduate students in environmental-related fields. You will become familiar with electronic instrumentation used to measure conditions at the earth's surface and in the atmospheric boundary layer. Measurements of temperature, moisture, wind, precipitation, and radiation will be emphasized. The course will emphasize applying basic principles in laboratory and field settings. Your course grade will depend on class participation, the completion of laboratory assignments, and a team class project. Completion of a calculus-based physics course that includes fundamental electronic principles is required.

Expected Course Outcomes
After completion of this course, you will have gained the knowledge and experience to be able to do the following:

- State the underlying principles associated with instrumentation and data acquisition units
    - Relate fundamental concepts of resistance, current, capacitance, and voltage to electronic instrumentation
    - Recognize measures of uncertainty, including accuracy and precision, and differences between systematic and random measurement errors
- Develop proficiency integrating instrumentation to data acquisition units and programming those units
    - Use information provided by instrument and data acquisition unit manufacturers to install and query sensors
- Develop proficiency to use instrumentation in the laboratory and outdoors
    - Follow defined safety practices to use electronic equipment individually and in group settings
    - Recognize appropriate methodologies for siting equipment
- Conduct a laboratory experiment or field project including design, implementation, and analysis of results
    - Demonstrate the ability to work as a team member and develop and execute a project plan
    - Illustrate competency through completing analysis and presentation of results in the form of a scientific conference quality poster

Course Format
Since this is a course in development, details remain to be worked out. Generally, you will review information prior to each Monday's lecture class based on reading assignments. The Monday morning lecture will then review the necessary concepts for that week's lab. You will attend consistently either the Monday afternoon or Tuesday afternoon lab session and work as a team with 2-3 others. The lab assignment for that week will normally be completed and turned in by the following Monday's class. During the semester, there will be time available to work on your class project.

Class Project
You will have some flexibility on the type of project to complete, but it does have to be completed using course resources in a timely and realistic fashion. Activities that contribute to preparation for the Persistent Cold-Air Pool Study (PCAPS) are particularly encouraged and will be judged to be most relevant, e.g., construction of calibration equipment, calibration of existing equipment, site surveys for NCAR/UU equipment and temporary deployment of equipment at those sites, or development of a mobile (car) observing system. The project will consist of an initial proposal (week 5), interim report (week 10), and a final poster presentation on April 26. It is expected that the class project will require several hours of effort per week, with additional concentrated effort during the latter half

of the semester. This is **not** the sort of project that can be completed in a rush at the end of the semester. The project will be evaluated on the basis of meeting interim milestones, final poster, and you group's presentation.

Class Policies and Grading

Security of the instrumentation and lab computers is critical. You are responsible to maintain that security. You will be required to check out equipment for use in the lab and in the field and that equipment remains your responsibility until it is checked back in. Lab and field safety is also critical- follow procedures specified in class.

Severe violations of security and safety procedures will lead to removal from the course and a failing grade. Grades will be determined from: (1) class/lab attendance, participation, and following safety and security procedures (15%), (2) lab assignments (35%), and (3) team project (50%). Your grade will depend in part on the effort of your teammates. Plagiarizing, copying, or otherwise misrepresenting ones' work will not be tolerated and will be dealt with as harshly as permitted under University Policy. Do not break the scientific code of honor.

ADA Accommodations

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangement for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Tentative Course Outline

- Jan 11. Basics of instrumentation systems, performance specifications. Circuits. Reading Assignment. PCAPS proposal. Appendix D. Chapter 1 and 3. Pgs 117-121. *Skills assessment due*. **Lab 1: CR1000 datalogger and time response**
- Jan 18. Martin Luther King Day. No lecture. Reading Assignment: PCAPS Experiment Plan. Chapter 2, 4, 5. **Finish Lab 1 & Team project**.
- Jan 25. Temperature, relative humidity, pressure. Chapter 7. *Team project worksheet due*. **Lab 2: Programming the CR1000**
- Feb 1. Wind. Chapter 9. **Lab 3: Setting up a weather station**
- Feb 8. Precipitation. **Lab 4: Rain rate and snow depth**
- Feb 15. President's Day. No lecture or labs. *Team project proposal due.* Chapter 10. **Team project**.
- Feb 22. Radiation balance. Chapter 12. **Lab 5: Solar and infrared radiation (led by Sebastian Hoch)**
- Mar 1. Upper air. **Rawinsonde launch (led by Erik Crosman)**
- Mar 8. Air chemistry. Kevin Perry. **Visit Kevin Perry's site- Monday afternoon only.**
- Mar 15. Boundary layer. **Sodar (led by Sebastian Hoch)**. *Team project interim report due*.
- Mar 22. Spring Break
- Mar 29. No lecture. Reading: Current micrometeorological flux methodologies with applications in agriculture by Meyers and Baldocchi (pdf). **MONDAY visit Campbell Scientific.**
- Apr 5. Turbulence and flux measurements. Reading: Measuring Carbon Dioxide in the Atmosphere by Welles and McDermitt (pdf) **Team project**
- Apr 12. Lecture: visit Bowling lab. **Team project**.
- Apr 19. **Team project**.
- Apr 26. *Poster session*