

ATMOSPHERIC SCIENCES 6040- Environmental Statistics

3 Semester Units. 2011 Spring Semester
295 FASB. TH 12:25-1:45 PM

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Office hours: by appointment

Required Text: *Matlab Recipes for Earth Sciences*. Martin H. Trauth. Springer-Verlag.

Recommended text: *Statistical Methods in the Atmospheric Sciences*, 2nd edition by Daniel Wilks

Class Blackboard page: <https://online.uen.org>.

Class web page: <http://chpc.utah.edu/~u0035056/5040>

Course Description: Environmental fields are overwhelmed with data. What is the best way to make sense of all that information? Statistical methods in environmental sciences are introduced including time series analysis, multivariate data analysis, statistical forecasting, forecast verification, and hypothesis testing. A variety of atmospheric and environmental data sets are examined using MATLAB.

At the end of the course, students will be able to:

- State and use basic statistical metrics to analyze environmental information
- Develop proficiency to program and use MATLAB software as a tool to analyze environmental data sets
- State and demonstrate the characteristics of effective research: distill a general interest in a subject into a specific question/hypothesis that can be evaluated; organize the data; find relationship(s) among the data; and examine the significance of the results.

Course Format: Teaching and Learning Methods

You must read the class notes prior to the corresponding lecture. Each chapter of notes contains review questions that must be completed and turned in. The review questions must be submitted electronically via email, which generally requires typing and inserting figures into one or more pdf formatted documents. Other assignments will be completed as well. You will be assigned to evaluate (including quality control) the data collected from an automated weather station within the Salt Lake Valley during the PCAPS field project.

It is not required that you own a copy of Matlab. We will be using the statistics toolbox which is prohibitively expensive for you to purchase. For assignments that require the statistics toolbox, you must complete an application for an account on the CHPC network if you do not have one already. The forms will be handed out on the first day of class. You may need to access Matlab on an Atmospheric Science department workstation (meteo08.chpc.utah.edu or meteo09.chpc.utah.edu) as discussed in class.

Class Policies and Grading

Grades will be determined from: 1) assignments (60%), 2) a mid-term exam (20%), and 3) a research project (20%). 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.

Final grades are based on the following scale:

- > 90 % guarantees an A or A-
- > 80 % guarantees a B+, B, or B-
- > 70 % guarantees a C+, C, or C-
- > 60 % guarantees a D+, D, or D-
- < 60% may result in an E

Cutoff points for the specific grades are identified to define reasonable distribution of grades.

Course Outline

- Week 1. Jan. 11, 13. Course Overview. **Basic statistical concepts**. Class Notes 1. Text Chap. 1&2.
- Class Notes 1 review questions due Jan. 22
- Week 2. Jan. 18, 20. Using matlab. **Exploratory Univariate Data Analysis**. Class Notes 2. Text Chap. 3.1-3.3
- Online homework assignment. <http://www.metted.ucar.edu/afwa/climo/stats/>. Due January 25.
- Week 3. Jan. 25, 27. Exploratory Univariate Data Analysis. Continued. Text Chap. 3.4-6, 3.9.
- Class Notes 2 review questions due Feb. 1.
- Week 4. Feb. 1, 3. **Theoretical Distributions and Hypothesis Testing**. Class Notes 3.
- Week 5. Feb. 8, 10. Theoretical Distributions and Hypothesis Testing. Continued. Exploratory Multivariate Data Analysis. Class Notes 4. Text Chap. 4.
- Class Notes 3 review questions due Feb. 15.
- Week 6. 15, 17. **Exploratory Multivariate Data Analysis**. Continued.
- Class Notes 4 review questions due Feb. 24.
- Week 7. Feb. 22, 24. **A statistics sampler**. Sections from Text Chapters will be assigned.
- Week 8. Mar. 1. Mid-term

- Week 9. March 8,10. **Topics in regression**: Class Notes 5, Text Chapter 4.9-4.10
- Week 10. March 15, 17. Topics in regression continued: Class Notes 5, Text Chapter 4.5-4.6
 - Class Notes 5 review questions due March 29
- Week 11. March 29, 31. **Harmonic analysis**: Class Notes 6, Text Chapter 5
- Week 12. April 5, 7. Harmonic analysis continued: Class Notes 6, Text Chapter 6
 - Class Notes 6 review questions due April 12
- Week 13. April 12, 14. **Data reduction**: Class notes 7, Text Chapter 9
- Week 14. April 19, 21. Data reduction continued: Class Notes 7
 - Class Notes 7 review questions due April 21
- Week 15. April 26. Poster session

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 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations.

Additional Information Regarding Faculty and Student Responsibilities.

All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee.

The syllabus is not a binding legal contract. It may be modified by the instructor when the student is given reasonable notice of the modification.