Instructor: Dr. Kyle C. Wiens  
BA Building, Room 1209  
phone: 806-742-3120  
email: kyle.wiens@ttu.edu

Office Hours: Tuesday, Thursday 3:00-4:30 PM (or by appointment)

Class Time: Monday, Wednesday 9:30-10:50 AM  
Class Location: SCIENCE 203

Class Web-site: http://www.atmo.ttu.edu/wiens/Classes/ATMO5352/index.html

Pre-requisites: Graduate standing or instructor’s consent.  
Knowledge of calculus and basic linear algebra is assumed.


Other useful references:  

Course Description:  
This course will present and discuss the general research process, and detail some specific research methods used within the atmospheric science community. The course will include an introduction to various meteorological data sets and structures. MATLAB and IDL will be used to apply descriptive statistics, regression, correlation, time series analysis, and filtering to the meteorological data sets. Although the necessary theory will be developed, the focus of this class will be on the process of research and various analysis procedures, including practical application and interpretation of large and diverse meteorological data sets.

Expected Learning Outcomes:  
Upon completion of his course, the students should be able to:  
1. Write an NSF-style research proposal.  
2. Understand the style and process of submitting an acceptable peer-reviewed publication.  
3. Apply analysis software (e.g., MATLAB, IDL) to import, manipulate, and present complex data sets.  
4. Apply basic statistical methodologies to meteorological data sets to prove/disprove hypotheses.  
5. Critically evaluate the basic statistical methods used in published scientific literature.

Methods for Assessing Expected Learning Outcomes:  
The expected learning outcomes will be assessed through the following activities:  
• Graded homework assignments.  
• A semester project: developing and writing an NSF-style proposal and defending it by making a presentation.  
• Student feedback on general points of confusion.
Grading:
Completing work in a professional and complete manner is an important aspect of being a successful scientist. Twenty (20%) of each assignment will be designated and based upon completing it in a professional manner. At a minimum, to receive the entire 20%, students must use good formatting, spelling, grammar, and provide for a complete and professional response to each item addressed.

Final course grades will be determined as follows:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Weight</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>70%</td>
<td>A = above 89.5%</td>
</tr>
<tr>
<td>Written proposal</td>
<td>20%</td>
<td>B = 79.5-89.4%</td>
</tr>
<tr>
<td>Oral presentation of proposal</td>
<td>10%</td>
<td>C = 69.5-79.4%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>D = 59.5-69.4%</td>
</tr>
</tbody>
</table>

Final letter grades will not be lower than indicated by this straight scale. However, a curve may be applied to the final grades, if necessary.

Homework assignments:
Graded homework assignments will consist of
1. A few traditional pencil and paper problems.
2. One or two critical evaluations of selected journal articles.
3. Computer-aided application of analysis techniques to meteorological data sets.

Each student must turn in his/her own work. However, students are encouraged to ask the instructor for help if they need it. No late homework will be accepted.

Semester Project (proposal):
Students will complete an NSF-style research proposal and defend it with an oral presentation. Each student will also be required to “peer-review” one other student’s first draft of the proposal.

Proposal due dates:
- 3 March: select proposal topic
- 31 March: submit first draft of proposal to a peer
- 14 April: complete peer review of first draft
- 26-28 April: defend proposal with an oral presentation
- 7 May: submit final draft of proposal to instructor

Students with Disabilities:
Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor’s office hours. Please note that instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, you may contact the Student Disability Services office at 335 West Hall or 806-742-2405.

Academic Integrity:
Cheating and plagiarism in any form will not be tolerated. Refer to the Code of Student Conduct in the Student Affairs Handbook.

Religious Holidays:
A student is excused from attending classes or other required activities, including examinations, to observe a religious holiday and for time needed for travel for the purpose of observance of a religious holiday and is not required to give advance notice of such absence.

Feedback:
Please talk to me or e-mail me with feedback on the course. I would like to make this course as useful as possible for all of you, so I will try to adjust the course content to that effect when possible.
Brief Proposed Course Outline and Schedule:
Topics we will cover in this class, in roughly this order:

- Introduction to MATLAB
- Fundamentals of probability and statistics
- Hypothesis testing
- Significance testing
- Linear regression and correlation analysis
- Autocorrelations and “red noise”
- Filtering and trend removal
- Harmonic analysis (Fourier series, power spectra, filtering)
- The research process
- Writing a proposal
- Publishing and presenting your results
- If time permits:
  - Brief linear algebra review
  - Empirical Orthogonal Function (EOF) analysis
  - Principal Component Analysis (PCA)
  - Singular Value Decomposition (SVD)