

Course Syllabus

Weather Radar Theory and Practice

MW, 10:00-11:15 am, NWC 5930
Fall 2009

Instructor: Prof. Robert Palmer (rpalmer@ou.edu)
 Office & Hours: NWC 4614 (come thru 4610), 325-6319, MW, 1:30-3:30 pm or anytime my door is open
 Class Homepage: Administered through Desire2Learn (<http://learn.ou.edu/>)
 Prerequisites: C or better in MATH 3113 and Phys 2524 and graduate status

Required Text: *Doppler Radar and Weather Observations, 2nd Ed*, R. J. Doviak and D. S. Zrnic, 1993.
 Dover Publications (2006) <http://store.doverpublications.com/>

References: *Getting Started with MATLAB 7*, R. Pratap, Oxford Press
Atmospheric Science, 2nd Ed, J. Wallace and P. Hobbs, 2006
A Short Course in Cloud Physics, R. Rogers and M. Yau, 1989
Fundamentals of Signals and Systems, 2nd Ed, E. W. Kamen and B. S. Heck, 2000
Probability, Random Variables, and Stochastic Processes, 3rd Ed, A. Papoulis, 1991
Fundamental of Applied Electromagnetics, F. T. Ulaby, 2004
Introduction to Spectral Analysis, P. Stoica and R. Moses, 1997

Course Content

To ensure a reasonable comfort level among students with diverse academic backgrounds, such as meteorology and engineering, introductory material will be provided before its use in the course. These topics are italicized in the Course Content list given below. In addition, use of the programming language Matlab will be covered to the extent necessary.

- Chapter 1 Motivation and Historical Perspective of Weather Radar
 Chapter 2 Electromagnetic Waves and Propagation
 Introduction: Atmospheric Structure, Basic Electromagnetics
 Chapter 3 Weather Radar Design Principles
 Introduction: Antenna Fundamentals, Fourier Transform, Filtering
 _____ Mid-Term Examination _____
 Chapter 4 Signal Statistics and the Weather Radar Equation
 Introduction: Random Processes
 Chapter 5 Doppler Spectra of Weather Signals
 Introduction: Discrete Fourier Transform, Digital Filters
 Chapter 6 Doppler Moment Estimation - Time and Frequency Domain
 Chapter 7 Techniques for Improved Data Quality (Dr. Sebastian Torres, NSSL)
 _____ Comprehensive Final Examination _____

Grading

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| Signal Processing Assignments | 25% |
| Final Project | 25% |
| Mid-Term Examination | 25% |
| Comprehensive Final Examination | 25% |
| <i>(Monday, December 14, 8:00-10:00 am)</i> | |

Course Information

- Lectures, homeworks, and projects will emphasize the theoretical and analytical foundations of weather radar. The class will not emphasize interpretation of weather radar data although practical examples of the concepts taught in class will be covered. After a fundamental coverage of atmospheric structure, electromagnetics, and basic radar design, emphasis will be placed on digital signal processing of time series (Level-I) data in order to estimate the Doppler spectrum moments.
- Academic Honesty: Assignments are important for your understanding of the material. Occasional help from a classmate is fine but be sure that you actually understand the material. It will help tremendously for you to come visit me in my office hours. You will be pleasantly surprised that I am not as mean as I look. Realize that simply copying an assignment from any source is considered cheating and will definitely not help your understanding. If caught, such activity could result in a failing grade in the course and possible disciplinary action. You are responsible for knowing the University of Oklahoma Student Code which can be obtained at <http://www.ou.edu/studentcode/>. Each assignment for this class must be accompanied by the following signed statement:

STATEMENT OF ACADEMIC INTEGRITY

On my honor I affirm that I have neither given nor received inappropriate aid in the completion of this exercise (homework, quiz, examination, laboratory report, etc.).

Signature: _____ Date: _____

- Plagiarism: Please read the document *Nine Things You Should Already Know About Plagiarism...*, which is posted on Desire2Learn. You will be held responsible for your understanding of plagiarism. In particular, this will be important in the preparation of the Final Project report.
- Assignments: No late assignments will be accepted.
- Pre-Finals Week: Note that a final assignment or project may be due during Pre-Finals Week.
- Homework: Homework assignments will be provided but will not be graded. Solutions will be available to help your understanding and to review for the examinations.
- Examinations: If you cannot be present for an examination, it is YOUR responsibility to make other arrangements before the examination. Otherwise, the missed test cannot be retaken.
- Class participation is important. It is easier to ask a question during class rather than trying to learn the material on your own.
- Reasonable Accommodation Policy: The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Those having such a need are requested to speak with Prof. Palmer as early in the semester as possible. Students with disabilities also must be registered with the Office of Disability Services (ODS) prior to receiving accommodations in this course. You may contact the ODS at Goddard Health Center, Suite 166, phone 405-325-3852 or TTD only at 405-325-4173.