

# *Course Syllabus*

## Weather Radar Theory and Practice

MWF, 10:00-10:50am, NWC 5930  
Fall 2006

Instructor: Prof. Robert Palmer (rpalmer@ou.edu)  
 Office & Hours: NWC 4614 (come thru 4610), 325-6319, 1:00pm-3:00pm MW or anytime my door is open  
 Class Homepage: Administered through Desire2Learn (<http://learn.ou.com/>)  
 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

References: *Fundamental of Applied Electromagnetics*, F. T. Ulaby, 2004  
*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  
*Introduction to Spectral Analysis*, P. Stoica and R. Moses, 1997  
*Matlab Introduction* - <http://www.contracosta.cc.ca.us/math/LMATLAB.HTM>

### 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  
                   \_\_\_\_\_ Comprehensive Final Examination \_\_\_\_\_

### Grading

Homeworks	15%
Signal Processing Project	
Mini-Modules	15%
Final Report	30%
Mid-Term Examination	20%
Comprehensive Final Examination	20%
<i>(Friday, December 15, 8:00-10:00am)</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: Homework 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 a homework 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 Report of the Signal Processing Project.
- Assignments: No late assignments will be accepted.
- Pre-Finals Week: Note that a final homework or project may be due during Pre-Finals Week.
- 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.