METR 5233 - CLOUD PHYSICS

Fall

2012

Instructor: Mark Morrissey

Class 12:00 pm - 12:50 pm MWF National Weather Center 5930 Aug 20, 2012 - Dec 07, 2012
Final Exam 1:30 pm - 3:30 pm W National Weather Center 5930 Dec 12, 2012 - Dec 12, 2012
Room: NWC 5930

Office Hours:
By Appointment

Texts:
1. *Physics and Chemistry of Clouds*
   Lamb and Verlinde, QC921.6 D95L36 2011
2. Getting Started with Mathematica' 3rd Edition, Cheung et al.
   (available via Amazon)

Software: Mathematica version 8.x (available at OU IT Store for free)

There will be two books for this course. The primary book is the new book "Physics and Chemistry of Clouds and Precipitation" 1st Edition. The second book is 'Getting Started with Mathematica' 3rd Edition. Due to comprehensive nature of the main book we will focus primarily on the thermodynamics/dynamics of cloud physics rather than its chemistry. Other book topics, such as 'radiation' will also be by-passed (you'll get that next semester).

This class will rely heavily on Mathematica in response to the School of Meteorology's new emphasis on enhancing student's programming skills. There's no assumption that the students are already familiar with this software. Therefore the first two weeks of the class will be dedicated to learning the basic syntax and notebook operations of Mathematica. Mathematica will allow one to focus on the physics in the book and make homework problems a breeze (somewhat ☺).

My email address is mmorriss@ou.edu. Please don't hesitate to contact me or stop by Room 5321 for anything.

Exams: 1 mid-term (take-home): 25% , 1 final (take-home): 30%, Homework: 45%,

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1. **Introduction**
   a. Getting Started with Mathematica (**Cheung et al. book**)
   b. Basic overview of clouds (**Chapter 1**)
   c. States of matter, gas, solids liquids, aerosols (**Chapter 2.1.3, 2.1.4**)
   d. Structure and organization of the atmosphere (**Chapter 2.3)**
   e. Equilibria (**Chapter 3 – 3.5.4)**

2. **Cloud Macrophysics**
   a. Cloud Thermodynamics (**Chapter 5**)
   b. Cloud formation and evolution (**Chapter 6.1-6.2**)

3. Cloud **Microphysics**
   a. Phase nucleation (**Chapter 7**)
   b. Vapor deposition (**Chapter 8**)
   c. Collision interactions (**Chapter 9**)
   d. Supersaturation evolution (**Chapter 10**)
   e. Warm clouds (**Chapter 11**)
   f. Cold clouds (**Chapter 12**)

Grading Policy: A >=90%, B>=80%, C>=70, D>=60%.

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Classroom Policies and Other Notes

Course Objectives and Intent: This course was designed to provide graduate students with diverse backgrounds a foundation in, and an overview of, the physics of clouds as these determine the observed characteristics of clouds. The book also includes cloud chemistry and cloud's role in climate, the second of these topics we'll discuss next semester in Radiation. We'll basically look at the fundamental processes working together the form clouds.

Office Hours: I usually make appointments via email. However, if my office door is open I am always willing to talk to students on class or other academic matters.

Homework and Tests: Homework is an integral part of this course. These problem sets help you understand the material, and give you the opportunity to work with the concepts until you become familiar with them. Students are allowed to work together in groups; however, I expect every student to understand every aspect of each assigned problem. The symbolic software Mathematica is required to do the homework. **I do not grade based on your knowledge of Mathematica, but definitely on your approach to the problem given. Neatness and logical approach is a factor in your grade, whether you use the Mathematica notebook like a 'Word' document or use the Mathematica language.** The first week or so will get you up to speed on Mathematica. I will give you a basic Mathematica notebook and explain necessary details. Use this notebook template for all exercises and tests. Please note that in previous classes some students chose to use the Mathematica notebook simply as a Word-like document where they simply placed the problems that they worked out on paper in the notebook. **This is fine and ok with me as long as it follows a logical sequence to answer a given problem.**

Participation: I expect graduate students to have a strong interest in learning. Reveal your curiosity by asking questions in class: it forces me to present the material in a way that you understand it. History has revealed that even the simplest question is beneficial for the entire class.

"Don't expect me to know all the answers while I'm on my two feet in class!" (Dennis Lamb: author of the book)

Grades: Grading is a poor, but necessary, way to assess your learning of the material. I am not interested in how quickly you can regurgitate the material so I usually give take-home exams. However, I'm very picky on neatness and the logic of the approach you take to answer the questions. I want you to answer the questions as if you are explaining to me the concepts involved. **On tests**, **do not work with your colleagues, work by yourself. On homework please <u>do work</u> with your colleagues.**

IMPORTANT POLICIES:

Reasonable Accommodation:

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or fax only 405/325-4173.

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***Academic Misconduct**:*

All provisions of the Norman Campus Academic Misconduct Code shall apply in cases of academic dishonesty. ANY violation of the Academic Misconduct Code will result in your removal from this course, and a grade of F will be recorded for the course. Academic misconduct is defined as "any act that improperly affects the evaluation of a student's academic performance or achievement." At the University of Oklahoma, academic integrity is expected from each student. Misconduct such as plagiarism, fabrication, and fraud, as well as attempting to commit such acts or assisting others in so doing, will not be tolerated. Students are responsible for knowing the OU Academic Code, which can be found at http://studentconduct.ou.edu/ and http://www.ou.edu/provost/integrity/