

**MEA 214 INTRODUCTION TO ATMOSPHERIC SCIENCES II**  
**Spring 2012**

**Lecture:** M 1:30- 2:45, Room 1108 Jordan Hall

**Labs:** W 9:10 - 11:00, Room 5131 Jordan Hall (and 5<sup>th</sup> floor lab, 5214 Jordan Addition)  
W 11:20 - 1:10, Room 5131 Jordan Hall (and 5<sup>th</sup> floor lab, 5214 Jordan Addition)

**Instructor:** Dr. Gary Lackmann  
Office: 1145 Jordan Hall  
Phone: 515-1439  
E-mail: [gary@ncsu.edu](mailto:gary@ncsu.edu)  
Hours: By appointment, best Tu, W, or Th

**TAs:** Mr. Andrew Hall  
Office: 5146 Jordan Hall  
Email: [amhall2@ncsu.edu](mailto:amhall2@ncsu.edu)  
Hours: Tu/Th 9:45-11:15 a.m.  
Wednesday 9:10 section

Mr. Chris Marciano  
Office: 1144 Jordan Hall  
Email: [cgmarcia@ncsu.edu](mailto:cgmarcia@ncsu.edu)  
Hours: Tu 10:00 a.m. - noon  
Wednesday 11:20 section

**Required Text:** *Meteorology Today: An Introduction to Weather, Climate, and the Environment*  
by C. Donald Ahrens, Brooks/Cole Thompson Learning (9<sup>th</sup> Edition)

**Course Description:** This is the second of a two-semester lecture/laboratory course sequence designed as an introduction to the atmospheric sciences for beginning students majoring in Meteorology. MEA 213, which provided fundamental background on atmospheric dynamics and processes, is a prerequisite for this course. If you have not taken MEA 213, please see me right away.

The following topics will be introduced in MEA 214 via lecture, laboratory, and other activities: a) the jet stream, frontal systems, cyclones, and associated weather; b) weather forecasting; c) severe convective storms; d) tropical cyclones, e) environmental change (including air pollution, historic and future climate change, the impacts of climate change, and stratospheric ozone depletion); and f) introductory information on careers in the atmospheric sciences.

Lecture material will be complimented by laboratory exercises in order to illustrate the quantitative, physical nature of the atmospheric sciences. The laboratory period permits time for hands-on exploration of topics related to the analysis and interpretation of weather data, including the numerous products available through the Internet and by other specialized software on the computer workstations in the 5<sup>th</sup> floor computer lab in the Jordan Hall addition.

This course is designed to facilitate the development of critical thinking skills. This means that the laboratory exercises, quizzes, exams, and other classroom activities will be *application based*. In other words, you will have opportunities to apply what you've learned in lecture to real-world situations.

**Course web page:** I have assembled some external resources, past exams, lectures, and other course materials on <http://www4.ncsu.edu/~gary/mea214/mea214.html>.

**Forecast Exercise:** Beginning during the month of February, students will participate in a web-based weather forecasting exercise. We will make forecasts derived from observational and computer model data available via the 5<sup>th</sup> floor computer laboratory and the internet. Students will not only learn to develop quantitative temperature and precipitation forecasts, but will learn to justify and defend their forecasts based on course concepts.

**Grading:** Course grades will be determined in the following manner:

Weekly Laboratory Exercises	45%
Midterm Exam (Mon 27 February)	20%
Comprehensive Final exam (Mon 7 May)	20%
Quizzes (3)	15%

Numerical course grades will be computed at semester's end. Letter grades are then determined according to the following:

<b>A+</b> (100-97)	<b>A</b> (96 - 93)	<b>A-</b> (92 - 90)
<b>B+</b> (89 - 87)	<b>B</b> (86 - 83)	<b>B-</b> (82 - 80)
<b>C+</b> (79 - 77)	<b>C</b> (76 - 73)	<b>C-</b> (72 - 70)
<b>D+</b> (69 - 67)	<b>D</b> (66 - 63)	<b>D-</b> (62 - 60)
	<b>E</b> ( $\leq 59$ )	

### Tentative Course Calendar

	<b>Day/Date</b>	<b>Topic</b>	<b>Text</b>
	M		
J	9	Brief review (clouds, precipitation, forces) jet stream	Ch. 6-11
A	16	<b>MLK, no class Mon.</b> Lab: Jet Stream, fronts, cyclones	Ch. 12 & 13
N	23	Midlatitude cyclones, winter weather, forecasting	Ch. 12 & 13
	30	Convective storms, lightning, hail	Ch. 14
F	6	Tornadoes, thunderstorm lab	Ch. 14
E	13	Hurricane climatology, structure, and impacts	Ch. 15
B	20	Hurricane formation and dynamics	Ch. 15
	27	<b>Midterm Exam (2/27)</b> , hurricane lab exercise	Ch. 15
M	5	<b>Spring Break Week (5-9 March)</b>	
A	12	Hurricane impacts and prediction, hurricanes and climate	Ch. 15
R	19	Climate: Past climates and paleoclimate data	Ch. 17
	26	Climate change mechanisms, natural and anthropogenic	Ch. 16
A	2	Climate change and weather extremes	Ch. 16
P	9	Climate change implications and impacts	handout materials
R	16	Air pollution meteorology, ozone depletion	Ch. 18
	23	The ozone hole, course wrap-up	Ch. 18
		<b>Final Exam, 1:00-4:00 p.m., Monday 7 May</b>	

## MEA 214 Course Objectives

Through lectures, lab exercises, text readings, homework, exams, quizzes, and other learning activities, students enrolled in MEA 214 should be able to meet the following course objectives:

- 1.) Learn the processes and structure of the midlatitude atmosphere:
  - westerly jet stream and relation of jet to fronts & cyclones
  - understand origin and mechanism of midlatitude cyclones
  - understand cyclone and frontal weather and its causes
- 2.) Students will develop the ability to analyze surface and upper-air data, and learn to manipulate thermodynamic diagrams, including application to analysis and forecasting problems, such as
  - recognition of atmospheric profiles that are conducive to severe convective storms
  - use of upper-air data to predict precipitation type
  - computations of different atmospheric parameters using thermodynamic diagrams
- 3.) Students will develop the ability to formulate conceptually based weather forecasts and analyses using both current and archived data, and will be able to utilize the following resources:
  - raw surface and upper-air observations
  - numerical weather forecast model output
- 4.) Students will develop a conceptual understanding of thunderstorm dynamics and thermodynamics, and including the following associated hazards:
  - lightning
  - hail
  - tornadoes
  - convective windstorms
- 5.) Students will gain a basic understanding of how hurricanes form and intensify, and become familiar with other issues relating to tropical storms, such as:
  - what factors control the location and seasonal frequency of hurricane activity
  - to what extent current and future hurricane activity may be linked to climate change
- 6.) Students will gain a basic understanding of earth's past climates, including
  - data sources for analysis of past climate
  - historical climate forcing due to solar and orbital change
  - the relation between climate and atmospheric composition
  - the difference between weather and climate, and how climate can relate to weather
- 7.) Students will gain a basic understanding of several current environmental issues, including
  - climate change
  - the relation between climate change and weather extremes
  - the implications of climate change, including sea-level rise and changing weather patterns
  - stratospheric ozone depletion
  - air pollution meteorology
- 8.) Students will explore some of the primary career options in the atmospheric sciences

## Policies and Procedures

1.) Unless specified otherwise, laboratory reports for the two Wednesday lab sections will be due on Fridays by 5:00 p.m. in my mailbox in the main office (1125 Jordan Hall). You may turn in the reports at the end of class, if the reports have been completed to the best of your ability. Reports turned in the following week will be discounted 20% per day (including the weekend), down to a minimum of 50%. Reports cannot be turned in for credit after they have been returned to the remainder of the class (1 week after assignment).

2.) Missed quizzes and exams will be counted as a zero *unless students notify me via e-mail, voice mail, or in person **prior** to the exam or quiz period.* If you must miss a quiz or exam, and make arrangements ahead-of-time, a make-up quiz or exam will be given but will not be the same exam that the rest of the class took.

3.) If absences occur for any reason, it is solely the student's responsibility to obtain all course notes, laboratory exercises, handouts, or any other information distributed while the student was not in class. The instructor or teaching assistant will not be expected to repeat lecture information or provide course notes to students who have been absent. Exceptions to this policy may be made at the instructor's discretion in the case of serious illness or accidents.

4.) Exams and quizzes: The philosophy of the instructor is that quizzes and exams represent a highly effective learning tool. In preparing for exams, students will assimilate large quantities of information and think about how to apply lecture topics in real-world settings. The exam as a learning tool is only effective if students make substantial efforts to prepare themselves by reviewing all available material, working in groups, or consulting with the instructor or teaching assistant during appointed office hours. Quizzes and exams that fail to challenge the average student degrade the effectiveness of this learning tool.

5.) Course web page: I have assembled some links to useful meteorology sites, selected assignment keys, and other course materials on <http://www4.ncsu.edu/~gary/mea214/mea214.html>.

6.) Course philosophy: The instructor is willing to take responsibility for creating a stimulating, enjoyable learning environment for this course. He is also willing to take responsibility for the degree to which students meet the course objectives, provided that students are willing to take responsibility for "their part". The instructor defines "their part" to include: i) keeping up with all reading, homework, and laboratory assignments; ii) attending all scheduled lecture and laboratory classes; iii) turning in all assigned homework, quizzes, and laboratory exercises, and iv) agreeing to utilize office hours (or, set up an appointment with the instructor or teaching assistants) if lecture or laboratory concepts become confusing.

Finally, let me say that I will do everything I can to make this course interesting, educational, and fun. Hopefully, by semester's end, you will agree with the instructor that atmospheric science is the most interesting, challenging, and exciting career out there!

## **Academic Integrity**

It is expected that students will conduct themselves in a manner consistent with the University policy on academic integrity found in the Code of Student Conduct. Plagiarism and cheating are attacks on the very foundation of academic life, and will not be tolerated. Academic dishonesty is the giving, taking, or presenting of information or material by a student that unethically or fraudulently aids oneself or another on any work which is to be considered in the determination of a grade or the completion of academic requirements or the enhancement of that student's record or academic career.

It is suggested that students review the Code of Student Conduct:

[http://www.ncsu.edu/policies/student\\_services/student\\_discipline/POL11.35.1.php](http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php)

Cheating and plagiarism take many forms, including assisting others whom may initiate dishonest activity. It will be made clear when students are expected to work independently, and it will also be made clear when collaboration is acceptable. Examples of academic dishonesty include:

- representing the work of others as his or her own;
- obtaining assistance in any academic work from another individual in a situation in which the student is expected to perform independently;
- providing assistance to another individual in a situation in which that individual is expected to perform independently;
- offering false data in support of laboratory or fieldwork.

## **Disability Statement**

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see

[http://www.ncsu.edu/provost/offices/affirm\\_action/dss/](http://www.ncsu.edu/provost/offices/affirm_action/dss/)