CLIM-314/GGS-314
Severe & Extreme Weather
Syllabus

Spring Semester, 2020

Mondays - Wednesdays, 12:00 - 1:15pm EST
Location: Research Hall, Room 201

Instructor: Zafer Boybeyi

Introduction:

CLIM-314/GGS-314 is a cross-listed lecture course (3-credit) under the Departments of Atmospheric, Oceanic & Earth Sciences (AOES) and Geography & Geoinformation Science (GGS). This course focuses on severe and extreme weather, covering the key concepts from thermodynamics, radiation and dynamics that are essential for understanding severe and extreme weather events. This course would be useful for any student wanting a one-semester overview of our weather.

General Course Goals:

- The overarching goal of this course is to provide students with a "big-picture" view of the key concepts from thermodynamics, radiation, and dynamics that are essential for understanding severe and extreme weather.
- This course is also designed to help students to understand the basic scientific processes and to develop their essential analytical and quantitative scientific reasoning skills in the context of severe & extreme weather.

Specific Course Goals:

- An overview of the important physical and dynamical processes which control the intensity, frequency, and evolution of the severe weather events.
- An understanding of the key scientific discoveries and remaining unanswered questions in atmospheric science related to the severe and extreme weather.
- An overview of the primary scientific principles and analytical tools used in weather forecasting, such as remote sensing and in-situ techniques.
- An understanding of the application of the scientific method to analyze and interpret observations and components of the severe weather.
- An understanding of the application of weather maps and model predictions in weather forecasting.

Course Learning Outcomes:

By the end of the semester students will able to demonstrate a basic understanding of:

- Temperature variation cross the Earth and in the vertical
- Solar influences and related heating which drive atmospheric thermodynamics and motions
- Earth's energy budget
- In-situ observations, weather maps & basic weather features
- Weather analysis, forecasting & ensemble forecast

- Climate & global change
- Atmospheric stability, moisture and its role in stability considerations
- Skew-T/Log-P diagram and its role in nowcasting considerations
- Atmospheric forces, force balances & atmospheric motions
- Weather producing mid-latitude cyclones (i.e., high- and low-pressure systems)
- Air masses & fronts
- Extratropical cyclones
- Atmospheric condensation and its role in cloud formation & precipitation
- Lake effect snowstorms
- Blizzards & cold waves
- Terrain effect, mountain snowstorms & windstorms
- Thunderstorms, hailstorms & downbursts
- Role of El Nino, La Nina and the Southern Oscillation in our weather
- Tornadoes & tropical cyclones (hurricanes)
- Floods, drought & heat waves

Instructor and Contact Information:

Prof. Zafer Boybeyi
Research I, Room 217
Mail Stop 6A2
Email: zboybeyi@gmu.edu
Office Hours: Mondays and Wednesdays, 9:00-10:30am EST
Additional hours by appointment

Course Website:

GMU Blackboard: https://gmu.blackboard.com/

In order to comply with student privacy laws, faculty and students need to use their GMU e-mail accounts when corresponding with each other.

Required Textbook:

Severe & Hazardous Weather: An Introduction to High Impact Meteorology, Fifth Edition
Robert M. Rauber, John E. Walsh and Donna J. Charlevoix
Kendall/Hunt Publishing Company, 2017

Recommended Additional Textbook:

Principles of Atmospheric Science
John E. Frederick
Jones and Bartlet

Course Format:

1) Lectures
- Covering material (chapters) in the textbook
- Video presentations related to specific severe weather events
- Group discussion
- Analysis of current severe weather events

2) Weekly homework assignments
3) Reading assignments both from the text and supplemental material
4) Surprise quizzes
5) A group project
6) Midterm exam
7) Final exam
8) Class notes will be posted on GMU Blackboard

Textbook Content:

Chapter 1 (Properties of The Atmosphere)
Chapter 2 (Meteorological Measurements)
Chapter 3 (Weather Maps)
Chapter 4 (Forecasting and Simulating Severe Weather)
Chapter 5 (Climate & Global Change)
Chapter 6 (Atmospheric Stability)
Chapter 7 (Forces & Force Balances)
Chapter 8 (The Development of High- & Low-Pressure Systems)
Chapter 9 (Airmasses & Fronts)
Chapter 10 (Extratropical Cyclones Forming East of The Rocky Mountains)
Chapter 11 (Extratropical Cyclones Forming Along The East & Gulf Coasts)
Chapter 12 (Freezing Precipitation & Ice Storms)
Chapter 13 (Lake-Effect Snowstorms)
Chapter 14 (Cold Waves)
Chapter 15 (Great Plains Blizzards)
Chapter 16 (Mountain Snowstorms)
Chapter 17 (Mountain Windstorms)
Chapter 18 (Thunderstorms)
Chapter 19 (Tornadoes)
Chapter 20 (Hailstorms)
Chapter 21 (Lightning)
Chapter 22 (Downbursts)
Chapter 23 (El Nino, La Nina & Southern Oscillation)
Chapter 24 (Tropical Cyclones)
Chapter 25 (Floods)
Chapter 26 (Drought)
Chapter 27 (Heat Waves)

Tentative Course Schedule:

Week 1 (Jan. 22)	Introduction & Syllabus
Week 2 (Jan. 27 & 29)	Chapters 1 & 2
Week 3 (Feb. 3 & 5)	Chapters 3 & 4
Week 4 (Feb. 10 & 12)	Chapters 5 & 6
Week 5 (Feb. 17 & 19)	Chapters 7 & 8
Week 6 (Feb. 24 & 26)	Chapters 9 & 10
Week 7 (Mar. 2)	Chapters 11
Week 7 (Mar. 4)	**(Midterm Exam**)
Week 8 (Mar. 9 & 11)	(**Spring Recess, No Classes**)

Week 9 (Mar. 16 & 18)	Skew-T/Log-P Diagram & Chapter 12
Week 10 (Mar. 23 & 25)	Chapters 13 & 14
Week 11 (Mar. 30 & Apr. 1)	Chapters 15 & 16 & 17
Week 12 (Apr. 6 & 8)	Chapters 18 & 19
Week 13 (Apr. 13 & 15)	Chapters 20 & 21 & 22
Week 14 (Apr. 20 & 22)	Chapters 23 & 24
Week 15 (Apr. 27 & 29)	Chapters 25 & 26 & 27
Week 16 (May 4)	**Group Project Presentations**

Final Exam (Cumulative): May 11, Monday 2020 at 10:30am.

Group Project:

This course requires a group project to familiarize the student with the general nature of severe and extreme weather:

- The students will work in pairs
- Identify a current or historical severe and extreme weather case
- Analyze the meteorological conditions (surface level, upper level maps, etc.) of the case
- Present the results (about 5-10 minutes presentation)

Important Notes:

- Attendance Policy: Students **MUST ATTEND** all classes.
- IF YOU ARRIVE MORE THAN 20 MINUTES LATE FOR AN EXAM/QUIZ, OR AFTER ANYONE HAS FINISHED THE EXAM/QUIZ AND LEFT, YOU MAY NOT TAKE IT.
- Anyone caught cheating on an exam/quiz, or talking after the exams have been handed out, will be referred to the George Mason University Honor Council.
- The exams are closed book and no notes.
- If you have a schedule conflict and cannot take an exam on the scheduled day, let me know ahead of time and I will try to arrange an alternative test date.

Makeup Policy:

Students will be permitted to submit late homework on a case-by-case basis. Late exams will be permitted if the instructor is provided with an acceptable explanation and if performed within one week of the original exam. Make-up exams **must** be scheduled **IN ADVANCE** with instructor permission.

Important Course Dates:

- **First lecture:** Wednesday, January 22, 12:00-1:15pm EST
- **Midterm Exam:** Wednesday, March 4, 12:00-1:15pm EST
- **Final Exam:** Monday, May. 11, 10:30am-1:15pm EST

Course Grading Policy:

Homework	15%
Participation*	5%
Group Project**	10%
Midterm Exam***	30%
Final Exam****	40%

*Participation consists of attendance and surprise quiz grades.
** The students will work in pairs to analyze and present a severe weather event.
***You are responsible for all material from text and any additional assigned readings.
****The final exam is comprehensive (covering all material covered in the course).

Numerical Grade Ranges:

A	94-100%
A-	90-93%
B+	87-89
B	83-86%
B-	80-82%
C+	77-79
C	73-76%
C-	70-72%
D	60-69%
F	Below 60%

Policy on Use of Personal Technology in the Classroom:

Laptops are permitted only for use only for this course and its related activities. Email and web surfing are not allowed and are distracting to both the student and to classmates. **Please use common courtesy and do not use your laptop for any activities other than those related to this course.**

Cellphones must be turned off or on vibrate. Please do not take calls or text in the lectures.

Religious Holidays and Observations:

http://ulife.gmu.edu/calendar/religious-holiday-calendar/ is available to help minimize difficulties for students of different faiths. **It is the student's responsibility to speak to the instructor in advance should their religious observances impact their participation in class activities and assignments.**

Students with Disabilities:

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703/993-2474. All academic accommodations must be arranged through that office.

George Mason University Honor Code:

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely.

What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form.

Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind), please ask for guidance and clarification.

To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this:

Student members of the George Mason University community pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.

http://www.gmu.edu/departments/unilife/pages/honorcode.html