University of South Carolina
Carolina Core

GEOGRAPHY 202
WEATHER AND CLIMATE

BULLETIN INFORMATION
GEOG 202 - Weather and Climate (4 credit hours)
Course Description:
Processes that influence weather and climate patterns on the earth.
Note: Three lectures and one two-hour laboratory per week.

SAMPLE COURSE OVERVIEW
This course seeks to explain the processes which influence weather and climate patterns on the earth.

ITEMIZED LEARNING OUTCOMES
Upon successful completion of Geography 202 students will be able to:

1. Demonstrate an understanding of the laws of science that affect the earth's energy budget;
2. Differentiate measures of atmospheric moisture and explain their relationship to the concept of saturation, understand basic cloud-forming and precipitation processes, explain historical and current scientific theories about these processes, and apply the scientific method through data analysis that tests theories of these processes;
3. Apply the scientific method to observe the state of the atmosphere, shape inquiry about its phenomena, and formulate hypotheses and conduct experimentation to explain local atmospheric processes;
4. Describe the earth's major pressure and wind patterns and the processes that cause them, and explain the evolution of ideas about global circulation;
5. Explain the structure and basic dynamics of mid-latitude cyclones, thunderstorms, tornadoes, and hurricanes;
6. Produce your own weather forecasts using current prediction tools and explore the computational tools used in atmospheric simulation;
7. Evaluate theories about natural and anthropogenic climate change and use current understanding about climate change to address local to international-scale policies designed to address this issue;
8. Develop sound reasoning to explain the daily weather that you experience.

SAMPLE REQUIRED TEXTS/SUGGESTED READINGS/MATERIALS

1. Aguado, E. and Burt, J.E. (2013) *Understanding Weather and Climate, 6th ed.,* Prentice Hall.
2. Carbone, G. (2013) *Exercises for Weather and Climate, 8th ed.*, Prentice Hall.

SAMPLE ASSIGNMENTS AND/OR EXAMS

1. **Exams:** There will be four exams (three midterms and a final). In the first exam, students should demonstrate understanding of terminology associated with atmospheric composition and structure and apply theories of radiation and energy to the earth's energy budget. In the second exam students must show that they understand current methods for measuring atmospheric moisture and theories about how moisture changes phase and clouds and precipitation form. In the third exam, they must explain theories of storm structure and dynamics and use observed data to test how the real world "behaves" relative to conceptual models. In the final, students should show an ability to synthesize class material by explaining the patterns of world climate, the processes that drive these patterns, and the mechanisms that cause climate to vary from short to long periods of time. Material covered on each will be derived primarily from lectures and the textbook. A few questions will come from lab or take-home exercises. Exams will consist of objective questions (e.g. multiple choice, true and false, matching) and short answer/essay questions. The final is not cumulative.

2. **Laboratory:** The lab section of this course will allow you to apply the principles of weather and climate learned in lectures and your text. You will solve problems using meteorological data from case studies, current online sources, and your own measurements. You will work with meteorological instruments (digital temperature sensors, infrared thermometers, sling psychrometers, weather balloons) to measure conditions that vary diurnally, in response to microclimates on campus, and vertically through the troposphere. Your lab grade will be determined by weekly quizzes and 4 exams.

3. **Exercises and Quizzes:** You will have regular exercises and quizzes during the semester. The quizzes will be given in class; your attendance for these is essential since there are no make-ups. While they will not be announced, quizzes will be based on material recently covered in lecture, the textbook, or lab. The exercises will be short take-home assignments covering current course material.

4. **Weather Journal:**
    a. Objective: This project is designed to have you observe, understand, and describe the weather more closely. It also offers an opportunity to articulate your experiences in the natural world, to formulate questions about things that you witness, and to synthesize your understanding of textbook and lecture material and relate class topics to the weather that you encounter daily.

    b. Form: You should make regular entries in a journal (at least 4 days each week), discussing the weather that you observe, or recent class material. When possible, relate your observations to some aspect of a recent lecture, textbook

reading, or laboratory exercise. Feel free to raise questions or simply to demonstrate your understanding of class concepts. Use your creativity and talents. If you have a scientific bent, you might want to put your observations into the context of scientific principles. If you are a poet, write poetry. Photography is welcome. You should occasionally include graphics from the internet or other sources (please provide information about any sources that you use). Use the form with which you feel most comfortable, but as the semester progresses, your writing should become more technical and should include greater explanation incorporating things you've learned in class. You will do your weather journal digitally, using Blackboard. When you click on "Assignments" on Blackboard, you will see a folder called "Weather Journals". Click on your name to make an entry.

SAMPLE COURSE OUTLINE WITH TIMELINE OF TOPICS, READINGS/ASSIGNMENTS, EXAMS/PROJECTS

Class 1: Introduction and overview: Atmospheric origin and composition
1-15, 22-29

Class 2: Vertical structure of the atmosphere
16-21

Class 3: Earth-sun geometry
43-53

Class 4: Solar radiation
31-43

Class 5: Energy balance
55-68

Class 6: Temperature
68-91

Class 7: Exam 1

Class 8: Atmospheric moisture
123-137

Class 9: Condensation, adiabatic processes, fog
138-157

Class 10: Cloud development, atmospheric stability, cloud types
159-187

Class 11: Cloud droplet growth, precipitation forms
189-211

Class 12: Exam 2

Class 13: Atmospheric pressure and wind
93-119

Class 14: General circulation, Local winds
215-257

Class 15: Air masses and fronts
259-277

Class 16: Mid-latitude cyclones
281-288

Class 17: Mid-latitude cyclones
288-305

Class 18: Thunderstorms and Tornadoes
307-343

Class 19: Exam 3

Class 20: Weather forecasting and analysis
381-417

Class 21: Hurricanes
345-377

Class 22: Climate controls
441-445

Class 23: World Climates
445-463

Class 24: Climatic change
465-468, 482-484

Class 25: Climatic change
468-481

Class 26: Atmospheric Optics

505-515

Class 27: Human impacts - CO2
11-15, 69-70, 487-499

Class 28: Review

Final Exam according to university exam schedule