

Geography 1401

Weather and Climate (Online)

Credit Hours: 4

1. Course Description: A systematic introduction to weather and climate as it pertains to man. Topics discussed will include components of weather, weather processes and their measurement, climatic elements and control factors, and climate as a factor of physical environments. Credit 4.

No prerequisites.

2. Class Meeting Times: Online, there are NO class meeting times scheduled.

3. Method of Instruction: Online

4. Class Instructor: James W. Tiller, Jr. 5.

Office Information

Office Location: LDB 332D

Office Hours: I am not in my office during the summer semester. If you need to discuss an issue with me, email me.

Office Phone: 936-294-1455

Office Email: geo_jwt@shsu.edu

6. Course Objectives

Introduction and Temperature Describe the difference between weather and climate, and list the basic elements of both. List several atmospheric hazards. Describe each of Earth's four spheres, and discuss how they interact to produce the Earth system. Summarize the composition of the atmosphere.

Describe the methods used to probe and investigate the atmosphere. Summarize the vertical structure of the atmosphere. Discuss the causes of the seasons and the significance of the solstices and equinoxes. Explain the difference between heat and temperature. Distinguish among the three basic mechanisms of energy transfer, and give an example of each. Describe what happens to incoming solar radiation as it passes through the atmosphere. Explain the greenhouse effect and how Earth's atmosphere is heated. Describe Earth's heat budget and latitudinal heat balance. Describe how the daily mean, daily range, monthly mean, annual mean, and annual temperature range are determined. List the factors that cause temperature to vary from place to place and time to time. Discuss the factors that contribute to the differential heating and cooling of land and water. Describe the influence of ocean currents, altitude, geographic position, cloud cover, and albedo on temperature. Relate the major controls of temperature to the world distribution of temperature. Discuss daily and annual temperature variations.

Pressure, Winds, Ocean Currents and Air Masses Define air pressure, and explain how it is measured. Describe the relationship that exists between the pressure exerted by a column of air, the air's temperature, and its density. Discuss pressure changes with increasing altitude. Outline in detail how the pressure-gradient force, the Coriolis effect, and friction each affect the wind. Define an isobar, and describe the relationship between the spacing of isobars and the amount of pressure change occurring over a given distance. Discuss winds aloft and geostrophic flow. Explain cyclonic and anticyclonic airflow. Describe surface winds and the forces that promote vertical airflow. Explain the difference between macroscale, mesoscale, and microscale winds. List and describe several types of local winds. Discuss the three-cell circulation model of the atmosphere. Identify each of Earth's idealized zonal pressure belts. Discuss the locations and causes of the major monsoons. Discuss the westerlies and midlatitude jet stream. Describe the relation between global winds and ocean currents. Define an air mass, and explain what is meant by air-mass weather. List the two essential criteria an air mass source region must meet. Discuss air mass classification. Describe the ways air masses are modified. List the source regions and properties of air masses that influence the weather of North America.

Moisture, Condensation and Precipitation Discuss the processes and energy requirements by which

water changes from one state of matter to another. Distinguish among absolute humidity, mixing ratio, vapor pressure, relative humidity, and dew point as methods to express the water vapor content of the air. Explain the two ways that relative humidity can be changed. Describe the principle that governs the use of a psychrometer in determining relative humidity and dew point. Discuss the adiabatic process and its role in cloud formation. List and describe the atmospheric conditions which determine the stability of air and the various types of stability. List and discuss the factors that modify the stability of air. State the four mechanisms that cause air to rise. Describe the process of condensation and the role of condensation nuclei in the formation of clouds. Discuss the basis of cloud classification and list the major cloud types based on their form and height. Explain the formation of the various types of fog, dew, and frost. Outline the formation of precipitation according to the Bergeron process and the collision-coalescence process. Distinguish among rain, snow, sleet, glaze and hail and describe the circumstances under which each forms.

Triggering Mechanisms Describe the polar-front theory as a model for the development of a middlelatitude

cyclone. Distinguish between warm fronts, cold fronts, stationary fronts, occluded fronts, and drylines. Discuss in detail the life cycle of a midlatitude cyclone. Summarize the idealized weather associated with a midlatitude cyclone as it passes completely over a region. Explain cyclogenesis and the nature of cyclonic and anticyclonic circulation. Describe the patterns of movement of traveling cyclones. Discuss anticyclonic weather, and list the affects of blocking highs.

Severe Weather Discuss the relative sizes and wind speed characteristics of tornadoes, hurricanes, middle-latitude cyclones, and thunderstorms. Describe the stages of development of an air-mass thunderstorm. Summarize the characteristics of severe thunderstorms, supercell thunderstorms, squall lines, and mesoconvective complexes. Outline the development, occurrence, destruction, and detection of tornadoes. List some of the most destructive and deadliest hurricanes that have struck the United States. Discuss the formation and decay of hurricanes. Describe the difference between a tropical disturbance, tropical depression, tropical storm, and hurricane. Summarize the Saffir-Simpson hurricane scale. List and describe the three classes of hurricane damage. Explain the difference between a hurricane watch and a hurricane warning.

Climate Explain the need for climate classification, and describe some early attempts at classification. Describe and use the Köppen climate-classification scheme. List the characteristics of each climate group in the Köppen classification. Summarize each of the major controls of climate. Provide a detailed overview, including temperature and precipitation characteristics as well as general location, of world climates.

7. **Class Textbook:** The textbook for this course is entitled: eWeather and Climate by Gillespie, Netoff and Tiller. This text is in the form of a CD and is found attached to the back cover of the Lab Manual for GEO 111 (the lab manual is entitled: Weather and Climate).

8. **Course Outline:**

I. Material for Exam #1

A. Introduction to the Course

B. Weather and Climate Controls I

1. Introduction to the Atmosphere

2. Solar Radiation

3. Temperature

C. Exam #1

II. Material for Exam #2

A. Weather and Climate Controls II

1. Air Pressure and Winds

2. Global Circulation

3. Air Masses B.

Exam #2

III. Material for Exam #3

A. Weather and Climate Controls III

1. Humidity, Condensation and Atmospheric Stability
2. Forms of Condensation and Precipitation

B. Exam #3

IV. Material for Exam #4

A. Weather and Climate Controls IV

1. Fronts
2. Weather Patterns
3. Severe Weather
4. World Climates

B. Exam #4

V. The Final Exam

9. Course Requirements Exams. There will be five exams given in this class. A description of each exam follows:

Exam #1: (see Outline I). Multiple-Choice/True-False; **20 percent** of your final course grade. The Exam, to be taken on BlackBoard, will include material from the lectures as well as the readings assigned in your text. Multiple choice and true/false.

Exam #2: (see Outline II). Multiple-Choice/True-False; 20 percent of your final course grade. The Exam, to be taken on BlackBoard, will include material from the lectures as well as the readings assigned in your text. Multiple choice and true/false.

Exam #3: (see Outline III). Multiple-Choice/True-False; **20 percent** of your final course grade. The Exam, to be taken on BlackBoard, will include material from the lectures as well as the readings assigned in your text. Multiple choice and true/false.

Exam #4: (see Outline IV). Multiple-Choice/True-False; **20 percent** of your final course grade. The Exam, to be taken on BlackBoard, will include material from the lectures as well as the readings assigned in your text. Multiple choice and true/false. Final Exam: (see Outline V). The Final Exam is **COMPREHENSIVE**. Multiple-Choice/True-False; **20 percent** of your final course grade. The Final Exam, to be taken on BlackBoard, will include material from the lectures as well as the readings assigned in your text. Multiple choice and true/false. Grading Curves. No grading "curves," either upward or downward, should be expected. Extra Credit. There are **NO** extra credit opportunities in this course. Unable to Complete the Course. If you are not able to complete the course requirements, you have several options: (1) you should expect to receive a grade of "F" for the course unless one of the options below is available to you (2) you drop the course by the date required. See the University Catalog for specifics. (3) you resign from the University by the date required. See the University Catalog for specifics. (4) you receive a grade of "X" for the course. See the University Catalog for specifics. Re-Grading Privileges. There is no re-grading privilege. This is not elementary or high school. You have one shot to make a grade on an exam. If you take the exam, you will receive the grade you make. If you are not prepared to take the exam - **DO NOT TAKE THE EXAM**. Posting of Grades. Grades will be submitted to the University for posting on your unofficial transcript.

10. **Letter Grade Scale**. Your final course grade will be based on the class Exams as described above.

A - Final Class Average of **90 to 100**

B - Final Class Average of **80 to 89.99**

C - Final Class Average of **70 to 79.99**

D - Final Class Average of **60 to 69.99**

F - Final Class Average of **59.99 or less**

11. Academic Honesty. All students are expected to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity in academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. The University and its official representatives may initiate disciplinary proceedings against a student accused of academic dishonesty including, but not limited to, cheating on examinations or other academic work which is to be submitted, plagiarism, collusion and the abuse of resource materials. Cheating includes: Copying from another student's test paper, laboratory report, other report, or computer files, data listings, and/or programs. Using, during a test, materials not authorized by the person giving the test. Collaborating, without authorization, with another student during an examination or in preparing academic work. Knowingly, and without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the contents of an unadministered test. Substituting for another student, or permitting another student to substitute for oneself, to take a test. Bribing another person to obtain an unadministered test or information about an unadministered test. Purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm. This section does not apply to the typing of the rough and/or final versions of an assignment by a professional typist. Plagiarism means the appropriation of another's work or idea and the unacknowledged incorporation of that work or idea into one's own work offered for credit. Collusion means the unauthorized collaboration with another person in preparing work offered for credit. Abuse of resource materials means the mutilation, destruction, concealment, theft or alteration of materials provided to assist students in the mastery of course materials. In a word or two: If I catch you engaged in any form of academic dishonesty, I will pursue the matter to the bloody end and do all in my power to not only remove you from the class, and give you the grade of "F" that you so richly deserve. I will also do all that I can to have you removed from the University.

12. Religious Holy Days. Students that are absent from class for the observance of a religious holy

day are allowed to take an examination or complete an assignment scheduled for that day within reasonable time after the absence. The period of time during which assignments and exams will be excused includes travel time associated with the observance of the religious holy day. A student who wishes to be excused for a religious holy day must present the instructor of each scheduled class that he/she will be absent from class for religious reasons with a written statement concerning the holy day(s) and the travel involved. The instructor should provide the student with a written description of the deadline for the completion of missed exams or assignments. In such cases, the student will be required to take the test or submit the assignment early-unless there are good reasons for not being able to do so and the instructor has agreed to those reasons.

13. Americans with Disabilities Act. It is the policy of Sam Houston State University that no otherwise qualified disabled individual shall, solely by reason of his/her handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any academic or Student Life program or activity. Disabled students may request assistance with academically related problems stemming from individual disabilities by contacting the Director of the Counseling Center in the Lee Drain Annex or by calling (936) 294-1720. Any student seeking

accommodations should go to the Counseling Center and Services for Students with Disabilities in a timely manner and complete a form that will grant permission to receive special accommodations.

14. **Letters of Recommendation.** I only write letters of recommendation for students who make an

"A" in the class.

15. **Class Evaluations.** You may be asked toward the end of the semester to complete a course/instructor evaluation.