ESC 430 – Geophysical Applications: Atmospheric Electricity
Syllabus

Credit
4 semester hours
(3 lecture hours per week, 3 lab hours per week)

Prerequisites
At least one of the following: ESC 305, ESC 306, or PHY 404

Course Description
Electrical nature of Earth's atmosphere, the global electric circuit, cloud physics, lightning, modeling thunderstorm parameters.

Rationale for Course
Physics is the study of the physical phenomena that we observe in our universe. It is broad ranging and essential to all the sciences. This course aims to introduce the fundamental concepts of physics, focusing primarily on the area of atmospheric electricity. Students will develop problem solving skills, learning how to logically approach and evaluate a variety of physical situations.

Learning Objectives
- The student will be proficient with the fundamental concepts of electricity and magnetism.
- The student will be able to describe the electrical structure of the Earth's atmosphere.
- The student will become familiar with the concepts and mechanisms of cloud electrification.
- The student will be able to describe the different types of lightning flashes and will understand the primary mechanisms by which lightning may be initiated.
- The student will understand the role of lightning currents in the global electric circuit.
- The student will become familiar with the relevant instruments used in the study of atmospheric electricity.
- The student will become aware of methods by which various electrical parameters of thunderstorms are modeled.

Academic Integrity
Students are expected to be honest and to submit their own work on exams and research papers. Strict adherence to the Mississippi College "Honesty Policy" (*2009-2010 Mississippi College Undergraduate Bulletin, pg. 60*) will be followed.

Course Outline
- Basic Electricity and Magnetism Review
- Overview of the Electrical Nature of Earth's Atmosphere
- Electrified Non-Thunderstorm Clouds
- Introduction to the Electrical Nature of Thunderstorms
- Corona and Point Discharge
- Lightning
- Instrumentation
- General Electrical Characteristics of Thunderstorms
- Models of Thunderstorm Electrification

Method of Instruction

Class will consist primarily of presenting fundamental physics concepts, working problems, and discussing in-class demonstrations. Key points will be highlighted by the choice of examples, and these points will be discussed in the context of the example.

Required Text and Materials

The Electrical Nature of Storms by MacGorman and Rust.

Grading

The final average will be computed as follows: 60% will be from lecture tests, 20% from lab project, and 20% from the final exam. The final exam is comprehensive. The lab component of this course will focus on the operation and design of the instruments used in the study of atmospheric electricity.

Scale:	Grade	Final Average
	A	90-100
	B	80-89
	C	70-79
	D	60-69
	F	0-59

Makeup Tests

Makeup tests will be given only under the following circumstances:

- Consent of the instructor has been obtained prior to the test.
- An excused absence is obtained from a doctor or the Vice-President for Academic Affairs

Absences

Mississippi College policies on attendance and academic integrity will be enforced. Please see the *2009-2010 Mississippi College Undergraduate Bulletin, pg. 56-57* for additional details of these policies. Students are responsible for all work missed during an absence.

Special Needs

If you need special accommodations due to learning, physical, psychological, or other disabilities, please contact Dr. Buddy Wagner (601-925-3354) in the Counseling and Career Development Center.