Fall 2023

PHYS 203 - 015: The Earth In Space

Andrew Gerrard

New Jersey Institute of Technology-Fall 2023

PHYS 203 – THE EARTH IN SPACE (3-0-3)

Topics: Introduces the fundamental structure and phenomena of the Earth's atmosphere and the Sun, the interactions occurring between the two, and associated hot-topic and/or public policy issues. The course will cover overviews of the solar and Earth systems, the space environment and the dynamical processes associated with space weather, and issues of global climate change. The very practical aspects space weather, including technological impacts on HF radio, GPS, and spacecraft operations, and global climate change will also be addressed.

Objectives: By the end of the course, students should

a) Understand the basics of atomic-scale physics, including atomic structure, energy states, EM wave emission/absorption, and radiation,
b) Understand the dominant forms of energy transport (conduction, convection, EM waves)
c) Identify and characterize the dominant regions of the solar atmosphere, the solar wind/interplanetary space, and Earth's atmosphere and geospace environment,
d) Address our current understanding of space weather and its impacts on our technological infrastructure
e) Address our current understanding of global climate change and identify the dominant processes responsible for today's state of affairs

Instructor: Andrew J. Gerrard, Ph.D., Professor, Chair, Department of Physics, Director, CSTR
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Office Hours: TBD Office: 101 TIER

Texts: None, but the students will be responsible for downloading numerous handouts throughout the semester.

Assessment and Grading Policy:

In-Class Quizzes: 30%

Based on previous lecture material, students will be given in-class quizzes approximately once a week and/or on a random class day. Each quiz will start promptly at the beginning of class and is expected to take ~10 minutes to complete. The lowest 2 quiz grades obtained throughout the semester will be dropped from the final average. NO QUIZ MAKEUPS ARE ALLOWED OR NECESSARY.

3 Exams (2 during the semester, worth 15% each, and 1 final worth 25%): 55%

The purpose of the exams is to test the *individual* student's progress in the class. Exams will be during scheduled class time. Exams are closed book/notes, but the student is allowed to bring in one 8.5x11 inch sheet of notes for each exam. Later exams can make use of previous note sheets (i.e., the note sheets are cumulative). Exams will be announced ahead of time.

Class participation 15%

Attendance at lecture is expected.

THE NJIT HONOR CODE WILL BE STRICTLY ENFORCED AND ANY VIOLATIONS WILL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DEPARTMET HEAD/DEAN OF STUDENTS.

Week	Date	Topic
1	Sept 3	Introduction to Class
2	Sept 10	Physics Fundamentals: EM Spectrum vs. Radiation, Atomic Structure, Electric Fields, Magnetic Fields, Atomic and Molecular Spectra
3	Sept 17	Physics Fundamentals- Blackbody "Radiation", Greenhouses, and Blankets
4	Sept 24	**EXAM I**
5	Oct 1	Solar Atmosphere
6	Oct 8	Structure and Dynamics of the Interplanetary Medium
7	Oct 15	Earth System- Magnetosphere
8	Oct 22	Earth System- Neutral Atmosphere
9	Oct 29	The Coupled Sun to Earth System
10	Nov 5	**EXAM II**
11	Nov 12+	Issues Involving Space Weather I- Storms
12	Nov 19+	Issues Involving Space Weather II- Impacts on Technological Systems
13	Nov 26+	Issues Involving "Global Change" I- Thermal Balance Equation + Role of Sun
14	Dec 3+	Issues Involving "Global Change" II- History of Kyoto and IPCCs
15	Dec 10	Final Class and Review