

Spring 2019

PHYS 203-002: The Earth in Space

Andrew J. Gerrard

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New Jersey Institute of Technology- Spring 2019
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 of global change "prevention," spacecraft charging and orbital decay, and power-grid disruption will also be addressed.

Objectives: By the end of the course, students should

- Understand the dominant forms of energy transport (conduction, convection, EM waves)
- Identify and characterize the dominant regions of the Earth's atmosphere, solar interior and atmosphere, geospace environment, and interplanetary medium
- Address our current understanding of space weather and its impacts on our technological infrastructure
- 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
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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:

| | |
|---|-----|
| <i>In-Class Quizzes:</i> | 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. | |
| <i>3 Exams (2 during the semester, worth 15% each, and 1 final worth 30%):</i> | 60% |
| The purpose of the exams is to test the <i>individual</i> student's progress in the class. 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. | |
| <i>Class participation</i> | 10% |
| 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 DEPARTMENT HEAD/DEAN OF STUDENTS.

| Week | Date | Topic |
|-------------|-------------|---|
| <i>1</i> | Jan 20 | Introduction to Class |
| <i>2</i> | Jan 27 | Physics Fundamentals: EM Spectrum vs. Radiation, Atomic Structure, Electric Fields, Magnetic Fields, Atomic and Molecular Spectra |
| <i>3</i> | Feb 3 | Physics Fundamentals- Blackbody "Radiation", Greenhouses, and Blankets |
| <i>4</i> | Feb 10 | EXAM I |
| <i>5</i> | Feb 17 | Sun System- Solar Interior and Solar Atmosphere |
| <i>6</i> | Feb 24 | Structure and Dynamics of the Interplanetary Medium |
| <i>7</i> | Mar 3 | Earth System- Magnetosphere |
| <i>8</i> | Mar 10 | Earth System- Neutral Atmosphere |
| <i>9</i> | Mar 17 | SPRING BREAK |
| <i>10</i> | Mar 24 | The Coupled Sun to Earth System |
| <i>11</i> | Mar 31 | Exam II |
| <i>12</i> | Apr 7 | Issues Involving Space Weather I- Storms |
| <i>13</i> | Apr 14 | Issues Involving Space Weather II- Impacts on Technological Systems |
| <i>14</i> | Apr 21 | Issues Involving "Global Change" I- Thermal Balance Equation |
| <i>15</i> | Apr 28 | Issues Involving "Global Change" II- History of Kyoto and IPCCs |
| <i>16</i> | May 5 | Final Class and Review |