

New Jersey Institute of Technology- Spring 2014
PHYS 656 – MAGNETOSPHERIC AND IONOSPHERIC RESPONSE TO SOLAR OUTPUT (3-0-3)

Overview/Topics: This is the second web – enabled course in the ‘George Ellery Hale Collaborative Graduate Education Program in Solar & Space Physics,’ a collaboration between University of Colorado, the University of Hawaii, and NJIT. The collaborative graduate program was established to broaden the scope of graduate curricula beyond what is routinely available at any one institution to include a series of focused topics courses for graduate students considering research in solar-terrestrial and space physics. This Spring 2014 offering will be taught out of NJIT and broadcast remotely.

This graduate-level class introduces the fundamental characteristics and structure of the solar wind, the Earth’s magnetosphere, Earth’s middle and upper atmosphere, and the interactions occurring between all the various systems. Emphasis will be placed on the current understanding of how synoptic structures/events, generated by the Sun and solar wind, impact the Earth geospace environment. The very practical aspects of “Space Weather” will also be addressed, including spacecraft charging and orbital decay.

This course is designed with the typical “solar graduate student” in mind. We will attempt to answer the question: “Why should a solar physicist care about the magnetosphere and ionosphere?” A background in introductory solar physics is expected.

Objectives: By the end of the course, students should:

- a) Identify and characterize the dominant regions mentioned above,
- b) Understand the dominant forms of energy transport between these systems,
- c) Be able to analytically discuss the dominant physics of each system,
- d) Address our current understanding of space weather and impacts on our geospace infrastructure.

Instructor: Andrew J. Gerrard, Ph.D., Professor
 Email: gerrard@njit.edu
 Web: <http://web.njit.edu/~gerrard>

Assessment and Grading Policy:

Term Project 40%
 Students will be expected to complete a term project focused on one of topics covered in the course. The project, which will need to be identified by the student approximately halfway through the term, should review the current scientific literature and recommend “next step” actions. The project content will be delivered in an end-of-semester presentation [lasting approximately 15-min each] and a 5-page written summary.

Homework 40%
 Approximately 1 assignment will be expected every 3 weeks, and evaluated by the local course supervisor. Questions are often “open ended,” and require post-lecture discussion with the larger class group or locally.

Participation 20%

SUBJECT TO MODIFICATION		
Week	Date	Topic
1	Jan 22	Introduction to Class
2	Jan 27-Jan 29	Overview of Instrumentation (ACE, THEMIS, VA Probes, ISR)
3	Feb 3-Feb 5	Characteristics/Structure of the Solar Wind-Characteristics
4	Feb 10-Feb 12	Characteristics/Structure of the Solar Wind-Streams, Interaction Regions, ULFs
5	Feb 17-Feb 19	Characteristics/Structure of the Earth’s Magnetosphere-Structure, Radiation Belts
6	Feb 24-Feb 26	Characteristics/Structure of the Earth’s Magnetosphere-Waves <i>[Jacob Bortnik, UCLA]</i>
7	Mar 3-Mar 5	Characteristics/Structure of the Earth’s Ionosphere, Thermosphere, and Upper Mesosphere-Circulation, Particle precipitation, Joule heating, Convection
8	Mar 10-Mar 12	Characteristics/Structure of the Earth’s Ionosphere, Thermosphere, and Upper Mesosphere-Waves
	Mar 17-Mar 19	NJIT SPRING BREAK
9	Mar 24-Mar 26	Interactions between the Sun and Earth-EM Waves

		<i>[Stan Solomon, NCAR-HAO]</i>
<i>10</i>	Mar 31-Apr 2	Interactions between the Solar Wind and Magnetosphere-Synoptic Features
<i>11</i>	Apr 7-Apr 9	Interactions between the Magnetosphere and Ionosphere/Upper Atmosphere-General Features
<i>12</i>	Apr 14-Apr 16	Interactions between the Magnetosphere and Ionosphere/Upper Atmosphere-Synoptic Features
<i>13</i>	Apr 21-Apr 23	Issues Involving Space Weather- History and Impacts on Technological Systems <i>[Lou Lanzerotti, NJIT]</i>
<i>14</i>	Apr 28-Apr 30	Student Presentations
<i>15</i>	May 5- (May 7)	Student Presentations