

AS 783: Ionospheres

Course Syllabus Spring 2012

Description The formation of the ionosphere. The structure and dynamics of the ionosphere and thermosphere. Aeronomy. Thermosphere/ionosphere coupling. Ionospheric electric fields and current systems. Ionospheric storms. Ionospheric waves and irregularities. Active experiments in space. Radio and optical ionospheric diagnostics.

Prerequisites AS703 & AS727 or equivalent

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Times Lectures: Tuesdays and Thursdays, 2-3:30pm

Office Hours: Monday 2-3:30 & Wed 2-3:30

Assignments

Term Project - (50% of Grade)

- Research project consisting of either original Ionospheric research or an exploration of an Ionospheric topic related to the student's Ph.D. research.
- Grades based on:
 1. Oral Presentation - (25% of grade): 20 minute in-class presentation of project results followed by 10 minute question period graded based on clarity, quality, and ability to answer questions on Term Project and related topics.
 2. Written Presentation - (25% of grade): A scientific style paper in letter format (for an example, see Geophysical Research Letters)

Problem Sets - (50% of grade):

- Bi-weekly problem set assignments.
- Students may work in groups but should write up solutions individually. Recommendation: students should initially attempt problems individually.
- To receive full credit on a problem, it must include: a reasonably clear explanation of the method used to obtain a solution, legible and, single sided pages
- Not every problem will be graded.

- Texts**
1. Kelley, M.; The Earth's Ionosphere: Plasma Physics and Electrodynamics (Second Edition); Good modern text covering principally the electrodynamics of the ionosphere from an observers viewpoint
 2. Schunk, R. and Andrew, N.; Ionospheres: Physics, Plasma Physics, and Chemistry (Second Edition); Good modern text from a Ionospheric modeler's viewpoint.
 3. Henry Rishbeth and Owen K. Garriott; Introduction to Ionospheric Physics; Old but has the foundations

Dates

Month	Day	Event
Jan	24	Project Title and Abstract Draft Due
Jan	26	LWS meeting and CSP Lecture on Gravity Waves by Dave Fritts
Jan	31	Revised Project Title and Abstract Due
Jan	31	Prof. Mendillo on Photochemistry and Formation of the Ionosphere 1
Feb	2	Prof. Mendillo on Photochemistry and Formation of the Ionosphere 2
Feb	7	ISR Lecture by Dr. Phil Erickson, director of Millstone Hill Observatory
Feb	16	Prof. Withers on Planetary Ionospheres 1
Feb	23	Prof. Withers on Planetary Ionospheres 2
Feb	27	Brief Project Presentations and Discussion
April	?	Prof. Josh Semeter on Auroral Physics
April	19	Draft Project Papers Due
April	26	Project Final Presentations
May	1	Project Final Presentations & Papers Due

Lectures

1. Introduction to Class and Ionospheres
2. Neutral Atmospheres: Structure, Temperature, and Physics
3. Gravity Waves and Tides
4. Escape
5. Ionospheric Chemistry
6. Photo Ionization
7. Ionospheric Measurement Techniques: Radar Coherent (guest lecture or self)
8. Ionospheric Measurement Techniques: ISR (guest lecture)
9. Ionospheric Measurement Techniques: Optical (guest lecture)
10. Ionospheric Measurement Techniques: Spacecraft and Rockets (guest lecture)
11. Ionospheric Measurement Techniques: scintillation (guest lecture)
12. Comparative Planetary Ionospheres
13. Suggested Projects: Present 10 min. preliminary ideas
14. Low Latitude dynamics
15. Low Latitude Waves and Instabilities 1
16. Low Latitude Waves and Instabilities 2
17. Mid-latitude dynamics
18. High Latitude Dynamics
19. High Latitude Waves and Instabilities 1
20. Low Latitude Waves and Instabilities 2
21. Magnetospheric Ionospheric Coupling
22. Active Experiments: Rocket Releases & Heaters
23. Project Final Presentations / Oral exams

Academic Conduct The Dean of CAS/GRS has asked faculty to remind students of the academic conduct code. The objective of the GRS academic conduct code is: "In order to ensure that the academic competence of students be judged fairly, and to promote the integrity of graduate education, the Graduate School embraces two broad principles: (1) No honest student should be put to a disadvantage because of the dishonesty of another student; (2) Penalties should be commensurate with the misdemeanors." Details of this policy can be found at <http://www.bu.edu/grs/academics/resources/adp.html>.