

BU GRS AS 783 Ionospheres

Course Syllabus Fall 2016

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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Office hours: Tuesday and Thursday 10-11:30

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:
 - 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.
 - Written Presentation - (25% of grade): A scientific style paper in letter format (for an example, see Geophysical Research Letters)
 - Problem Sets - (50% of grade):
 - * Periodic 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. Hargreaves, J.~K.; The solar-terrestrial environment; A broad text covering aeronomy, ionosphere, magnetosphere and some solar wind - not a good introductory text but has a lot of foundational material.
 2. 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
 3. Schunk, R. and Andrew, N.; Ionospheres: Physics, Plasma Physics, and Chemistry (Second Edition); Good modern text from a Ionospheric modeler's viewpoint.
 4. Henry Rishbeth and Owen K. Garriott; Introduction to Ionospheric Physics; Old but has the foundations

Month	Day	Event
Sep	6	First Class Introduction
Sep	13	Prof. Mendillo on Photochemistry and Formation of the Ionosphere 1
Sep	13	Project Title and Abstract Draft Due
Sep	15	Prof. Mendillo on Photochemistry and Formation of the Ionosphere 2
Sep	20	Revised Project Title and Abstract Due
Oct	18	Optical Aeronomy by Dr. Martinis
Oct	20	Ionosphere-Atmosphere interactions by Dr. Larisa Goncharenko
Nov	8	GPS TEC global insights, including Scintillation and TIDs by Dr. Coster
Nov	10	Dr. Withers on Planetary Ionospheres 1
Nov	15	Dr. Erickson: Ionosphere-plasmasphere-magnetosphere: The Geospace Plume
Nov	17	Dr. Josh Semeter on Auroral Physics
Nov	22	Brief Project Presentations and Discussion
Dec	1	Draft Project Papers Due
Dec	1	Project Final Presentations
Dec	6	Project Final Presentations
Dec	8	Project Final Presentations & Papers Due

Dates

Topics

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>.