BU GRS AS 783 Ionospheres

Course Syllabus Fall 2016


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
4. Henry Rishbeth and Owen K. Garriott; Introduction to Ionospheric Physics; Old but has the foundations
### Dates

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Event</th>
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<tbody>
<tr>
<td>Sep</td>
<td>6</td>
<td>First Class Introduction</td>
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<tr>
<td>Sep</td>
<td>13</td>
<td>Prof. Mendillo on Photochemistry and Formation of the Ionosphere 1</td>
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<td>Sep</td>
<td>13</td>
<td>Project Title and Abstract Draft Due</td>
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<td>Sep</td>
<td>15</td>
<td>Prof. Mendillo on Photochemistry and Formation of the Ionosphere 2</td>
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<td>Sep</td>
<td>20</td>
<td>Revised Project Title and Abstract Due</td>
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<tr>
<td>Oct</td>
<td>18</td>
<td>Optical Aeronomy by Dr. Martinis</td>
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<td>Oct</td>
<td>20</td>
<td>Ionosphere-Atmosphere interactions by Dr. Larisa Goncharenko</td>
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<tr>
<td>Nov</td>
<td>8</td>
<td>GPS TEC global insights, including Scintillation and TIDs by Dr. Coster</td>
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<tr>
<td>Nov</td>
<td>10</td>
<td>Dr. Withers on Planetary Ionospheres 1</td>
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<td>Nov</td>
<td>15</td>
<td>Dr. Erickson: Ionosphere-plasmasphere-magnetosphere: The Geospace Plume</td>
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<td>Nov</td>
<td>17</td>
<td>Dr. Josh Semeter on Auroral Physics</td>
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<td>Nov</td>
<td>22</td>
<td>Brief Project Presentations and Discussion</td>
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<td>Dec</td>
<td>1</td>
<td>Draft Project Papers Due</td>
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<tr>
<td>Dec</td>
<td>1</td>
<td>Project Final Presentations</td>
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<td>Dec</td>
<td>6</td>
<td>Project Final Presentations</td>
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<tr>
<td>Dec</td>
<td>8</td>
<td>Project Final Presentations &amp; Papers Due</td>
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### 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](http://www.bu.edu/grs/academics/resources/adp.html).