

**Syllabus 29:235 Special Topics in Astrophysics:
Space and Astrophysical Plasmas**

Semester: Spring 2012
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Office Hours: 1:30-3:30pm T, 2-3pm W, or by appointment
Department: Physics & Astronomy, 203 Van Allen Hall, Prof. Mary Hall Reno, Chair

Catalog Description: This course covers the fundamentals of the dynamics and evolution of space and astrophysical plasma environments, including the structure of the heliosphere and planetary magnetospheres, structure of accretion disks, solar and stellar winds, and galaxy clusters. Waves, shocks, and turbulence will be explored, focusing on their influence on the evolution of the plasma environment. No prerequisites (the basics of the background plasma physics will be covered in this course), but 029:194 and 029:195 are recommended.

Meeting: Tuesday and Thursday 12:15 pm - 1:30 pm
618 Van Allen Hall

Textbooks: No required texts, but I suggest you purchase one of the recommended texts below:
1) Margaret G. Kivelson & Christopher T. Russell, *Introduction to Space Physics*
2) Frank H. Shu, *The Physics of Astrophysics, Volume II: Gas Dynamics*

Web Page: <http://www.physics.uiowa.edu/~ghowes/teach/astroplasma/index.html>

Grading: Homework: 75%
Final Project: 25%

Homework: Homework will be assigned on a regular basis with a time allotment corresponding to the level of difficulty. Longer assignments will be weighted more heavily in the homework score. Some assignments may involve a certain amount of computer work. Late homework will not be accepted. You are encouraged to work together in groups on the homework, but each student must write his or her own solutions; you may discuss how to solve the problem together, but you may not copy another student's solution.

Topics:

1. Fundamental Plasma Physics Concepts (Single Particle Motion, MHD) (3 weeks)
2. Magnetospheric Physics (Structure and Dynamics) (5 weeks)
3. Heliospheric Physics (Structure and Dynamics) (2 weeks)
4. Astrophysical Systems (Accretion Disks, Galaxy Clusters, Supernova Remnants) (5 weeks)
5. Plasma Physics Phenomena (Shocks, Reconnection, Turbulence, Instabilities) (throughout)

Reference books: W. Baumjohann & R. A. Treumann, *Basic Space Plasma Physics*
C. J. Clarke & R. F. Carswell, *Principles of Astrophysical Fluid Dynamics*
J. Frank, A. King, & D. Raine, *Accretion Power in Astrophysics*
D. Gurnett and A. Bhattacharjee, *Introduction to Plasma Physics with Space and Laboratory Applications*
R. Kulsrud, *Plasma Physics for Astrophysics*
H. J. G. L. M. Lamers & J. P. Cassinelli, *Introduction to Stellar Winds*
J. Pringle & A. King, *Astrophysical Flows*
R. A. Treumann & W. Baumjohann, *Advanced Space Plasma Physics*

The College of Liberal Arts and Sciences Policies and Procedures

Administrative Home

The College of Liberal Arts and Sciences is the administrative home of this course and governs matters such as the add/drop deadlines, the second-grade-only option, and other related issues. Different colleges may have different policies. Questions may be addressed to 120 Schaeffer Hall or see the Academic Handbook.

www.clas.uiowa.edu/students/academic_handbook/index.shtml

Electronic Communication

University policy specifies that students are responsible for all official correspondences sent to their University of Iowa e-mail address (@uiowa.edu). Faculty and students should use this account for correspondences. (Operations Manual, III.15.2. Scroll down to k.11.)

Accommodations for Disabilities

A student seeking academic accommodations should register with Student Disability Services and meet privately with the course instructor to make particular arrangements. For more information, visit this site: www.uiowa.edu/~sds/

Academic Fraud

Plagiarism and any other activities when students present work that is not their own are academic fraud. Academic fraud is a serious matter and is reported to the departmental DEO and to the Associate Dean for Undergraduate Programs and Curriculum. Instructors and DEOs decide on appropriate consequences at the departmental level while the Associate Dean enforces additional consequences at the collegiate level. See the CLAS Academic Fraud section of the Student Academic Handbook.

www.clas.uiowa.edu/students/academic_handbook/ix.shtml

CLAS Final Examination Policies

Final exams may be offered only during finals week. No exams of any kind are allowed during the last week of classes. Students should not ask their instructor to reschedule a final exam since the College does not permit rescheduling of a final exam once the semester has begun. Questions should be addressed to the Associate Dean for Undergraduate Programs and Curriculum.

Making a Suggestion or a Complaint

Students with a suggestion or complaint should first visit the instructor, then the course supervisor and the departmental DEO. Complaints must be made within six months of the incident.

www.clas.uiowa.edu/students/academic_handbook/ix.shtml#5

Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community have a responsibility to uphold this mission and to contribute to a safe environment that enhances learning. Incidents of sexual harassment should be reported immediately. See the UI Comprehensive Guide on Sexual Harassment for assistance, definitions, and the full University policy.

Reacting Safely to Severe Weather

In severe weather, class members should seek appropriate shelter immediately, leaving the classroom if necessary. The class will continue if possible when the event is over. For more information on Hawk Alert and the siren warning system, visit the Public Safety web site.