

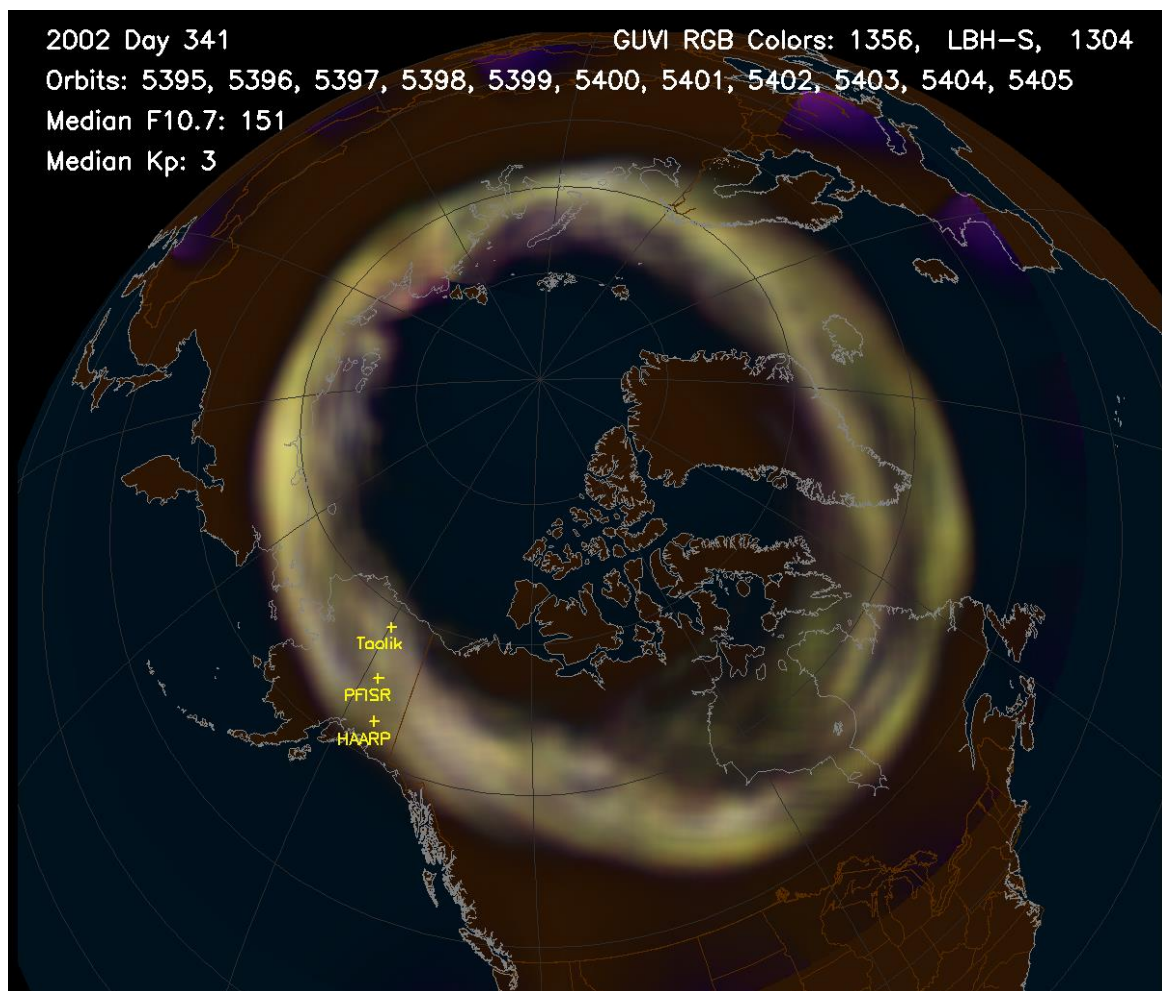
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# Physics 471C

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## Space and Auroral Physics 1 Credit

Instructor – Dr. Mark Conde



## Overview

### Description

This will be an introduction into the physics of Earth's space environment, and the auroral phenomena that occur as a result of it. Topics to be covered will include:

- Basic physics of space plasmas
- Earth's space environment and space weather
- Solar origins of near-Earth space weather
- Auroral phenomena resulting from space weather
- Optics and spectroscopy of the aurora
- Auroral forecasting
- Tools and techniques for studying aeronomy and the aurora
- Aurora on other planets

The course will be mostly focused on giving students a practical working understanding of these topics, rather than developing detailed high-level theoretical descriptions.

### Course goals and student learning outcomes

Upon completion of this course students will:

- Understand space weather impacts on Earth
- Understand the societal relevance of these topics
- Be familiar with the tools and techniques used to study them

My goal as an instructor is to provide every student with maximum possible opportunity for success. This means that I try to be as flexible as possible with the course requirements, to avoid creating needless hurdles. Nevertheless, some penalties for missed or late work are necessary; my policies in this regard are outlined in subsequent sections.

### Instructor information

Instructor:	Dr. Mark Conde
Email:	<a href="mailto:mgconde@alaska.edu">mgconde@alaska.edu</a>
Office locations:	Reichardt room 110 and Elvey room 706C.
Office Phone:	474-7741
Office hours:	I do not intend to establish fixed office hours for this small class. I will always be available after class on MWF. Further, I will be supervising a lab in Reichardt Room 135 between 2:30-5:30 pm on Tuesday and Thursday. Students work independently during much this class, and so I would likely be able to assist with PHYS471C then. Other meeting times are available by arrangement.

## **Target schedule**

<i>Week</i>	<i>Dates</i>	<i>Topics</i>	<i>Comments</i>
1	Sep 30 – Oct 04	Class introduction, basic space plasmas	
2	Oct 07 – Oct 11	Space plasmas, intro to the aurora	HW1 assigned
3	Oct 14 – Oct 18	The magnetosphere & auroral phenomena	HW1 due; HW2 assigned
4	Oct 21 – Oct 25	Solar weather & auroral forecasting	HW2 due; HW3 assigned
5	Oct 28 – Nov 01	The solar wind and heliosphere. Last lecture is on Wednesday. Take-home final Wed – Fri.	HW3 due.

Note that this is a just a guess; I do not yet know exactly how long each topic will take.

## **Course components and instructional methods**

### **Instructional materials**

Material for this course will be prepared electronically and will be available *over the web* via the “Blackboard”<sup>1</sup> system at <http://classes.uaf.edu>. Material to be posted this way includes:

- Course syllabus (this document)
- Lecture notes (see comments below)
- Homework problem sets
- Supplementary handouts
- Online student grades

Note that I will not be distributing homework or exam solutions to the web. These will instead be posted in the glass cabinets in the physics departmental area of the Reichardt building.

### **Lectures**

I will be presenting lectures mostly using a computer, although I will supplement this with additional informal diagrams etc drawn on the blackboard. I intend to post printable versions of the electronic lecture notes online ahead of time.

Lectures are currently scheduled for 1-2 pm on Monday, Wednesday, and Friday in room 207 of the Reichardt building.

### **Homework**

Homework will be assigned each week during the Wednesday lecture, and will be due at the Wednesday lecture the following week. Turn in your homework by handing it to me at the lecture. You may work with others on the homework problems, but you are prohibited from simply copying other's work. Homework will count significantly toward your final grade, as well as provide me with feedback regarding your understanding of the material.

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<sup>1</sup> All students should have access to Blackboard. Please let me know if you have difficulties with this.

Please realize that even if you submit a correct solution to a problem, I may not recognize it as correct if it's poorly presented. To maximize your chance of scoring well, your homework must:

- Be neatly laid out
- Be largely free from crossing out and over-writing
- Use grammatically correct English and be well enough explained that I can understand what you're doing

## Exam

There will be take-home final exam. I will hand out the exam at the end of our last class, on Wednesday October 30; the completed exams will be due back to me by Friday November 01. I will be traveling for a rocket mission during November, and so will be unable to accept late exam submissions.

## Course policies

### Grading

The course grade will consist of the following components

- Homework: 60% (20% each for 3 problem sets)
- Final exam: 40%

I will post all grades online, using the UAF's "Blackboard" system (<http://classes.uaf.edu>). All registered students have access to this system for checking their grades. Please do *check that we have posted all your grades correctly*, and let me know if you think there is an error. Also, please retain all work that we return after grading, in case an error does appear. Returned graded work is proof of your scores.

Final grades will be returned as letter grades with plus/minus modifiers. These will be derived from your overall percentage grade. The approximate conversions for each letter grade will be as follows. A:  $\geq 90\%$ ; B: 75% to 90%; C: 60% to 75%; D: 50% to 60%; F:  $< 50\%$ . Plus/minus modifiers will subdivide each main grade into three equally spaced sub-levels.

### Attendance

UAF policies<sup>2</sup> include statements that:

- "you must begin attending classes on the first day of instruction or you may lose your place, regardless of whether or not you have paid tuition and fees"
- "you are expected to adhere to the class attendance policies set by your instructors"

In general, I expect at least 90% attendance from all students. Extended periods of consistent absence may lead to a penalty in your overall grade, depending on circumstances.

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<sup>2</sup>See <http://catalog.uaf.edu/academics-regulations/attendance/> and <https://www.uaf.edu/register/services.php#attend>

## **Class participation**

There is no requirement for you to participate actively in class by asking questions or joining discussions, and there is no grade component based on this. Nevertheless, you are of course free to ask questions at any time during the lectures. Because we have a large amount of material to cover, I may defer answering lengthy or numerous questions until after class.

## **Missed or late work**

Problem sets will generally not be accepted after the due date, without evidence of illness or genuine emergency. Students having documented clashes with other UAF commitments may pre-arrange alternate homework submission deadlines with me. All decisions regarding late homework or alternate deadlines will be at the discretion of the instructor.

## **Student conduct and academic honesty**

It is the responsibility for each student to be informed about the policies for student conduct and safety at the University of Alaska. You are encouraged to read these policies at <https://www.uaf.edu/student-affairs/student-resources/conduct.php>. It should go without saying that students are expected to do their own original work for all assignments. Any deviation from this may be considered academic misconduct and may result in a failing grade and referral to university authorities for possible disciplinary action.

## **Course requirements and materials**

### **Prerequisites**

PHYS F220; PHYS F301; or permission of instructor.

### **Textbooks**

Required: None

I will be posting fairly comprehensive lecture notes online. I expect some students may find these notes alone to be adequate for this course. I will be drawing on numerous text books and published articles, but the following are some recommended books for further reading:

- Space physics: an introduction to plasmas and particles in the heliosphere and magnetospheres, by May-Britt Kallenrode, Springer 2004. ISBN 3540206175, 9783540206170
- Introduction to space physics, by Kivelson & Russell, CUP 1995, ISBN 0521457149, 9780521457149.
- Basic space plasma physics, by Baumjohann & Truemann, world Scientific 1996, ISBN 186094079X, 9781860940798.

## Technology Requirements

Course materials will be delivered via Blackboard, which means students will require easy web-browser access to the internet. Most material will be delivered in PDF format, so that students will need access to Adobe Acrobat Reader or other third-party equivalent software.

You will need access to a calculator to complete some of the homework and exam problems. Remember that it is much more important to present the correct reasoning for solving a problem than it is to arrive at the correct numerical value. Please, explain your reasoning when presenting solutions to homework and exam problems. I will award partial points for correct reasoning, if presented, even if the final answer is incorrect or incomplete. In general, it is better to work with algebraic variables whenever possible; numerical values should not be substituted in until absolutely necessary.

## Support Services

### Complaints and concerns

You are always welcome to discuss your concerns with me. However, if you have a concern that you feel cannot be resolved by discussion with me, you may wish to contact the Physics Department chair, Dr. Wackerbauer. The University also has an Academic Advising Center on the 5<sup>th</sup> floor of the Gruening building, open Monday to Friday, 8 am to 5 pm and contactable via phone at 907-474-6396. The advising center can help with all student matters, from study tips to help with understanding the University's formal mechanisms for academic appeals. (See also <http://www.uaf.edu/advising/>)

### Student Health and Counseling Center

The University provides health and counseling services through its Student Health and Counseling Center, which is located at 612 N. Chandalar Drive, on the 2nd floor of the Whitaker Building (the same building as Fire and Police, across from the bus turn around.) Their web site is at <http://www.uaf.edu/chc/>. The center will see students on an appointment basis. The number to call for an appointment is 474-7043. It is best to do so at 8:00 AM in the morning, because they are scheduled daily on a first come first serve basis.

### Disabled students

Disability services are provided free of charge, and are available to any student who qualifies as a person with a disability. Student seeking special accommodations for a disability must first discuss their needs with Disability Services. Call 474-5655 to schedule an appointment. I will make accommodations for any student's special instructional needs, according to recommendations to me from Disability Services.

UAF Disability Services is located in the Whitaker Building, room 208. Extensive support is available, as described at <http://www.uaf.edu/disability/>

## REQUIRED INFORMATION FOR UNDERGRADUATE SYLLABI

### STUDENT PROTECTIONS AND SERVICES STATEMENT:

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc. to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: [www.uaf.edu/handbook/](http://www.uaf.edu/handbook/).

UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: <https://alaska.edu/nondiscrimination/>.

Your instructor follows the University of Alaska Fairbanks Incomplete Grade Policy: "The letter "I" (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an "I" grade."

Effective communication: Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication's Speaking Center (907-474-5470, [speak@uaf.edu](mailto:speak@uaf.edu)) and the UAF English's Department's Writing Center (907-474-5314, Gruening 8th floor), and/or CTC's Learning Center (604 Barnette Street, 907-455- 2860).

### ADDITIONAL INFORMATION

The University of Alaska has detailed and ever-changing requirements for courses and course syllabi. The purpose of this statement is to indicate that, in addition to requirements explicitly stated here, all other current overarching UAF policies also apply to this course – whatever the heck they may be this time around....