General Information
Instructor: Daniel Dale
Office: 214 Physical Sciences
Phone: 766-5154
Office hours: WRF 11-11:50, or by appointment
Website: physics.uwyo.edu/~ddale/teach/15_16
E-mail: ddale@uwyo.edu
For an anonymous e-mail option, see physics.uwyo.edu/~ddale/teach/email.html

Lecture: Wednesday & Friday 8:35-9:50, PS 227

“Tell me and I forget. Teach me and I remember. Involve me and I learn.” -- Benjamin Franklin

Course Content
In this graduate astrophysics course we will explore the basic structure and physical processes that dominate the interstellar medium. We will approach the material from both theoretical and applied approaches, and cover topics ranging from the incredibly small (electronic transitions within atoms) to the extremely large (the magnetic field of the entire Galaxy), from the highly energetic (supernovae) to the quiescent (cold dust and gas clouds at ~10 K), and environments ranging from stellar atmospheres to galaxy halos.

Class Meetings
Since ideas and definitions from the text will be used freely in class, it is necessary for you to read and study the assigned chapters before class. To promote interesting and relevant in-class discussions, we will utilize "Just-in-Time Teaching," whereby students respond to a question posted via email. The responses will be due before lecture, but far enough in advance such that depending on the responses, the classroom activities can be better tailored to meet student needs.

I have specifically avoided titling this section "Lecture." I prefer "Class Meetings" because research on science teaching has shown that the standard "sage-on-the-stage", one-way communication format is not the most effective learning environment. Thus, in addition to lecturing and developing the Just-in-Time Teaching technique, we will also use a mixture of seminar-type discussions, problem-solving sessions, conceptual questions, guest speakers, and in-class presentations (see below). Please help me determine an effective mix.

Class Presentations
We will hold frequent sessions of The First Seven Minutes. Astrophysicists at Caltech use this format to quickly review hot topics; we will use this format to briefly review topics focused on the interstellar medium. There are only two rules: i) The presenter has seven minutes to review the salient aspects of a journal article; ii) one transparency/slide and the whiteboard may be used to aid the presentation (plus one for the article title and authors). You may squeeze as much material as you want into the transparency/slide, but beware the impact on your audience. Please choose to review a refereed article relevant to that week’s topic.

This will be excellent preparation for presentations you will make at national meetings of the American Astronomical Society. AAS speakers are limited to a whopping five minutes, and those who try to cram their 45-minute, 45-slide presentation into 300 seconds are not viewed favorably by their peers. In addition, poster presenters at smaller conferences are frequently allowed to orally present their results on one slide and within two minutes.
Textbook
Before 2004 most graduate courses on the ISM relied on the classic 1978 text by Lyman Spitzer. However, the fast pace of astrophysics left many parts of the book out-of-date, and for a while the concise book by Dyson & Williams (1997) was a popular alternative. Thankfully there are finally several new graduate-level ISM textbooks, and we will use one written by a true expert. We will use the text as a general guide to the topics covered during the semester. Since graduate coursework sometimes requires delving into material that goes beyond what is presented in the course textbook, here are some excellent alternative resources:

Draine (2011) Physics of the Interstellar Medium
Maciel (2013) Astrophysics of the Interstellar Medium

General Outline of the Course
The Galactic Ecosystem Chapter 1 (Tielens)
Gas Cooling & Heating Chapters 2 & 3 (Tielens)
Interstellar Grains and Molecules Chapters 5 & 6 (Tielens)
Phases of the ISM Chapter 8 (Tielens)
Radiatively-excited regions Chapter 7 (Tielens)
Photodissociation Regions Chapter 9 (Tielens)
Molecular Clouds Chapter 10 (Tielens)
Dynamics of the ISM Chapters 11 & 12 (Tielens)

Grading
Homework will be accepted up to 24 hours late, but with a 50% penalty. I plan to adopt the +/- grading system. The tentative distribution:
Presentations/reports (25%)
Online/paper/computer homework (50%)
Final exam/project (25%)

Just-in-Time Teaching
As alluded to above, we will use a technique that fosters better lecture preparation for both teacher and student. Each week there will be a question posed via email. It is your responsibility to respond by the due date.

Academic Honesty
Although you are encouraged to study together with other students, any assignments, exams, and lab submissions must be your own work unless you have been directed by your instructor to work together. The University of Wyoming is built upon a strong foundation of integrity, respect and trust. All members of the university community have a responsibility to be honest and the right to expect honesty from others. Any form of academic dishonesty is unacceptable to our community and will not be tolerated. Suspected violations of standards of academic honesty should be reported to the instructor, department head, or dean.

Special accommodations
If you have a physical, learning, or psychological disability and require accommodations, please let the instructor know as soon as possible. You must register with, and provide documentation of your disability to, University Disability Support Services in SEO, Room 330 Knight Hall. 766-6189, TTY: 766-3073
Expectations
Consider reading “A&S Students and Teachers—Working Together” found at www.uwyo.edu/as/_files/current/Students%20and%20Teachers%20Working%20Together.pdf. This useful set of guidelines was written by a faculty and student committee. It is a concise attempt to inform students of instructor expectations as well as what students may expect of teachers and advisors.

This syllabus is subject to change, and any changes shall be clearly communicated to the students.

What I expect from you:
- To attend and participate in each class meeting. It is your responsibility to obtain and understand the material presented, even if you are not in attendance due to illness or a University-sponsored activity.
- To make a good effort and to be prompt in completing assignments.
- To spend about 15 hours per week on this course. If you are spending more time than this, please see me so that we can ensure you spend your time efficiently.

What you should expect from me:
- To cover the material outlined.
- To administer multiple feedback questionnaires, to better gauge your needs.
- To encourage group learning in lecture with frequent conceptual questions to be discussed in small groups.
- To expeditiously grade and return your work.
## Tentative Class Schedule

<table>
<thead>
<tr>
<th>The Week Beginning on Monday</th>
<th>Topic (and readings)</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Aug 31                      | The Galactic Ecosystem (chapter 1) | Aug 31: Trail Mix Day  
Sep 02: National Beheading Day |
| Sep 07                      | (continued)          | Sep 07: Labor Day  
Sep 08: Date Nut Bread Day |
| Sep 14                      | Gas Cooling and Heating (chapters 2 & 3) | Homework #1 is due Sep 16  
Sep 15: Felt Hat Day |
| Sep 21                      | (continued)          | Sep 22: Hobbit Day  
The First Seven Minutes #1 |
| Sep 28                      | Interstellar Grains (chapters 5 & 6) | Homework #2 is due Sep 30  
Oct 03: Virus Appreciation Day |
| Oct 05                      | (continued)          | Oct 09: Moldy Cheese Day  
The First Seven Minutes #2 |
| Oct 12                      | HII Regions (chapter 7) | Homework #3 is due Oct 14  
Oct 14: Be Bald and Free Day |
| Oct 19                      | (continued)          | Oct 21: Babbling Day  
The First Seven Minutes #3 |
| Oct 26                      | The Phases of the ISM (chapter 8) | Homework #4 is due Oct 28  
Oct 28: Chocolate Day |
| Nov 02                      | (continued)          | Nov 04: Waiting for the Barbarians Day  
The First Seven Minutes #4 |
| Nov 09                      | Photodissociation Regions and Molecular Clouds (chapters 9 & 10) | Homework #5 is due Nov 11  
Nov 11: Air Day |
| Nov 16                      | (continued)          | Nov 19: Have a Bad Day Day  
The First Seven Minutes #5 |
| Nov 23                      |                       | Nov 27: Pins and Needles Day  
Nov 25-27: Thanksgiving Break |
| Nov 30                      | Interstellar Shocks and Dynamics of the ISM (chapters 11 & 12) | Homework #6 is due Dec 02 |
| Dec 07                      | (continued)          | Homework #7 is due Dec 18  
Dec 09: Pastry Day |
| Dec 14                      |                       | Finals Week |