

UNIVERSITY OF CALGARY  
DEPARTMENT OF PHYSICS and ASTRONOMY  
COURSE OUTLINE

1. **ASPH503, The Interstellar Medium**

L01: MWF, 15:00-15:50, ENA233

Instructor, D. Leahy, Office SB513, Tel. No. 402-220-7192, e-mail address leahy@ucalgary.ca, Office Hours: MW: 14:00-14:50

Blackboard course: ASPH 503 L01 (Fall 2010)

Departmental Office location SB605, telephone no. 403-220-5385

2. **PREREQUISITES:** Astrophysics 403

3. **GRADING:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments (6)	40%
Midterm test (2)	20% (in-class, Oct.15, Nov.10)
Final Examination	40% (To be scheduled by the Registrar)

In Asph 503 we are using: Percentage grades will be given for all elements of term work and examinations in Asph 503. A weighted course percentage will be calculated for each student after the final exam is written. A table of conversion from final course percentage to final course letter grade will be published on the Asph 503 Blackboard site later in the term.

4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

5. **TEXTBOOK:** "Physics and Chemistry of the Interstellar Medium ", Sun Kwok, University Science Books.

6. **EXAMINATION POLICY:** Generally, aids allowed on tests and examinations include a calculator. You will be notified before each test on whether that test is open book or not.] Students are encouraged to read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

Department Approval \_\_\_\_\_

Date

Oct 1 / 10

Associate Dean's Approval for  
out of regular class-time activity: \_\_\_\_\_

Date: \_\_\_\_\_

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

- (a) **ACADEMIC MISCONDUCT** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) to inform yourself of definitions, processes and penalties
- (b) **ASSEMBLY POINTS** in case of emergency during class time. Be sure to **FAMILIARIZE YOURSELF** with the information at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.
- (c) **ACADEMIC ACCOMMODATION POLICY.** Students with documentable disabilities are referred to the following links:  
Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>  
Disability Resource Centre: <http://www.ucalgary.ca/drc/>
- (d) **SAFEWALK:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **FREEDOM OF INFORMATION AND PRIVACY:** This course will be conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, **students should identify themselves on all written work by**

placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.

- (f) **STUDENT UNION INFORMATION:** VP Academic Phone: 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca).  
SU Faculty Rep. Phone: 220-3913 Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca) Website <http://www.su.ucalgary.ca/home/contact.html>.  
Student Ombudsman: <http://www.su.ucalgary.ca/services/student-services/student-rights.html>
- (i) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

Course Syllabus: Topics:

i. overview of the interstellar medium (ISM):

states of matter in the ISM  
interactions of stars and the ISM  
radiation in the ISM  
structure of the multiphase ISM

ii. radiation

fundamental concepts  
radiation transfer  
scattering and polarization  
measurement of radiation

iii. photoionization and recombination

the hydrogen atom; spectroscopic notation  
bound free transitions; recombination  
ionization nebulae  
the diffuse interstellar radiation field

iv. line radiation from atoms and ions

permitted and forbidden transitions  
fine structure and hyperfine structure  
spectral line formation  
line broadening  
recombination lines  
collisionally excited lines

v. continuum radiation

free-bound radiation; two-photon radiation  
free-free continuum  
electron scattering  
photoionized regions

vi. Interstellar molecules

molecular transitions  
electronic structure of molecules  
rotational and vibrational transitions

vii. interstellar grains

extinction; absorption and scattering  
dust emission; coupling between gas and dust  
composition of grains; optical properties  
carbonaceous grains  
origin of dust grains

viii. chemical reactions in the ISM (will be covered if time permits)

CO chemistry; cosmic ray ionization;  
grain-surface chemistry