

# ASTRONOMY 3302A: Astrophysics of Interstellar Space

## 2017-2018: fall term

### General Information

- **Lectures:**  
Tuesdays 9:30am–10:30am and Thursdays 9:30am–11.30am; Rm PAB 148
- **Instructor:**  
Prof. Els Peeters  
Rm 206 PAB  
phone: 661-2111 ext. 80973  
epeeters [at] uwo.ca
- **Office hours:**  
Mondays 1:30pm–2:30pm. I can also be reached immediately after class and during the week through e-mail for simple inquiries or to make an appointment. I will try to reply to e-mails within two working days of reception.
- **Teaching assistant:**  
Collin Knight  
cknigh24 [at] uwo.ca
- **Course website:**  
Sakai OWL: <http://owl.uwo.ca>
- **Texts, readings, materials:**
  - Recommended textbook: “The physics of the interstellar medium” by Dyson & Williams, 2nd ed. The textbook is on reserve in the Taylor Library.
  - Supplementary reading: Additional reading will be held on reserve in the Taylor Library or referenced on the course website.
    - \* Additional textbooks on reserve in the Taylor Library:  
“An Introduction to Modern Astrophysics” by B.W. Carroll & D.A. Ostlie, 2nd ed., 2007.  
“The Physics and Chemistry of the Interstellar Medium” by A. G. G. M. Tielens, 2005.
    - \* Additional textbook available on-line via the Taylor Library:  
“The Interstellar Medium” by J. Lequeux, 2005 (see course website: Links).

### Course Philosophy

The interstellar medium (ISM) is the “stuff between the stars” and includes cold and molecular gas as well as hot and ionized gas, dust grains, magnetic fields, radiation, and cosmic rays. The goal of this course is to understand how the interesting physics at play (including atomic, molecular, gas-phase, and gravitational physics) determines the energetics, composition, and structure of the ISM.

### Course Description

- **Calendar description:**  
The physics of interstellar space—the gas, dust, electromagnetic radiation, cosmic rays, and magnetic fields—present between the stars in a galaxy and between galaxies. Star formation, the interaction of

light and matter, and the physical processes that determine the properties, dynamics, and behavior of the interstellar medium.

Prerequisites: Physics 2101A/B, 2102A/B

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

- **Outline of topics covered:**

- Introduction to the ISM
- The Interaction of Light and Matter
- Microscopic Processes in the ISM
- Interstellar dust
- HII regions
- Gas dynamics
- Star formation

Course content may vary.

- **Course Learning Outcomes:** By the end of this course, students should have a basic understanding of the theory and observations that underpin current research of the Interstellar Medium. More specifically, students should be able to:

- Quantitatively describe the components that make up the interstellar medium and explain how these components are studied.
- Quantitatively describe, explain, and apply the interaction of radiation and matter.
- Quantitatively describe and apply the microscopic processes occurring in the interstellar medium, and explain how they determine the macroscopic properties of (components of) the interstellar medium.

- **Mark distribution:**

- Three assignments: 15%
- Two quizzes: 40%
- Final exam: 45%

In order to pass the course, you must attain a grade of at least 50% on the weighted average of the quizzes and the final exam. Unless you achieve this criterium, your maximum grade in this course will be 40%.

The Department of Physics and Astronomy may, in rare cases, adjust the final course marks in order to conform to Departmental policy.

Any errors, or appeals to your scores, must be reported to your instructor within two weeks of their initial posting.

- **Description of examinations:**

- Two 2-hour quizzes (short answers, essays and problems; closed book)
- One 3-hour final (short answers, essays and problems; cumulative; closed book)

## Course Calendar/Schedule

- Assignments are due *in class* on Sept. 26, Oct. 31, and Nov. 28.
- Quizzes: Thursdays Oct. 5 & Nov. 16 in class.
- Final exam: during the December exam period. Details to be announced.
- Last day to drop this course: November 12

## Course policies & friendly reminders from UWO:

- Students are expected to come to class prepared, to bring a calculator and to work through exercises (alone or in groups).
- The course website will be the only medium where course materials are distributed, announcements are made and where you can access your marks for various components of this course. It is your responsibility to check this website frequently.
- Assignments must be turned in at the requested date **in class**. Remember that clarity is essential for getting partial or full credit for problems. Please show all steps leading to your final answer. Finally, remember to include the appropriate units for any numerical answer and take care of the significant digits.
- A basic scientific calculator (e.g. the Sharp EL-510RB calculator used for first year physics courses) is allowed during the quizzes and exams but programmable calculators, smartphones, and smart-watches are **not** permissible for quizzes and exams.
- Assignments: Students will be allowed to discuss the material among them, **but each student will have to turn in her/his own copy of the assignment**. Assignments must be turned in at the requested date **in class**. However, a student may miss a due date once during the semester, and hand in the late assignment **during** the following class without incurring any penalty. Otherwise, for every day (i.e. 24hrs) for which they are late, assignments will automatically have a third of the maximum number of points subtracted from their total.
- Missed quizzes or final exam: Documentation must be provided to the Dean's Office in order for you to receive permission to write a make-up (see item on "medical or other serious circumstances" below). Note that if you fail to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination of a final exam normally will be the scheduled date for the final exam the next time the course is offered.

Students needing to make travel arrangements are advised to book a travel date after the end of the examination period. No make up exams will be given to accommodate travel!

- Accessibility: Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.
- Emotional/mental health distress: Students who are in emotional/mental distress should refer to Mental Health@Western (<http://www.uwo.ca/uwocom/mentalhealth/>) for a complete list of options about how to obtain help.

- Medical or other serious circumstances: If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately.

For UWO Policy on Accommodation for Medical Illness, see [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_illness.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf) (which includes a link to the Student Medical Certificate).

Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth 10% or more of their final grade must apply to the Academic Counseling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.

- Academic misconduct: Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:  
[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).
- Accommodation for students with disabilities: for the University's policy on accommodation, see [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_disabilities.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf).
- Religious holidays: for the University's policy on accommodation for religious holidays, see [www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf).

### **Advice for successful performance:**

This is a challenging class that will require you to apply many different types of physics in novel ways. You are advised to keep up with the course, participate in class, and work through the assignments to succeed in this course. If you encounter difficulties in doing the homework assignments, ask your fellow students, the TA or me for help.

Estimation of student workload: Expect to spend 10-15 hours (including class time) per week on this course alone.