

ASTRONOMY 3302A: Astrophysics of Interstellar Space 2021-2022

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.

List of 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.

Instructor:

Professor Els Peeters; epeeters@uwo.ca

Teaching assistant:

Kaylie Green; kgreen94@uwo.ca

Lectures:

In person; Tuesdays 9:30AM-10:20AM and Thursdays 9:30AM-11:20AM; Rm PAB 34

Office hours:

Online (Zoom); Tuesdays 10:30AM-11:00AM and Thursdays 11:30AM-12:00PM or by appointment

Contingency plan for an in-person class pivoting to 100% online learning:

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor. In the event that online learning is required, a stable internet connection with working microphone and webcam and a device that meets the system requirements for Zoom will be required. As has been the case in the past, the decision to pivot to online learning will be made by Western, and not individual instructors or departments (excepting temporary online instruction in the event of instructor illness).

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 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.
- Explain and illustrate how the interesting physics at play (including atomic, molecular, gas-phase, and gravitational physics) determines the energetics, composition, and structure of the ISM.

Outline of topics to be covered:

1. Introduction to ISM
2. Interaction of Light and Matter
3. Microscopic processes in the ISM
4. Interstellar dust
5. HII Regions

Course content may vary.

Texts, readings, materials:

Supplementary reading on reserve in the Taylor Library or referenced on the course website:

- 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.
- available on-line via the Taylor Library: "The Interstellar Medium" by J. Lequeux, 2005 (see course website: Links).

Calculator:

A basic scientific calculator (e.g. the Sharp EL-510RB calculator used for first year physics courses) is allowed during the midterm and the final exam but programmable calculators, smartphones, and smartwatches are not permissible for quizzes and exams.

Zoom:

Office hours will be held virtual via zoom. You can access Zoom from the course OWL site.

Gradescope:

Some assignments will be submitted to Gradescope, accessible from the course OWL site. Gradescope accepts pdfs, scans or photos of handwritten assignment pages. Marks and feedback on these assignments will be returned to the student via Gradescope.

Grading:

The overall course grade will be calculated as listed below:

Quiz 1	0%
Assignments (4)	40%
Midterm Exam (November 11, 2021)	25%
Final Exam (date TBD, Registrar's Office)	35%

In order to pass this course, you must obtain (1) a grade of at least 50% for the course grade (based on the weight distribution given) AND (2) a grade of at least 50% on the weighted average of the midterm and the final exam. If you fail to obtain a grade of 50% on either one, the lower value of the following two grades – your course grade (based on the weight distribution given) or a course grade of 45 – will be adopted as your final course grade.

Please note: The Department of Physics and Astronomy may, in exceptional cases, adjust the final course marks in order to conform to Departmental policy. Final grades will be rounded to the nearest integer, and grades ending in 9 (eg. 69) are not automatically “bumped up” by 1 mark.

Accommodated Evaluations

- Quiz 1: Quiz 1 is accessible for 14 days. You will need to obtain 100% on the quiz to access the course materials beyond week 1.
- Assignments: Assignments 1, 2, and 3 are due by 11:59pm on October 5, October 26, and November 30. A student may miss a due date of assignments 1, 2, and 3 *once* during the semester and submit the late assignment by 11:59pm on October 7, October 28, and December 2 respectively without incurring any penalty. No submissions will be accepted after the late submission deadline. Assignment 4 is due by 3pm on October 29. See Student Absence to receive permission for accommodations for assignments. If you received permission for absence of assignment 1 and/or 2, the weight of the assignment(s) will be added to the weight of the midterm exam. If you received permission for absence of assignment 3, the weight of the assignment will be added to the weight of the final exam. If you received permission for absence of assignment 4, contact the instructor to discuss a late submission date in November.
- Make-up Midterm and final exam: See Student Absence to receive permission to write a make-up. If you received permission for absence to the midterm, the missed midterm must be made up on November 19, 2021 from 2:00-3:50pm. If you received permission for absence for both the midterm and the make-up of the midterm, the weight of the midterm will be added to the weight of the final exam. If a student fails to write a scheduled Special Examination (final), the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered.

Friendly reminders:

- Students must use their Western (@uwo.ca) email addresses when contacting their instructors and TAs.

- You can contact the instructor or TA by email. We will try to respond to your email inquiry within two working days of reception.
- Students are responsible for checking OWL (<http://owl.uwo.ca>) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.
- All course material will be posted to OWL: <http://owl.uwo.ca>.
- Students are expected to come to class prepared, to bring a calculator and to work through exercises.
- If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Masking Guidelines

Students will be expected to wear triple layer, non-medical, paper masks at all times in the classroom as per University policy and public health directives. Students who are unable to wear a mask must seek formal accommodation through Western Accessible Education, and present medical documentation. Students are not permitted to eat or drink while in class to ensure masks stay in place. Students will be able to eat and drink outside of the classroom during scheduled breaks. Students unwilling to wear a mask as stipulated by Western policy and public health directives will be referred to the Dean, and such actions will be considered a violation of the student Code of Conduct.

Course Absences due to Daily COVID Screening Questionnaire

Missed assessments (e.g., presentations, essays, quizzes, tests, midterms, etc.) require formal academic considerations (typically self-reported absences and/or academic counselling). Methods for dealing with missed work and course content are at the discretion of the instructor(s). Students should be aware that some learning outcomes cannot be easily made up and may need to be completed in a subsequent year. Your instructor will provide you with further information as to how this applies within this course. Students who demonstrate a pattern of routinely missing coursework due to self-reported COVID symptoms, and therefore do not demonstrate mastery of the learning outcomes of the course, will not receive credit for the course.

Academic Consideration for Student Absences

Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to meet academic requirements may submit a request for academic consideration through the following routes:

- (i) Submitting a Self-Reported Absence (SRA) form provided that the conditions for submission are met. To be eligible for a Self-Reported Absence:
 - a. an absence must be no more than 48 hours
 - b. the assessments must be worth no more than 30% of the student's final grade
 - c. no more than two SRAs may be submitted during the Fall/Winter term
- (ii) For medical absences, submitting a Student Medical Certificate (SMC) signed by a licensed medical or mental health practitioner to the Academic Counselling office of their Faculty of Registration.
- (iii) Submitting appropriate documentation for non-medical absences to the Academic Counselling office in their Faculty of Registration.

Note that in all cases, students are required to contact their instructors within 24 hours of the end of the period covered, unless otherwise instructed in the course outline.

Students should also note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences that are not covered by the Self-Reported Absence Policy must be submitted to the Academic Counselling office of a student's Home Faculty.**

For the policy on Academic Consideration for Student Absences – Undergraduate Students in First Entry Programs, see:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_illness.pdf

and for the Student Medical Certificate (SMC), see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf.

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

<https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>.

Absences from Final Examinations

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a “Multiple Exam Situation” (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

Accommodation Policies

Students with disabilities work with Accessible Education (formerly SSD), which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at: [https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Only a basic calculator will be allowed on the midterm and final exam (no programmable calculator, smartwatch, smartphone etc.).

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 Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Tests and examinations in this course may be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>.

Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at (519) 661-2147 if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (<http://www.health.uwo.ca/mentalhealth>) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services>.