Western Science

Department of Physics and Astronomy

Astronomy 3302A: Astrophysics of Interstellar Space
Course Outline

1. Course Information

Course Information
Astronomy 3302A: Astrophysics of Interstellar Space

List of Prerequisites
Physics 2101A/B, 2102A/B
Unless you have either the prerequisites for this course or written special permission from the Department of Physics and Astronomy to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr. Els Peeters	epeeters@uwo.ca		80973	
TA TBD				

Students must use their Western (@uwo.ca) email addresses when contacting their instructors. We will try to respond to your email inquiry within two working days of reception.

Format office hours: in-person or zoom.

3. Course Syllabus, Schedule, Delivery Mode

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.

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. Phases of the ISM
5. Interstellar dust
6. HII Regions

Course content may vary.

Relevant Key Sessional Dates:

Classes begin: September 4, 2025
Fall Reading Week: November 3 – 9, 2025
Classes end: December 9, 2025
Exam period: December 11 – 22, 2025

4. Course 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 (see course website: Links):
  - 'The Physics and Chemistry of the Interstellar Medium' by A. G. G. M. Tielens, 2005
  - 'The Physics of the interstellar medium' by Dyson & Williams, 2020
  - 'Physics of the Interstellar and Intergalactic Medium' by B. Draine, 2011

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.

All course material will be posted to OWL: https://westernu.brightspace.com/

Students are responsible for checking the course OWL site (https://westernu.brightspace.com/) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Gradescope:
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.

Technical Requirements:
Access to a computer with a stable internet connection. In the event that classes have to go online, a device with working microphone and/or webcam will also be required.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments (best 3 of 4)	40%
Midterm Test	25%
Final Exam (cumulative)	35%

Assignments are due: Monday Sep 29, Tuesday Oct 21, Tuesday Nov 18, Tuesday Dec 2 at 9:30am
Midterm test: Thursday Oct 30 during class time.

Use of Generative AI Tools
The use of generative AI tools (e.g., ChatGPT, Copilot, Gemini) are **prohibited** for all assessments.

General information about missed coursework
Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs,* posted on the Academic Calendar:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Examinations scheduled during official examination periods (Defined by policy)
- Midterm (Designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration)

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

When a student misses 1 assignment, no accommodation is granted due to flexible completion (see below). When a student misses more than 1 assignment and their Academic Consideration has been granted (see below), these additional (2^{nd}, …) missed assignments will be reweighted to the final exam.

When a student misses the Midterm Test and their Academic Consideration has been granted, they will be allowed to write the Make-up Midterm Test. When a student misses the Midterm Test and the Make-up Midterm Test and their Academic Consideration has been granted in both cases, the Midterm Test will be reweighted to the final exam.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

Essential Learning Requirements
Even when Academic Considerations are granted for missed coursework, the following are deemed essential to earn a passing grade.

To ensure that students demonstrate sufficient mastery of the learning outcomes, students must obtain:

1. a grade of at least 50% over all course components

AND

2. a grade of at least 50% on the weighted average of the midterm test and the final exam

in order to pass this course. If you fail to obtain a grade of 50% on either one, this failing grade will be adopted as your final course grade. If you fail to obtain a grade of 50% on both, the weighted average of these failing grades 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.

Coursework with Assessment Flexibility
By policy, instructors may deny Academic Consideration requests for the following assessments with built-in flexibility:

Flexible Completion
Assignments. This course has 4 assignments, and the 3 assignments with the highest marks are counted towards your final grade. Should extenuating circumstances arise, students do not need to request Academic Consideration for the first missed assignment. Academic consideration requests will be denied for the first missed assignment. Academic Consideration requests may be granted when students miss more than 1 assignment, and these additional (2nd, 3rd, …) missed assignments will be reweighted to the final exam.

Deadline with a No-Late-Penalty Period
Assignments. Students are expected to submit each of the 4 assignments by the deadline listed. Should extenuating circumstances arise, students do not need to request Academic Consideration and they are permitted to submit their assignment up to 72 hours past the deadline without a late penalty. Otherwise, late problem sets (i.e. submitted after 72 hours past the deadline) will not be accepted even with Academic Consideration granted. Academic Consideration requests may be granted only for extenuating circumstances that started before the deadline and lasted longer than the No-Late-Penalty Period (72 hours).

6. Additional Statements

6.1 Religious Accommodation
When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays - https://www.edi.uwo.ca

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, 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.

6.3 General Academic Policies
The website for Registrar Services is https://www.registrar.uwo.ca/.

Use of @uwo.ca email: 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 email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as "appeals")

Policy on Request for Relief from Academic Decision:
https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:
https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

Tests and examinations in this course may be conducted using a remote proctoring service in the event of a health lockdown. 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.

6.5 Support Services

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

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

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

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. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counsellors at Learning Development and Success (https://learning.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.

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