

Astronomy 3303 – Galaxies Course Outline Fall 2024

1. Course Information

Course Information

Introduction to galaxies, including the Milky Way. Galaxy components and their variation with location, shape, and age; the distribution of galaxies in space and time; interpretation of observational data to derive physical properties of galaxies.

List of Prerequisites

Physics 2101A/B, Physics 2102A/B

Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) 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.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Prof. Els Peeters	epeeters@uwo.ca		x 80973	
TA Charmi Bhatt	cbhatt7@uwo.ca			

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

Office hours will be in-person unless otherwise arranged in advance.

3. Course Syllabus, Schedule, Delivery Mode

Course Learning Goals

By the end of this course, students should have a basic understanding of the theory and observations that underpin current research in galaxies and galaxy evolution. More specifically, students should be able to:

- Explain quantitatively how the three-dimensional structure of the Milky Way, the Local Group, and the large-scale distribution of galaxies is measured, and the results of those measurements.

- Quantitatively describe the components that make up galaxies, explain how these components are studied and their relation to galaxy morphological type.
- Compute properties of galaxies by combining observational data with physical laws.
- Describe the statistical distributions of integrated galaxy properties in the universe and explain how these properties have changed over cosmic time.

Outline of Topics

1. Galaxies in the Local Universe
 - The Milky Way and its satellites
 - The Hubble Diagram
2. Galaxy Structure
 - morphology: (thin and thick) disk, bulge, halo
 - globular cluster systems
 - interstellar medium and star formation
 - light distribution
 - dynamics of stars, gas, dark matter (rotation and random motions)
 - nuclei
 - stellar populations
 - scaling relations (Tully-Fisher, fundamental plane)
3. Distance Scale
4. Galaxy Populations
 - giant galaxies: spirals and ellipticals
 - dwarf ellipticals, dwarf spheroidals, dwarf irregulars
 - properties and environmental dependencies
5. Galaxy Environments
 - field
 - groups
 - clusters
 - large scale structure
6. Galaxy Evolution
 - changes with cosmic time
 - the active galactic nuclei phase
 - mergers

A detailed syllabus will be posted to the course OWL site. Course content may be adjusted over the course of the semester.

Key Sessional Dates

Classes begin: September 5, 2024

Fall Reading Week: October 12 – 20

Classes end: December 6, 2024

Exam period: December 9 – 22, 2024

4. Course Materials

Course Textbook

Sparke & Gallagher, *Galaxies in the Universe, An Introduction*, 2nd Edition, Cambridge University Press. We will use this text for reading assignments. You may use either the hard copy or online version. As needed, additional reading materials will be posted to the course website.

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.

Gradescope

Some assignments will be submitted to Gradescope, accessible from the course Brightspace site. Gradescope accepts pdfs, scans or photos of handwritten assignment pages. These will be accessed by the TA to grade, and marks and feedback will be returned to the student via Gradescope.

OWL

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.

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 5 of 6)	40%
Midterm Test (Oct 24; make-up Nov 7)	25%
Final Exam (cumulative)	35%

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:

1. **Examinations scheduled during official examination periods** (Defined by policy)
2. **Midterm Test** (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 (2nd, 3rd, 4th...) 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 6 assignments, and the 5 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, 4th...) 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 6 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

Religious Accommodation

When conflicts 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 or 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>.

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.

Academic Policies

The website for Registrar Services is <https://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 their official university address is attended to in a timely manner.

Only 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.

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:

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

In the event that classes have to go online, Tests and examinations in this course will be conducted using Zoom. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** 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.

Support Services

Please visit the Science & Basic Medical Sciences Academic Advising 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/>.

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 and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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. You may also wish to contact Accessible Education at

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

if you have any questions regarding accommodations.

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/>.