ASTR 511: Contemporary topics in observational extra-galactic astronomy

Department of Physics and Astronomy

Jan-April 2026

Instructor: Professor Sara Ellison
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Territory acknowledgement: We acknowledge and respect the Lək̓ʷəŋən (Songhees and Esquimalt) Peoples on whose territory the university stands, and the Lək̓ʷəŋən and W̱SÁNEĆ Peoples whose historical relationships with the land continue to this day.

Office hours: Tuesdays 2-3pm in Elliott 208 (or by appointment, in person or on Zoom)

Lecture delivery: This is an in-person lecture course. Regular attendance is expected (and necessary for optimal learning). Please contact the instructor if you expect to miss class (particularly if it will include dates with student-led components).

Lecture schedule: Monday and Thursday 2:30pm-3:50pm
Location:
Unit value: 1.5

Course goals/learning outcomes: This course aims to provide students with an understanding of modern research topics in the field of observational extragalactic astronomy. By the end of the course, students should 1) have a broad understanding of the methods used in modern observational extragalactic astronomy as well as the theory that underpins them; 2) be able to engage in meaningful discussions about topics of current interest; 3) have some detailed knowledge of recent research discoveries and questions of on-going interest; 4) gain some practical skill through an applied project.

Course description: The course is divided into two parts; the first part is based on lectures and content delivery, whilst the second part is a project. Although the first half of the semester is largely focused on lectures and the second half mostly focused on projects, both activities will occur during the semester. Students are referred to the detailed course schedule below so that they are prepared for tasks and deadlines.

Part 1. In the spirit of providing a modern review, the course is based on papers published in the Annual Review of Astronomy & Astrophysics (ARA&A) journal. Six papers are selected by the instructor to cover a range of topics that, together, give a good overview of research into different aspects of galaxy formation and evolution, both locally and at high redshift. The topic

of each ARA&A paper spans two lectures. In the first lecture on each topic, the instructor will provide a pedagogical introduction to the methods and requisite theory of the topic. The second lecture will present an overview of some of the important research results from the ARA&A paper, as presented by one of the paper's authors. It is recommended that students read the review paper in advance of each 2-lecture topic cycle. Links to papers can be found on Brightspace.

Also in Part 1, each student will be responsible for delivering one 20 minute lecture on a subject related to the course, selected from amongst topics provided by the instructor (Feb 9 + 12).

Part 2. Students will be introduced to the KILOGAS dataset and be provided with some project ideas. Students are also welcome to come up with their own projects. Project results will be presented both in class and in a written report. Important dates requiring student participation (come prepared!):
Feb 26 – Project brainstorm (students come with ideas to discuss with group. Slides optional)
Mar 9 – Project updates (students come with updates/slides, ~10-15 minutes each)
Mar 16 – Project updates (students come with updates/slides, ~10-15 minutes each)
Mar 23, 26 – Project presentations (3 per day, 20+5 minutes each)

Pre-requisites: None, although an undergraduate level of knowledge on galaxies is desirable (but not necessary).

Course calendar details:
UVic Important Dates: uvic.ca/calendar/dates/
Last day to add courses: Jan 21 2026
Last day to drop a course without penalty of failure: Feb 28 2026
Final Exam Period: April 7-22 2026 (not relevant for this course, since there is no final)

Detailed lecture schedule:
Jan 5: Lecture 1 of Salim & Narayanan (2020) - The dust attenuation law in galaxies.
Jan 8: Lecture 1 of Hickox & Alexander (2018) – Obscured active galactic nuclei

Sara away this week. The lectures are pre-recorded and will be presented/supervised in lcass by a substitute:
Jan 12: Lecture 2 of Salim & Narayanan (2020) - The dust attenuation law in galaxies.
Jan 15: Lecture 2 of Hickox & Alexander (2018) – Obscured active galactic nuclei

Jan 19: Lecture 1 of Saintonge & Catinella (2020) – The cold ISM of galaxies in the local universe.
Jan 22: Lecture 2 of Saintonge & Catinella (2020) – The cold ISM of galaxies in the local universe.

Jan 26: Lecture 1 of Sanchez (2020) – Spatially resolved spectroscopic properties of low redshift star forming galaxies.

Jan 29: Lecture 2 of Sanchez (2020) – Spatially resolved spectroscopic properties of low redshift star forming galaxies.

Feb 2: Project preparation: The ALMaQUEST survey and its results
Feb 5: Introduction to KILOGAS and MySQL

Feb 9: Student led lectures (x3)
Feb 12: Student led lectures (x3)

Feb 16-20 : Reading break

Feb 23: Mid-term
Feb 26: Project brainstorm session

Sara away this week. March 2 lecture will occur on Zoom. March 5 lecture is pre-recorded and will be supervised by a substitute:
Mar 2: Lecture 1 of Tumlinson, Peeples & Werk (2017) – The circumgalactic medium.
Mar 5: Lecture 2 of Tumlinson, Peeples & Werk (2017) – The circumgalactic medium.

Mar 9: Project updates and discussions
Mar 12: Lecture 1 of Forster-Schreiber & Wuyts (2020) – star-forming galaxies at cosmic noon

Mar 16: Project updates and discussion
Mar 19: Lecture 1 of Forster-Schreiber & Wuyts (2020) – star-forming galaxies at cosmic noon

Mar 23: Project presentations (x3)
Mar 26: Project presentations (x3)

Course materials:
Lecture slides and videos are available on Brightspace. It is recommended that you use these as a basis for your notes (they contain many figures) complemented by your own note taking. There is insufficient text on the lecture slides for them to be considered as lecture notes, so it is important that you make your own notes in class.

Assessment/evaluation: Marks are divided into the following components:

1) Dust attenuation law computational assignment, due Jan 19. 10%

2) Student-led lecture presentation (Feb 9 or 12). 20%

3) Mid-term. Written exam on content covered to date. In class on Feb 23. 20%

4) Participation/preparedness in project brainstorm and discussion sessions (Feb 26, Mar 9, Mar 16). 10%

5) Project presentation (March 23 or 26). 20%

6) Project write-up, due April 9. 20%.

UVic graduate grading system (As per the Academic Calendar):

Grade	Grade Point Value	Percentage*	Description	Achievement of Assignment Objectives
A+	9	90 – 100	Exceptional Work	Technically flawless and original work demonstrating insight, understanding and independent application or extension of course expectations; often publishable.
A	8	85 – 89	Outstanding Work	Demonstrates a very high level of integration of material demonstrating insight, understanding and independent application or extension of course expectations.
A-	7	80 – 84	Excellent Work	Represents a high level of integration, comprehensiveness and complexity, as well as mastery of relevant techniques/concepts.
B+	6	77 – 79	Very Good Work	Represents a satisfactory level of integration, comprehensiveness, and complexity; demonstrates a sound level of analysis with no major weaknesses.
B	5	73 – 76	Acceptable work that fulfills the expectations of the course	Represents a satisfactory level of integration of key concepts/procedures. However, comprehensiveness or technical skills may be lacking.
B-	4	70 – 72	Unacceptable work revealing some deficiencies in knowledge, understanding or techniques	Represents an unacceptable level of integration, comprehensiveness and complexity. Mastery of some relevant techniques or concepts lacking. Every grade of 4.0 (B-) or lower in a course taken for credit in the Faculty of Graduate Studies must be reviewed by the supervisory committee of the student and a recommendation made to the Dean of Graduate Studies. Such students will not be allowed to register in the next session until approved to do so by the Dean.
C+	3	65 – 69		
C	2	60 – 64		
D	1	50 – 59		

Course feedback. I value your feedback on this course. Towards the end of term, as in all other courses at UVic, you will have the opportunity to complete an anonymous **Course Evaluation Survey (CES)** regarding your learning experience. The survey is important for providing feedback to me regarding the course and my teaching, as well as to help the department

improve the overall program for students in the future. The survey is accessed online and can be done on your laptop, tablet, or mobile device. I will remind you and provide you with more detailed information nearer the time, but please be thinking about this important activity during the course.

Course policies:

Academic integrity and tri-faculty code of conduct: The instructors (lecture and lab) take conduct and academic integrity extremely seriously. UVic's Policy on Academic Integrity is found at uvic.ca/calendar/future/undergrad/index.php#/home. It is every student's responsibility to be aware of this policy, including policies on cheating, plagiarism, unauthorized use of an editor, multiple submission, and aiding others to cheat. If you have any questions or doubts, please talk to me. For more information, see uvic.ca/learningandteaching/cac.

Use of AI: Please be advised that in this course you are not authorized to use any form of generative AI. In order to successfully complete course activities, generative AI is not required nor welcomed. Students should not make any use of generative AI tools such as ChatGPT, Grammarly, among others that use AI for content generation and editing. As the University of Victoria states on its Academic Integrity Policy "Academic integrity requires commitment to the values of honesty, trust, fairness, respect, and responsibility." Therefore, I expect you to comply with the course syllabus and I encourage you to enhance your academic experience in this course by refraining from use of generative AI.

Collaboration: The points below summarize expectations based on the academic integrity policy:

- For the dust attenuation assignment you may not use any external functions (only basic numerical functions within numpy) in your code – it must be written by you (not by ChatGPT!) entirely from scratch. Please include a comment line in your code stating "All of the code submitted here is exclusively my own work."
- For the midterm, you must complete all work on your own without help from another person or from outside sources.
- For the preparation of your mini-lecture, discussion with classmates or other graduate students regarding the general content is permitted (and is likely to be helpful!). But the slide preparation must be your own and external content used on slides should be credited.
- For the research project (design, implementation, in-class presentations) you are *encouraged* to discuss with your classmates, in order to experience the collaborative nature of research, whilst leading the project yourself. The written report, however, must be entirely your own work and all text generation must be your own.

Note that it is an academic integrity violation and a violation of UVic policies about information technology to post material from this class to any online "homework help" site.

APPENDICES AND RESOURCES

DEPARTMENT OF PHYSICS AND ASTRONOMY INFORMATION

- **Department Website:** uvic.ca/science/physics/index.php
- **Department General Office:** physgen@uvic.ca
- **Department Undergraduate Advisor:** phast_advising@uvic.ca
- **Department Graduate Advisor:** pkovtun@uvic.ca
- **Department Graduate Program Assistant:** physgrad@uvic.ca

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UNIVERSITY STATEMENTS & POLICIES

- Academic Calendar: Information for All Students
- Creating a respectful, inclusive, and productive learning environment
- Accommodation of Religious Observance
- Accommodation and Access for Students with Disabilities
- Student Conduct
- Non-academic Student Misconduct
- Accessibility
- Diversity / EDI
- Equity Statement
- Sexualized Violence Prevention and Response
- Discrimination and Harassment Policy

STUDENT RESOURCES

POSITIVITY AND SAFETY

The University of Victoria is committed to promoting, providing, and protecting a positive and safe learning and working environment for all its members.
Student Groups & Resources

ACADEMIC RESOURCES

UVic Library - *UVic Library offers many services and resources for undergraduate and graduate students.*
uvic.ca/students/academics/library-services
Learning Resources - *UVic Learn Anywhere is the primary learning resource for students that offers many learning workshops and resources to help students with academics and learning strategies.*
onlineacademiccommunity.uvic.ca/uviclearn/
Centre for Academic Communication - *Offers online and in-person one-on-one tutorials, workshops, and more.*
uvic.ca/learningandteaching/cac
Physics Aid Service – *Addresses problems with conceptual understanding, difficulties encountered with homework assignments, preparation for mid-term and final exams, and occasionally even preparation for external exams such as the MCAT. Instruction may be one-to-one or in small groups, with emphasis placed on engaged interaction between the students and the instructor.*
https://www.uvic.ca/science/physics/current/undergraduate/pas/index.php

MENTAL HEALTH & WELLNESS

A note to remind you to take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, getting enough sleep, and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone.

Student Wellness Centre - *Our team of practitioners offers a variety of services to support students' mental, physical, and spiritual health.*
uvic.ca/student-wellness

Counselling Services - *Counselling Services can help you make the most of your university experience. They offer free professional, confidential, inclusive support to currently registered UVic students.*
uvic.ca/student-wellness

Health Services - *University Health Services (UHS) provides a full-service primary health clinic for students and coordinates healthy student and campus initiatives.*
uvic.ca/student-wellness

ACCESSIBILITY

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a documented disability or health consideration that may require accommodations, please feel free to approach me and/or the Centre for Accessible Learning (CAL) as soon as possible.

Centre for Accessible Learning - *The CAL staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.*
uvic.ca/accessible-learning

ADVISING

For academic advising-related questions, students in the Department of Physics & Astronomy are also encouraged to meet with the Undergraduate Advisor (phast_advising@uvic.ca) as well as an academic advisor in the Academic Advising Centre early in their studies to help map out a plan to declare a major and complete university program requirements.

Academic Advising Centre - *Academic advice and support is currently available by phone, email and virtual or in-person appointments*. uvic.ca/services/advising

Ombudsperson - *The ombuds office is an independent, impartial, and confidential resource for undergraduate and graduate students and other members of the University of Victoria community. The ombudsperson helps resolve student problems or disputes fairly.* uvicombudsperson.ca

ACADEMIC CONCESSION

You can request an academic concession if your course requirements are affected by unexpected and unavoidable circumstances, or conflicting responsibilities. Concession requests can be for an in-course extension, deferral, withdrawal under extenuating circumstances, or an aegrotat. Please speak to an advisor at the Academic Advising Centre if you have questions on how requesting a concession will affect your academic program.

Undergraduate Academic Concessions - uvic.ca/students/academics/academic-concessions-accommodations

EQUITY AND HUMAN RIGHTS AT UVIC

EQHR is a resource for students, staff, and faculty who have experienced sexualized violence, discrimination, and/or harassment and are looking for informal and/or formal resolution options as well

as advice, coaching, and/or education. We are available for confidential consultations so that you can ask questions and learn your options.
EQHR – By email at eqhr01@uvic.ca or in-person (Sedgewick C115). uvic.ca/equity
Sexualized Violence Resource Office – *If you have been directly or indirectly impacted by sexualized violence, reach out to the SVRO for information, advice, and resolution options (restorative and disciplinary) as well as support options and referrals. The SVRO is both survivor-centred and trauma-informed in their approach. You can reach us by phone at 250-721-8021 or by email at eqhr01@uvic.ca to book either an in-person (Sedgewick C119) or online appointment.* uvic.ca/sexualizedviolence

RESOURCES FOR INTERNATIONAL STUDENTS
International Centre for Students - *The primary office supporting international students on campus at the university-wide level*. uvic.ca/international-experiences
UVic Global Community Initiative - *Provides various supportive programming, including a Mentorship Program and Conversation Partner Program*. uvic.ca/international-experiences/get-involved/uvic-global-community

RESOURCES FOR INDIGENOUS STUDENTS
Indigenous Student Support - *UVic offers holistic services to Indigenous students throughout their academic journey.* uvic.ca/students/info-for/indigenous-students
Elders in Residence - *The Office of Indigenous Academic and Community Engagement (IACE) has the privilege of assembling a group of Elders from local communities to guide students, staff, faculty, and administration in Indigenous ways of knowing and being.* uvic.ca/iace/