



COURSE OUTLINE

1. **Course:** ASPH 307, Introduction to Observational Astrophysics - Winter 2023

Lecture 01 : TR 09:30 - 10:45 in SB 142

Instructor	Email	Phone	Office	Hours
Dr Philip Langill	pplangil@ucalgary.ca	403 220-5402	SA 101B	See Below

To account for any necessary transition to remote learning for the current semester, courses with in-person lectures, labs, or tutorials may be shifted to remote delivery for a certain period of time. In addition, adjustments may be made to the modality and format of assessments and deadlines, as well as to other course components and/or requirements, so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff).

In Person Delivery Details:

In-person lectures will be delivered according to the schedule posted by the Registrar's Office. The midterm exam will also be in-person.

Re-Entry Protocol for Labs and Classrooms:

To limit the spread of COVID-19 on campus, the University of Calgary has implemented safety measures to ensure the campus is a safe and welcoming space for students, faculty and staff. The most current safety information for campus can be found [here](#).

Course Site:

D2L: Asph307W23 Observational Astrophysics

Note: Students must use their U of C account for all course correspondence.

1) The optimal day/time(s) that students are available to attend Dr. Langill's office hours will be established at the beginning of the semester in lecture with feedback from students.

2) Data acquisition via RAO telescopes and detectors is done remotely from campus, with students working in groups. Scheduling will be required, and details will be provided in lecture.

3) Students will be provided with the software they need to analyze their astronomical data acquired with RAO telescopes and detectors. These programs are accessed through the UCIT Virtual Machine environment. Access details will be provided in lecture.

4) One component of this course will be a small data analysis exam worth 4%. This will occur at the end of the course before the final exam period, and some scheduling will be required to make sure students have all the VM resources they need. Details will be discussed in lecture.

Equity Diversity & Inclusion:

The University of Calgary is committed to creating an equitable, diverse and inclusive campus, and condemns harm and discrimination of any form. We value all persons regardless of their race, gender, ethnicity, age, LGBTQIA2S+ identity and expression, disability, religion, spirituality, and socioeconomic status. The Faculty of Science strives to extend these values in every aspect of our courses, research, and teachings to better promote academic excellence and foster belonging for all.

The Physics and Astronomy EDI Committee acknowledges there are persistent barriers that prevent such accessibility and hinder our progress towards EDI. Our representatives (faculty, postdocs, graduate and undergraduate students) are committed to addressing any concerns and work towards proactive solutions that enact necessary change within the department. To submit anonymous questions, comments or concerns regarding EDI related issues, please reach out to our Associate Head EDI, Claudia Gomes da Rocha (claudia.gomesdarocho@ucalgary.ca)

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

Prerequisite(s):

Astrophysics 213 or 305.

Antirequisite(s):

Credit for Astrophysics 307 and 507 will not be allowed.

3. Grading:

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar.

In determining the overall grade in the course the following weights will be used:

Course Component	Weight	Due Date (duration for exams)	Modality for exams	Location for exams
Assignments	20%	Ongoing		
Observing Projects	36%	Ongoing		
Teammate Evaluation	2.5%	Ongoing		
Data Analysis Final	4%	Ongoing		
Midterm Exam	17.5%	Feb 28 2023 at 09:30 am (60 Minutes)	in-person	In Class
Registrar Scheduled Final Exam	20%	Will be available when the final exam schedule is released by the Registrar	in person	Will be available when the final exam schedule is released by the Registrar

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Minimum % Required	92 %	85 %	80 %	75%	70%	65 %	60 %	55%	50%	45 %	40 %

This course will have a Registrar Scheduled Final exam that will be delivered in-person and on campus. [The Final Examination Schedule](#) will be published by the Registrar's Office approximately one month after the start of the term. The final exam for this course will be designed to be completed within 2.5 hours.

The University of Calgary offers a [flexible grade option](#), Credit Granted (CG) to support student's breadth of learning and student wellness. Faculty units may have additional requirements or restrictions for the use of the CG grade at the faculty, degree or program level. To see the full list of Faculty of Science courses where CG is not eligible, please visit the following website: <https://science.ucalgary.ca/current-students/undergraduate/program-advising/flexible-grading-option-cg-grade>

4. Missed Components Of Term Work:

The university has suspended the requirement for students to provide evidence for absences. Please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations.

In the event that a student legitimately fails to submit any online assessment on time (e.g. due to illness etc...), please contact the course coordinator, or the course instructor if this course does not have a coordinator to arrange for a re-adjustment of a submission date. Absences not reported within 48 hours will not be accommodated. If an excused absence is approved, one possible arrangement is that the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course. This option is at the discretion of the coordinator and may not be a viable option based on the design of this course.

5. **Scheduled Out-of-Class Activities:**

There are no scheduled out of class activities for this course.

Students will; (i) develop an understanding of telescopes, instruments, and detectors; (ii) become familiar with interpreting astronomical data using reduction and analysis methods, simulations and model fitting, data and error analysis.

Observations will be carried out at the Rothney Astrophysical Observatory and/or on the main UC campus, in the evening hours after sunset, when weather conditions allow.

An optional field trip to the RAO will be organized for a date near the beginning of the semester.

6. **Course Materials:**

Required Textbook(s):

Frederick R. Chromey, *To Measure the Sky: An Introduction to Observational Astronomy 2nd Ed*: Cambridge.

In order to successfully engage in their learning experiences at the University of Calgary, students taking online, remote and blended courses are required to have reliable access to the following technology:

- A computer with a supported operating system, as well as the latest security, and malware updates;
- A current and updated web browser;
- Webcam/Camera (built-in or external);
- Microphone and speaker (built-in or external), or headset with microphone;
- Current antivirus and/or firewall software enabled;
- Stable internet connection.

For more information please refer to the UofC [ELearning](#) online website.

7. **Examination Policy:**

Non-communicating calculators are allowed during the midterm and final exam. Other resources may be allowed, as discussed in lecture.

Students should also read the Calendar, [Section G](#), on Examinations.

8. **Approved Mandatory And Optional Course Supplemental Fees:**

There are no mandatory or optional course supplemental fees for this course.

9. **Writing Across The Curriculum Statement:**

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

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10. **Human Studies Statement:**

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

11. **Reappraisal Of Grades:**

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

- a. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **ten business days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall submit the Reappraisal of Graded Term work [form](#) to the department in which the course is offered within 2 business days of receiving the decision from the instructor. The Department will arrange for a reappraisal of the work within the next ten business days. The reappraisal will only be considered if the student provides a detailed

rationale that outlines where and for what reason an error is suspected. See sections [I.1](#) and [I.2](#) of the University Calendar

- b. **Final Exam:**The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

12. Other Important Information For Students:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Services:** For more information, see their [website](#) or call [403-210-9355](#).
- c. **Sexual Violence:** The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email (svsa@ucalgary.ca) or phone at [403-220-2208](#). The complete University of Calgary policy on sexual violence can be viewed [here](#).
- d. **Student Ombuds Office:** A safe place for all students of the University of Calgary to discuss student related issues, interpersonal conflict, academic and non-academic concerns, and many other problems.
- e. **Student Union Information:** [SU contact](#), Email your SU Science Reps: science1@su.ucalgary.ca, science2@su.ucalgary.ca, science3@su.ucalgary.ca,
- f. **Academic Accommodation Policy:**

It is the student's responsibility to request academic accommodations according to the University policies and procedures listed below. The student accommodation policy can be found at: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Student-Accommodation-Policy.pdf>

Students needing an accommodation because of a disability or medical condition should communicate this need to Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities: <https://www.ucalgary.ca/legal-services/sites/default/files/teams/1/Policies-Accommodation-for-Students-with-Disabilities-Procedure.pdf>.

Students needing an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, by filling out the [Request for Academic Accommodation Form](#) and sending it to Dr. David Feder by email phas.ahugrd@ucalgary.ca preferably 10 business days before the due date of an assessment or scheduled absence.

- g. **Misconduct:** Academic integrity is the foundation of the development and acquisition of knowledge and is based on values of honesty, trust, responsibility, and respect. We expect members of our community to act with integrity. Research integrity, ethics, and principles of conduct are key to academic integrity. Members of our campus community are required to abide by our institutional [Code of Conduct](#) and promote academic integrity in upholding the University of Calgary's reputation of excellence. Some examples of academic misconduct include but are not limited to: posting course material to online platforms or file sharing without the course instructor's consent; submitting or presenting work as if it were the student's own work; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; borrowing experimental values from others without the instructor's approval; falsification/fabrication of experimental values in a report. Please read the following to inform yourself more on academic integrity:

[Student Handbook on Academic Integrity](#)
[Student Academic Misconduct Policy](#) and [Procedure](#)
[Faculty of Science Academic Misconduct Process](#)
[Research Integrity Policy](#)

Additional information is available on the [Student Success Centre Academic Integrity page](#)

- h. **Copyright of Course Materials:** All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by

law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law.

- i. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). Students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information, see [Legal Services](#) website.
- j. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

Course Goals:

Most people think that astronomers simply use telescopes to make dazzling images of things in space. But this course teaches students that a fancy picture is not the goal. All we know about the universe; how big stars are and how far away they are and what they are made of and how old they are and how they are born and how they die, and the physical properties of planets and galaxies and the universe - we know because we collect and study the light that arrives at our telescopes and detectors.

The UCalgary Rothney Astrophysics Observatory is a laboratory filled with the modern tools astronomers use to collect and study light from space, across the electromagnetic spectrum. In this course, students collect data to make measurements. To estimate uncertainty in those measurements students require a solid understanding of the instruments employed, the data analysis process, statistical arguments, and error propagation. After much work a measurement is in hand including its estimated uncertainty, and from that, conclusions are drawn about the phenomena being studied.

Teamwork:

Students taking this course will learn many of the details involved in this entire process of astronomical investigation and discovery. As students will need to work in small groups to accomplish the long list of tasks they are challenged with in this course, this is an opportunity to hone communication and collaborative skills. Accountability to your teammates is part of the evaluation process. Details of this evaluation process will be discussed in lecture.

Course Learning Incomes:

Students entering this course have taken a math-based introductory astrophysics course, or equivalent. Thus, basic concepts such as the magnitude system, astronomical and geological coordinate systems, telescope optics and mounting systems, observable properties of stars, and the constituents of the solar system and Milky Way galaxy are familiar. Mathematical skills are important at all levels of one's undergraduate pursuits in physics, and this course is no exception. Familiarity in geometry, algebra, and calculus are advantageous skills for students coming into this course.

Syllabus:

A wide range of topics will be discussed in this course. These include, but are not restricted to;

- Brief review of astronomical basics
- Aspects of light and matter
- Measurements, statistics, and uncertainty
- Optics, telescopes, and filters
- CCDs, spectrographs, and other detectors
- Digital image processing

Projects:

There are observationally based projects to be done, in Teams of students, this semester. The topics will be outlined in the lectures. The level of effort involved will vary from one project to the next. The total weight of the projects is 36%.

Course Outcomes:

- Examine how complex optical systems, from telescopes to spectrographs, function
- Examine how specialized astronomical filters (griz, Johnson, Ha, 1420 MHz) and precision photometric arrays (CCDs), work and are applied to different data acquisition methodology

- Learn and apply fundamental data analysis software tools and techniques to remove instrumental defects and reduce noise.
- Learn and attempt to apply advanced data analysis methods such as image stacking, deconvolution, Fourier transform filtering, etc.
- Gain insight into error analysis and error propagation, quantifying signal to noise ratio, and planning ahead to produce the highest quality data possible in the gathering process
- Become proficient in three keys areas of observational astrophysics; Photometry, Astrometry, and Spectroscopy

Electronically Approved - Jan 03 2023 17:14

Department Approval