



REVISED COURSE OUTLINE FOR REMOTE LEARNING

To account for the necessary transition to remote learning from March 13 onward, adjustments have been made to assessment deadlines and requirements so that all coursework tasks are in line with the necessary and evolving health precautions for all involved (students and staff). If you are unable to meet the deadlines or requirements specified, please connect with your course instructor to work out alternative dates/assessments.

1. **Course:** ASPH 307, Introduction to Observational Astrophysics - Winter 2020

Lecture 01: TR 09:30 - 10:45 - Remote Learning (check with your instructor or coordinator for details)

Instructor	Email	Phone	Office	Hours
Dr Philip Langill	pplangil@ucalgary.ca	403 220-5402	SA 101B	1:30 - 2:30 pm, Tuesdays and Thursdays

Course Site:

D2L: Asph307W20 - Intro to Observational Astrophysics

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

2. **Requisites:**

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

Prerequisite(s):

Astrophysics 213 or 305; one of Physics 211, 221, 227 or Engineering 202; and one of Physics 255, 259 or 323. Also known as: (formerly Astrophysics 507)

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:

Component(s)	Weighting %	Date
Assignments	20	
Observing Projects	36	
Teammate Evaluation	2.5	
Midterm Exam	17.5	
Final Exam	24	due 11:30 AM, Friday April 24th (open 48hrs prior)

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 %

NOTE: Students who attain a combined weighted average grade, on the midterm and final exams, of less than 40% should not expect to receive a course letter grade above a D.

4. **Missed Components Of Term Work:**

The University has suspended requirements for students to provide evidence for reasons for absences so please do not attend medical clinics for medical notes or Commissioners for Oaths for statutory declarations. Please let your instructor know immediately if you are ill and cannot meet the deadlines specified.

Missed components of term work receive a zero grade without exception. This includes late assignments. If a

documented valid reason for missed work is provided a solution will be offered that may include transfer of weight or an opportunity to finish the work at a later date at the discretion of the instructor. Such accommodation will only be considered if the request is made at the earliest possible opportunity.

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.

6. Course Materials:

Required Textbook(s):

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

7. Examination Policy:

Non-communicating calculators will be 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.

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 Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see www.ucalgary.ca/wellnesscentre or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. 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](tel:403-220-2208).
- d. **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/ fabrication of experimental values in a report. **These are only examples.**
- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the procedure for accommodations for students with disabilities available at [procedure-for-accommodations-for-students-with-disabilities.pdf](#).

Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head of the Department of Physics & Astronomy, Dr. David Feder by email phas.ahugrd@ucalgary.ca or phone 403-220-8127. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.

- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). 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.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: sciencerep@su.ucalgary.ca. [Student Ombudsman](#), Email: ombuds@ucalgary.ca.
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **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.

- I. **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.

Course Goals:

Most people think that all astronomers do is use telescopes to make cool 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 UC's 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 3 major projects to be done, in Teams of 4 students, this semester. The biggest involves CCD images taken with the RAO-BN telescope, to search for and study asteroids. The smallest involves processing CCD images in 3 filters acquired with the 1-meter telescope at the Cerro-Tololo InterAmerican Observatory, to study objects not viewable from the RAO. The medium project involves spectroscopic studies of various targets using the RAO-CMT-Echelle system. The weights of these projects are 16%, 12%, 8% for a total of 36%.

Final Exam:

The final exam will be an open-book, take-home, exam. The question set will be distributed to students 48 hours before the scheduled end-time of the exam (the original end-time of the exam set by the Registrar's Office, which is 11:30 AM, Friday April 24th). Student's completed exams need to be returned electronically by this due date/time. More details will be provided in lectures. It carries a weight of 24% toward the final grade.

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

Electronically Approved - Mar 23 2020 15:53

Department Approval

Electronically Approved - Mar 24 2020 11:39

Associate Dean's Approval for alternate final examination arrangements or remote learning