UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Physics & Astronomy
Science B 605
403 220-5385
phasoffice@ucalgary.ca

COURSE OUTLINE

1. **Course:** ASPH 305, Introduction to Astrophysics - Fall 2020

   Lecture 01: MWF 11:00 - 11:50 - Online

Instructor	Email	Phone	Office	Hours
Dr Rene Plume	rplume@ucalgary.ca	contact via email only	SB 517	W - 9-10am

Online Delivery Details:

Some aspects of this course are being offered in real-time via scheduled meeting times. For those aspects you are required to be online at the same time.

1) **All lectures are pre-recorded** and you can watch them in your own time, at your own pace. The **lectures are all located on D2L in the "Pre-recorded Lectures"** section under the "Content" menu item. The lectures vary in length but I tried to keep them all to between 20-30 minutes to reduce the "boredom factor".

2) **One class per week will be LIVE via ZOOM**. This will be a Q&A tutorial in which you can ask questions and I will attempt to answer them via an electronic whiteboard. This live tutorial will be **every Wednesdays at 11am - noon** (a normally scheduled class time). Attendance is NOT mandatory, simply sign in if you have questions or just want to listen. **Connection info is given on D2L in the "Weekly ZOOM Tutorial"** section under the "Content" menu item.

Course Site:

D2L: ASPH 305 L01-(Fall 2020)-Introduction to 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):
3 units from Physics 211, 221, 227 or Engineering 202; and 3 units from Mathematics 267 or 277. Also known as: (formerly Astrophysics 213)

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 %
Assignments (4) (due dates on D2L)	40
Lab #1 - Sky & telescope Familiarization (due date on D2L)	10
Lab #2 - Data Processing & Analysis (due date on D2L)	20
Midterm Test (Wednesday, Oct 28, 202: 11am - noon)	10
Final Exam (Scheduled by Registrar's office - TBA)	20

Each of the above components will be given a letter grade using the official university grading system (see section F.1.1). The final grade will be calculated using the grade point equivalents weighted by the percentages given above and then converted to a final letter grade using the official university grade point equivalents.

This course has a registrar scheduled final exam.

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, then the percentage weight of the legitimately missed assignment could also be pro-rated among the components of the course.

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

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

6. **Course Materials:**

   Recommended Textbook(s):

   Karttunen, H., Kröger, P., Oja, H., Poutanen, M., Donner, K.J. ,*Fundamental Astronomy 6th edition*: Springer.

7. **Examination Policy:**

   All exams will be closed book exams. Formulae sheets will be provided as part of the exam material. Any kind of calculator is allowed (even programmable ones).

   Exams are meant to be done individually without communication or help from other students or outside resources. I rely on your honour as a student to adhere to these rules.

   The midterm exam will be done online, through D2L on Wednesday, Oct 28 from 11am to noon.

   The final exam (date TBA) will be a "take home" exam which you will have 24 hours to complete. The start time will be determined by the registrar's office.

   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:** For more information, see www.ucalgary.ca/wellnesscentre 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 at (https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf)

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. **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.

f. **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.

g. **Student Union Information:** VP Academic, Phone: 403-220-3911 Email: suvpaca@ucalgary.ca. SU Faculty Rep., Phone: 403-220-3913 Email: sciencerep@su.ucalgary.ca. Student Ombudsman, Email: ombuds@ucalgary.ca.

h. **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 SYLLABUS

- Part 1 - Introduction & Coordinate Systems

Students are expected to work with different celestial coordinate and time keeping systems.

- Part 2 -Telescopes & Detectors

Students are expected to know different types of telescopes used throughout the electromagnetic spectrum, and apply concepts of angular resolution, the effect of the atmosphere and optical aberrations, limiting magnitude, and detector technology.

- Part 3 - Parallax & Proper Motion

Students are expected to convert between angular size and actual size using distance, and relate spatial motion to proper motion and radial velocity.

- Part 4 -The EM Spectrum & Photometric Concepts

Students are expected to apply basic concepts of electromagnetic radiation as a wave phenomenon and as the primary tool of observational astrophysics. Key aspects are concepts of flux and luminosity, the Planck spectrum, Doppler shift, apparent and absolute magnitudes, colour indices, bolometric magnitude, and absolute and differential interstellar extinction. Students are expected to apply these concepts in relation to radiative transfer of electromagnetic waves through matter.

- Part 5 - Radiation Mechanisms

Students are expected to understand spectral line and continuum radiation. Specific applications include the Planck spectrum in relation to physical properties of stars, energy levels of the hydrogen atom, physics of spectral line formation, absorption lines and emission lines, measurement techniques for spectra, and Kirchhoff's laws.

- Part 6 -The Sun & Stars

Students are expected to understand basic physical processes of the Sun and other stars. These include structure, hydrostatic equilibrium, convection, stellar atmospheres, nuclear fusion as a source of energy, stellar activity, spectral classification of stars, luminosity classes and surface gravity, theoretical and observational Herzsprung-Russell diagram, the main sequence and evolves stars, and the stellar initial mass function.

- Part 7 - Celestial Mechanics

Students are expected to understand concepts of orbital motion, and apply Newtons' laws of mechanics and gravity to astrophysical situations. Key aspects are orbital motion and Kepler's laws, relate orbital velocity to mass of a central object, relate orbital velocity to escape velocity, orbital motion of objects with similar mass, spectroscopic binaries, and single-line spectroscopic binaries with application to extra-solar planets. Specific to stars and star formation, students should be able to understand and apply the virial theorem and Jeans mass of a gravitationally bound system of particles.

- Part 8 - Star Formation & Stellar Evolution

Students are expected to understand the physical relation between the interstellar medium and stars, and the origin of chemical elements in the cosmos. These subjects include the formation of stars from interstellar clouds, formation of proto-planetary disks, nuclear fusion in stars, evolution of solar mass stars and of massive stars, and synthesis of the heaviest nuclei through the s-process and the r-process.

Course Outcomes:

- Students will apply quantitative measures of intensity and flux density to astrophysical objects in relation to black body radiation and transitions between discrete energy levels in atoms.
- Students will analyze the radiative transfer in a uniform layer of gas as a function of opacity in the context of spectral lines and interstellar extinction.
- Students will apply the principles of orbital mechanics related to Kepler's laws for the 2-body system of arbitrary masses, and the Virial theorem.
- Students will describe the topology and kinematics of the universe in terms of a projection on the celestial sphere, and apply methodologies to inverse this projection.

Electronically Approved - Aug 23 2020 17:51

Department Approval