UNIVERSITY OF CALGARY
FACULTY OF SCIENCE

Department of Physics & Astronomy
Science B 605
403 220-5385
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COURSE OUTLINE

1. **Course:** ASPH 509, High Energy Astrophysics and Cosmology - Winter 2024

Lecture 01 : MWF 15:00 - 15:50 in ST 128

Instructor	Email	Phone	Office	Hours
Dr. Jeroen Stil	jstil@ucalgary.ca	403 220-8015	SB 519	Wednesdays, 10am-12pm

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:

This is an in-person course. Lecture recordings will be made available on D2L if technology permits. There will be no for-credit activities during the lectures. Attendance of lectures in-person or live through Zoom is recommended but not required. There are no midterm exams in this course. The term project (see Section 12 of this course outline) serves as a significant and personalized assessment of student's understanding of high-energy astrophysics. The final exam will include topics from the set sections of the textbook, lectures and the assignments. If this course is required to go on-line, office hours will be scheduled through Zoom **at a different time** (to be announced if the need arises).

Course Site:

D2L: ASPH 509 L01-(Winter 2022)-High Energy Astrophysics and Cosmology

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

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.gomesdarocha@ucalgary.ca)

2. **Requisites:**

See section 3.5.C in the Faculty of Science section of the online Calendar.

Prerequisite(s):
Astrophysics 401 and Physics 343.

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 (3)[1]	21%	Ongoing		
Quiz 1	15%	Jan 31 2024		
Quiz 2	15%	Feb 16 2024		
Quiz 3	15%	Mar 25 2024		
Registrar Scheduled Final Exam[2]	34%	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

[1] Tentatively due January 24, February 26, and April 1 at 23:59 Calgary time.

[2] The duration of the final exam is 2 hours. All exams are cumulative and closed-book

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	93 %	85 %	80 %	75%	70%	65 %	60 %	55%	50%	45 %	40 %

The course percentage grade is calculated as the weighted mean of the course components. This percentage grade will then be converted into a letter grade by application of the conversion table, subject to the requirement to receive a sufficient grade for the final exam.

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 hours.

Those who start early may benefit from guidance by the instructor and the TA for the assignments. Those who leave work until the last moment must realize that they must work independently and that they will be competing with others for the time that the instructor and the TA are available.

If the weighted average of midterm 1 (with weight 20/70), midterm 2 (with weight 20/70) and the final exam (with weight 30/70) is less than 40%, the letter grade for the course will not be higher than a D+, irrespective of the over-all weighted percentage grade of the course.

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:**

In the event that a student legitimately fails to submit any online or in-person assessment on time (e.g. due to illness, domestic affliction, 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, or possible exemption and reweighing of components. Absences not reported within 48 hours will not be accommodated. Students may be asked to provide supporting documentation (Section M.1) for an excused absence, See FAQ.

If an excused absence is approved, options for how the missed assessment is dealt with is at the discretion of the coordinator or course instructor. Some options such as an exemption and pro-rating among the components of the course may not be a viable option based on the design of this course.

Missed components of course work receive a zero grade by default. Requests for accommodation must be made promptly.

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

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

6. **Course Materials:**

Required Textbook(s):

Stephan Roswog and Marcus Brueggen, *Introduction to High-Energy Astrophysics*: Cambridge.

Hand-written lecture notes will be scanned and posted on D2L after the lectures. The course notes alone will not be sufficient to be successful in ASPH 509. Students are expected to study related sections of the textbook along with the lectures. The instructor may post links to open-access on-line resources that will then become part of the required course material.

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:**

The final exam and in-class quizzes are closed-book. The final exam and quizzes may include among others, derivations, calculations, or interpretation of observational data or simulations. The final exam is cumulative. It may draw from all sections of the textbook, lecture notes, assignments and quizzes. The quizzes will be more focused, but major topics from earlier in the course are expected to be known.

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.

Grading of all course components will depend on clarity, completeness, conciseness and structure of the response. Minor spelling or grammatical errors will not be considered in the grading.

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 a s 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 (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.

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.

1. If you need assistance.

Questions about course material can be asked immediately after class, during office hours, or by appointment. **Email to the instructor is strictly for issues related to the organization of the course, or to book an appointment.** Questions about course material cannot be effectively answered by email. Please do not send scanned notes by email.

The instructor will make an effort to remain after the lectures until all questions have been answered. Questions can also be raised at office hours or at another time by appointment.

2. Assignments

Assignments will be a mix of written assignments and on-line assignments administered through TopHat. All assignments will be posted on D2L in the folder Assignments, and announced by email. Assignments are designed to support learning of the course material. This may include raising questions before the due date of the assignment. Students are strongly encouraged to review an assignment when it is posted, because last-minute questions may be impossible to accommodate. Timing of the assignments depends on the progression of the lectures.

3. TopHat

We use TopHat (https://tophat.com) for some assignments. We will not use TopHat during lectures. The TopHat course name is **ASPH509W2024**, **join code 099720**. TopHat is available at no charge to students at the UofC. Registration is required. Students should be registered in TopHat by Monday, January 15, 2024.

4. Quizzes

Quizzes will be closed-book written tests during class time on January 31, February 16, and March 25. The quizzes will review set topics, testing proficiency in the use of technical terms, understanding of physical processes and ability to perform relevant calculations.

5. Course syllabus

We will only cover some sections of Chapters 2 and 3 as those chapters contain some material covered in prerequisite courses that are left for independent review, if necessary. In particular Sections 3.1-3.6 are deemed to be covered in ASPH 305 and ASPH 403. In the lectures we will cover the following:

Chapter 2.1: Collisions

Chapter 2.4: The equations of fluid dynamics

Chapter 2.6: Bernoulli's equation

Chapter 2.7: Shock waves

Chapter 2.8: Shock acceleration

Chapter 2.9: Fluid instabilities

Chapter 3.7: Radiation from moving charges (physics essentials and results)

Chapter 3.8: Individual radiation processes (physics essentials and results)

The following chapters cover specific high-energy phenomena. We will cover

Chapter 4: Supernovae with emphasis on supernova remnants

Chapter 5: Neutron stars, pulsars and magnetars

Chapter 5: Added topic: Fast Radio Bursts (course notes only)

Chapter 8: Active Galactic Nuclei (added topic: galaxy clusters)

Chapter 6: Compact Binary systems and accretion. We will cover this topic last, time permitting.

Course Outcomes:

- Develop a knowledge base of theories, concepts and models with the area of high energy astrophysics.
- Collect and critically evaluate quantitative and qualitative information.
- Use well established methods to develop different approaches to problem solving.
- Formulate arguments based on concepts, information and theories and communicate them in writing and orally
- Apply knowledge in a variety of contexts, including new situations.

Electronically Approved - Jan 05 2024 09:51

Department Approval