

# PHYS 4201/5401 for Term Winter 2025

Astrophysics

We, the people of the Faculty of Science at Carleton University, acknowledge that our campus is located on the traditional, unceded territories of the Algonquin Anishinabeg people. Miigwetch for your hospitality and stewardship of this territory and the teachings that come from it. We are grateful for this land, the air that we breathe, and the water that sustains us all as well as for the animals, plants and other living beings: these enable us to research, teach, mentor, support, study, and learn. We recognize our responsibility to our natural environment and to reconciliation with Indigenous peoples.

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**Course Instructor:** Prof. Simon Viel

**How to address me:** by first name

**Gender Pronouns:** (he/him)

**Email:** [sviel@physics.carleton.ca](mailto:sviel@physics.carleton.ca)

N.B. Please include “PHYS4201” or “PHYS5401” in the email subject line.

If you have a question or would like to talk with me, you can send an email, visit me during student hours (see below), or approach me after lecture.

**Student Hours:** Weekly TBA, and by appointment (send me an email)

**N.B.** Because of research travel, there will be no class on Thursday March 6, 2025

**Office Location:** HP 3370

**Class Location:** Please check Carleton Central for the room location.

**Class Times:** Tuesdays and Thursdays, 8:35 – 9:55 am

**Prerequisites:** PHYS 3701, PHYS 3606/3608, and PHYS 2401 or PHYS 4409, or permission of the Department.  
(PHYS 3606/3608 and PHYS 4409 may be taken concurrently)

**Preclusions:** Cross-listed, PHYS 4201 precludes PHYS 5401 and vice versa.

**Department/Unit:** Physics

**Course TAs:** TBA

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## Topics Covered

**Official course description:** Stellar evolution, including stellar modeling, main sequence stars, red giants and the end states of stars such as neutron stars and black holes. Galactic structure and dynamics. Neutrino astrophysics.

The primary course content is that of Chapters 1 to 7 of the textbook. Supplementary material will be provided in the lectures and course notes.

Topic	Textbook Chapter
Introduction	1
Stars: Basic Observations	2
Stellar Physics	3
Stellar Evolution and Stellar Remnants	4
Star Formation and the Interstellar Medium	5
Extrasolar Planets	6
The Milky Way and Other Galaxies	7
Neutrino Astrophysics and Dark Matter	10 + Extra material

*Important dates and deadlines can be found here:*

<https://carleton.ca/registrar/registration/dates/academic-dates/>, including class suspension for fall, winter breaks, and statutory holidays.

## Assessments

COMPONENT	GRADE VALUE
ASSIGNMENTS	50 %
MIDTERM	15 %
FINAL EXAM	35 %

Research about learning strongly suggests that **the most important factor in learning is doing the work** of reading, writing, recalling, practicing, synthesizing, and analyzing. Learning happens best when people actively engage material on a consistent basis, and that is why we have high standards in this course. We are confident that, with appropriate effort, you all can meet those standards.

### ***Requirements for Undergraduate and Graduate Students***

This course is offered at the undergraduate and graduate level, with different requirements. Additional questions may be assigned to graduate students on assignments and exams.

### ***Assignments (50%)***

Five sets of written homework problems will be assigned during the term. They will be due one week after they are assigned. Each assignment is expected to require at most 10 hours of work. **All the material you need to solve them will have been presented in class:** online searches are discouraged. If you have any questions, please send me an email or visit me during student hours.

You are encouraged to study together, and write separately. **The work you hand in must be your own.** Replicated / copied / plagiarized assignments (this includes AI-generated answers) will receive a grade of zero.

Grade flexibility: Each student's homework assignment with the lowest percentage grade (except for disciplinary reasons) will not be considered when calculating the contribution of homework assignments to the final grade.

### ***Midterm Exam (15%)***

The midterm exam will be during the regular lecture period on **Tuesday February 25, 2025**. This exam will be closed book and closed notes.

If the final exam percentage grade is higher than the midterm exam grade, then the midterm exam will receive a percentage grade equal to that of the final exam. The final exam is expected to be harder than the midterm exam, so do not rely on this!

### ***Final Exam (35%)***

There will be a 3-hour written final exam, during the final examination period in April 2025. The final exam will be closed book and closed notes. **The final exam is a requirement** to successfully complete this course.

## **Late and Missed Work Policies**

### **Late Work**

Late work will not necessarily be accepted and may result in a grade of zero. It is your responsibility to **email the instructor** ahead of the deadline to request an extension. It is also possible to use the [academic considerations form](#).

### **Missed Work**

*Short-term (5 days or less):* For assignments, please see the above statement on late work. There will be no deferred midterm exam; if the midterm exam is missed, then the midterm exam will receive a percentage grade equal to that of the final exam.

*Long-term (> 5 days):* Please email the instructor, or use the [longer-term accommodation request form](#).

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## Learning Materials

Learning Material	Options for Purchasing	Approximate Cost
Textbook: Astrophysics in a Nutshell, 2 <sup>nd</sup> ed. by Dan Maoz	University Bookstore, Online, etc.	\$119.00 (new, hardcover)

While students often find that reading the textbook is an essential part of learning the course material, **students are not required to purchase textbooks or other learning materials for this course.**

Course notes will be posted on Brightspace. The course notes are protected by **copyright**: they are for your own educational use, but you are *not* permitted to share them.

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## Academic Accommodations and Regulations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes are outlined on the Academic Accommodations website (<https://students.carleton.ca/course-outline/>).

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here: <https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

### Statement on Artificial Intelligence Usage

The use of large-language models and generative AI for assignments is prohibited.

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.

### Statement on Academic Integrity

Students are expected to uphold the values of academic integrity, which include fairness, honesty, trust, and responsibility. Examples of actions that compromise these values include but are not limited to plagiarism, accessing unauthorized sites for assignments or tests, unauthorized collaboration on assignments or exams, and using AI tools such as ChatGPT when your assessment instructions say it is not permitted.

Misconduct in scholarly activity will not be tolerated and will result in consequences as outlined in [Carleton University's Academic Integrity Policy](#). A list of standard sanctions in the Faculty of Science can be found [here](#).

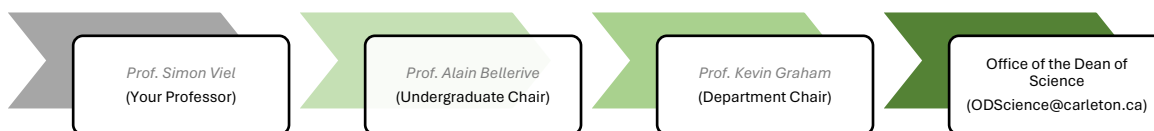
Additional details about this process can be found on the [Faculty of Science Academic Integrity website](#). Students are expected to familiarize themselves with and abide by [Carleton University's Academic Integrity Policy](#).

### **Student Rights & Responsibilities**

Students are expected to act responsibly and engage respectfully with other students and members of the Carleton and the broader community. See the [7 Rights and Responsibilities Policy](#) for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

### **Student Concerns**

If a concern arises regarding this course, **your first point of contact is me**: Email or drop in during student hours and I will do my best to address your concern. If I am unable to address your concern, the next points of contact are (in this order):



**Note:** You can also bring your concerns to [Ombuds services](#).