ASTR 1P01/02: Introduction to Astronomy I/II

Brock University, Fall 2025 / Winter 2026

Prof. Barak Shoshany

Course overview

ASTR 1P01 and ASTR 1P02 are two parts of a comprehensive introduction to astronomy at the undergraduate level. In these courses we will learn about many fascinating and exciting topics in astronomy, including:

- The history of astronomy,
- The night sky,
- Light and telescopes,
- Orbits and gravity,
- The Earth, the Moon, and the Sun,
- The Solar System,
- Stars and galaxies,
- Black holes, curved spacetime, and general relativity,
- Dark matter and dark energy,
- Cosmology and the Big Bang, and
- Life beyond Earth.

The courses are offered twice a year:

- Fall/Winter term:
  - Fall (D2): ASTR 1P01, two sections: LEC (in-person lectures) and ASO (asynchronous online with on-campus exams).
  - Winter (D3): ASTR 1P02, two sections: LEC (in-person lectures) and ASO (asynchronous online with on-campus exams).
- Spring term:
  - First Half (D2): ASTR 1P01, ASO (asynchronous online with on-campus exams) section only.
  - Second Half (D3): ASTR 1P02, ASO (asynchronous online with on-campus exams) section only.

IMPORTANT: The exams in ASTR 1P01/02 are all given IN PERSON, even for the online sections. To be perfectly clear, being in the online section does not mean you can take exams online under any circumstances. There will be absolutely no exceptions to this rule.

Both ASTR 1P01 and 1P02 are intended as science credits for students of all majors, and as such, they do not have any physics or math prerequisites. We will learn all relevant physics and math concepts as needed throughout the term, with emphasis on conceptual rather than technical understand-

ing. Students who did not take physics or math in high school might need to work a little bit harder, but not harder than in any other course. Students are usually able to get good grades regardless of their background knowledge.

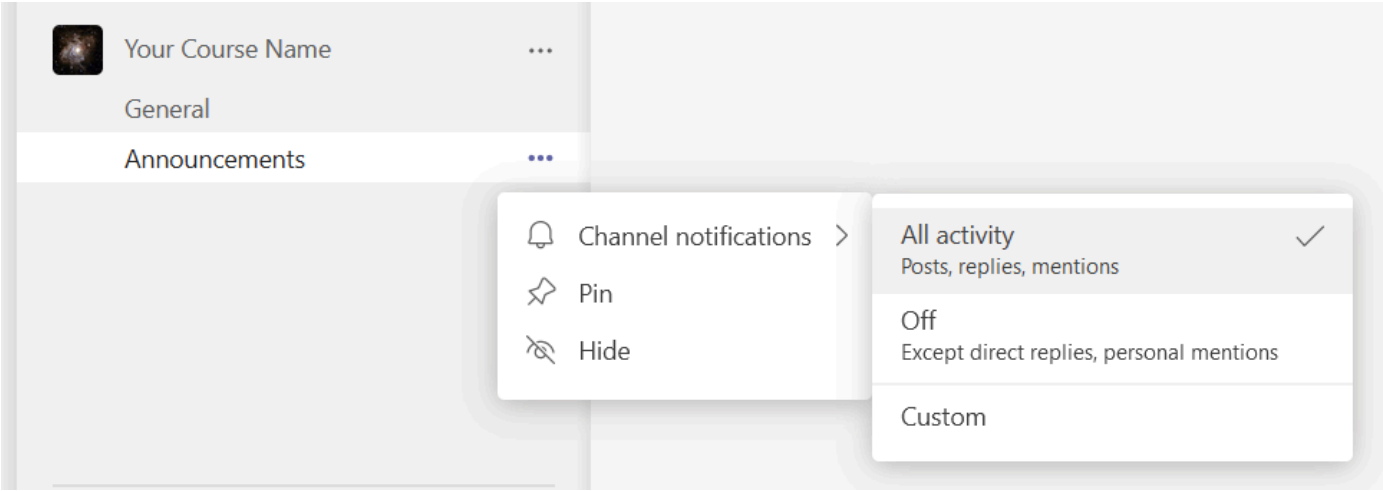
ASTR 1P02 is a direct continuation of ASTR 1P01, and relies on it for crucial background knowledge of many important concepts in astronomy. Therefore, students **must** take ASTR 1P01 before taking ASTR 1P02. However, they do not have to be taken consecutively in the same term. No exceptions will be made; if you did not take ASTR 1P01, you will **not** be able to take ASTR 1P02.

Please note that the online (ASO) sections are asynchronous, meaning that there are no scheduled lectures. Students are expected to study the material on their own time, by watching the recorded lecture videos and reading the textbook. If you prefer to attend regularly scheduled lectures, please make sure to take the course in the Fall/Winter term and register for the in-person (LEC) section.

The two courses, ASTR 1P01 and ASTR 1P02, are combined into a single course website (but not Teams site) for convenience, because ASTR 1P02 is a continuation of ASTR 1P01, and most students tend to take both courses consecutively. **However, please note that they are still two separate courses, and you need to register for each course separately!**

Obviously, if you are only registered for one of the courses, then any information specific to the other course, such as lectures or exams, does not apply to you. If you are only enrolled in one of the courses, then you do not need to take the exams for the other course. **Please make sure you know which course(s) you are enrolled in.**

IMPORTANT: Announcements from the professor, containing crucial information and ongoing updates about the course, will be posted throughout the term on Microsoft Teams , in the "Announcements" channel. To make sure you get notified of these announcements, please go to the course Teams site, click on the three dots to the right of "Announcements", then go to "Channel notifications" and choose the option "All activity", as shown in this screenshot:



Please also bookmark the course Teams site in your browser, install Teams on your phone, and enable notifications on the phone app!

It is your responsibility to follow the announcements and read all of them thoroughly on a regular basis. No accommodations will be made for students who fail to satisfy the course

requirements due to not reading the professor's announcements!

The official textbook for both ASTR 1P01 and 1P02 is OpenStax Astronomy, 2nd edition . However, please note that **the professor's lectures are the main source of material** in both courses, and the exams will be based on the lectures, not the textbook. There may be some material that appears in the lectures but not in the textbook, and vice versa. The textbook is only meant to be a bonus study resource for students who want extra practice or to delve deeper into the material.

Course syllabus

The course website also doubles as the course syllabus. If you need the syllabus in PDF format, simply click here to print it and choose "Save to PDF".

About the professor

The professor for this course is Dr. Barak Shoshany (ħe/ħim). I did my BSc in mathematics and physics at Tel Aviv University in Israel and my MSc and PhD at Perimeter Institute for Theoretical Physics in Waterloo, Ontario. I then taught at the University of Toronto for a short time. I joined Brock University as Assistant Professor in September 2020, and I also regularly teach scientific computing at McMaster University .

I am a theoretical, mathematical, and computational physicist. My research focuses on the nature of time and causality in general relativity and quantum mechanics, as well as symbolic and high-performance scientific computing. I'm always happy to talk about my research, and theoretical physics in general, so please feel free to ask me about it, both in and out of class!

I also love teaching. I developed 10 full-term undergraduate and graduate courses from scratch since 2020, including 5 physics courses, 3 astronomy courses, 1 scientific computing course, and 1 mathematics course. My devotion to teaching won me the Brock University Faculty of Mathematics & Science Award for Excellence in Teaching in 2023.

When I'm not teaching or doing research, I love composing music, playing video games, board games, and tabletop role-playing games, and reading or watching science fiction and fantasy. Please see my personal website for details on my research, teaching, talks, media interviews, music compositions, and more.

I love teaching astronomy to non-majors because it's a field of science that anyone can get excited about, and be amazed by, regardless of background. I hope I am able to make you as excited about astronomy as I am! 😊

About the TA

The TA for this course is Alessandro Pisana. Alessandro received his BSc in Physics from the Università degli Studi di Padova in Italy, where he also obtained his MSc in Physics of the Fundamental

Interactions. During his studies, he spent a year at Aix-Marseille University in France, studying Loop Quantum Gravity. Alessandro joined Prof. Shoshany's research group at Brock University as a PhD student in the fall of 2022. His interests include quantum entanglement, tensor networks, and loop quantum gravity. He is currently working on mathematical aspects of general relativity. Alessandro will be happy to answer any questions you may have on the course, and may be contacted at astr@brocku.ca .

Schedule and lectures

Both ASTR 1P01 and 1P02 have two sections: an in-person (LEC) section (~500 students) and an online (ASO) section (~1100 students). Please make sure you know which section you are in!

- The in-person section will attend the lectures in person at the **David S. Howes Theatre** (DHOWES), according to the schedule below.
  - Students in the online section who wish to attend the in-person lectures may do so only if there are seats available, on a first-come-first-serve basis.
- The online section will watch previously recorded lecture videos **online on YouTube**.
  - All lectures were recorded during the Fall 2022 and Winter 2023 terms, and are posted on Prof. Shoshany's YouTube channel . Direct links to the videos, as well as the slides used in the lectures, are available below.
  - **IMPORTANT:** Although old lectures by another professor may be found on YouTube, only the new lectures recorded by Prof. Barak Shoshany are relevant for this course. Please make sure you only watch the correct lectures!
  - **Online students should follow the progress of the in-person lectures.** Every week, the professor will post an announcement on Teams to inform everyone which units (or parts of units) were covered that week. Online students should then watch the recordings of the same units.

Each course will have 12 weeks of 2 lectures each, for a total of 24 lectures and 36 hours. Note that classes at Brock end 10 minutes ahead of the hour or half hour. The lecture schedule is as follows:

ASTR 1P01

ASTR 1P01 will take place during the Fall (D2) 2025 term, from September 3 to December 2, 2025. The deadline for withdrawal without academic penalty is November 4. For the in-person section only, there will be two 1.5-hour lectures every week:

- Tuesdays 16:00-17:30,
- Wednesdays 16:00-17:30.

The following lectures will be canceled:

- Tuesday, September 30, due to National Truth and Reconciliation Day. There will be a makeup lecture on Wednesday, December 3 at the usual time and place.
- Tuesday, October 14 and Wednesday, October 15, due to Reading Week.

In total, we will have 24 lectures and 36 lecture hours. For your convenience, here is the full list of lecture days, times, and locations:

- **Lecture 1:** Wednesday, September 3, 2025, 16:00-17:30, DHOWES
- **Lecture 2:** Tuesday, September 9, 2025, 16:00-17:30, DHOWES
- **Lecture 3:** Wednesday, September 10, 2025, 16:00-17:30, DHOWES
- **Lecture 4:** Tuesday, September 16, 2025, 16:00-17:30, DHOWES
- **Lecture 5:** Wednesday, September 17, 2025, 16:00-17:30, DHOWES
- **Lecture 6:** Tuesday, September 23, 2025, 16:00-17:30, DHOWES
- **Lecture 7:** Wednesday, September 24, 2025, 16:00-17:30, DHOWES
- (Tuesday, September 30: National Truth and Reconciliation Day)
- **Lecture 8:** Wednesday, October 1, 2025, 16:00-17:30, DHOWES
- **Lecture 9:** Tuesday, October 7, 2025, 16:00-17:30, DHOWES
- **Lecture 10:** Wednesday, October 8, 2025, 16:00-17:30, DHOWES
- (Tuesday, October 14 and Wednesday, October 15: Reading Week)
- **Lecture 11:** Tuesday, October 21, 2025, 16:00-17:30, DHOWES
- **Lecture 12:** Wednesday, October 22, 2025, 16:00-17:30, DHOWES
- **Lecture 13:** Tuesday, October 28, 2025, 16:00-17:30, DHOWES
- **Lecture 14:** Wednesday, October 29, 2025, 16:00-17:30, DHOWES
- **Lecture 15:** Tuesday, November 4, 2025, 16:00-17:30, DHOWES
- **Lecture 16:** Wednesday, November 5, 2025, 16:00-17:30, DHOWES
- **Lecture 17:** Tuesday, November 11, 2025, 16:00-17:30, DHOWES
- **Lecture 18:** Wednesday, November 12, 2025, 16:00-17:30, DHOWES
- **Lecture 19:** Tuesday, November 18, 2025, 16:00-17:30, DHOWES
- **Lecture 20:** Wednesday, November 19, 2025, 16:00-17:30, DHOWES
- **Lecture 21:** Tuesday, November 25, 2025, 16:00-17:30, DHOWES
- **Lecture 22:** Wednesday, November 26, 2025, 16:00-17:30, DHOWES
- **Lecture 23:** Tuesday, December 2, 2025, 16:00-17:30, DHOWES
- **Lecture 24:** Wednesday, December 3, 2025, 16:00-17:30, DHOWES (makeup for National Truth and Reconciliation Day)

ASTR 1P02

ASTR 1P02 will take place during the Winter (D3) 2026 term, from January 5 to April 3, 2026. The deadline for withdrawal without academic penalty is March 5. For the in-person section only, there will be two 1.5-hour lectures every week:

- Tuesdays 16:00-17:30,
- Fridays 16:00-17:30.

The following lectures will be canceled:

- Tuesday, February 17 and Friday, February 20, due to Reading Week.
- Friday, April 3, due to Good Friday. There will be a makeup lecture on Monday, April 6 at the usual time and place.

In total, we will have 24 lectures and 36 lecture hours. For your convenience, here is the full list of lecture days, times, and locations:

- **Lecture 1:** Tuesday, January 6, 2026, 16:00-17:30, DHOWES
- **Lecture 2:** Friday, January 9, 2026, 16:00-17:30, DHOWES
- **Lecture 3:** Tuesday, January 13, 2026, 16:00-17:30, DHOWES
- **Lecture 4:** Friday, January 16, 2026, 16:00-17:30, DHOWES
- **Lecture 5:** Tuesday, January 20, 2026, 16:00-17:30, DHOWES
- **Lecture 6:** Friday, January 23, 2026, 16:00-17:30, DHOWES
- **Lecture 7:** Tuesday, January 27, 2026, 16:00-17:30, DHOWES
- **Lecture 8:** Friday, January 30, 2026, 16:00-17:30, DHOWES
- **Lecture 9:** Tuesday, February 3, 2026, 16:00-17:30, DHOWES
- **Lecture 10:** Friday, February 6, 2026, 16:00-17:30, DHOWES
- **Lecture 11:** Tuesday, February 10, 2026, 16:00-17:30, DHOWES
- **Lecture 12:** Friday, February 13, 2026, 16:00-17:30, DHOWES
- (Tuesday, February 17 and Friday, February 20: Reading Week)
- **Lecture 13:** Tuesday, February 24, 2026, 16:00-17:30, DHOWES
- **Lecture 14:** Friday, February 27, 2026, 16:00-17:30, DHOWES
- **Lecture 15:** Tuesday, March 3, 2026, 16:00-17:30, DHOWES
- **Lecture 16:** Friday, March 6, 2026, 16:00-17:30, DHOWES
- **Lecture 17:** Tuesday, March 10, 2026, 16:00-17:30, DHOWES
- **Lecture 18:** Friday, March 13, 2026, 16:00-17:30, DHOWES
- **Lecture 19:** Tuesday, March 17, 2026, 16:00-17:30, DHOWES
- **Lecture 20:** Friday, March 20, 2026, 16:00-17:30, DHOWES
- **Lecture 21:** Tuesday, March 24, 2026, 16:00-17:30, DHOWES
- **Lecture 22:** Friday, March 27, 2026, 16:00-17:30, DHOWES
- **Lecture 23:** Tuesday, March 31, 2026, 16:00-17:30, DHOWES
- (Friday, April 3: Good Friday)
- **Lecture 24:** Monday, April 6, 2026, 16:00-17:30, DHOWES (makeup for Good Friday)

Contact information

Unfortunately, as this is a very large class (up to 1,600 students each term!), the professor is unable to answer individual emails from students. Therefore, students are asked not to contact the professor directly. Instead, students should do as follows:

Non-personal questions

All **non-personal** questions related to the course, whether about the material, schedule, logistics, exams, or anything else, should be posted publicly on Microsoft Teams , in the General channel. I promise to answer your question as soon as possible.

There are several reasons for asking you to post your question on Teams:

- Posting questions publicly on Teams allows other students to see the questions and benefit from the answers.
- Creating new posts on Teams encourages other students to add their own followup questions and triggers valuable discussions about the subject matter that would not have happened

otherwise.
- There is a very large number of students in this course, and posting your non-personal questions publicly on Teams means the professor and the TA won't have to answer the same question multiple times.

IMPORTANT: In my experience, many of the questions asked by students throughout the term already have answers either on the course website or in Teams discussions and announcements. Therefore, before you ask a question, please check if perhaps it already has an answer on this website or on Teams - that way, you won't have to wait for a response.

Personal questions

All **personal** questions involving private information that cannot be posted publicly on Teams, such as grades, accommodations, missed exams, or medical issues, should be sent to **the TA** at astr@brocku.ca .

If you email the TA, please make sure to do so from your Brock email account, not from your personal account, since otherwise they have no way to verify your identity. The TA will not be able to communicate with you if you contact them from your non-Brock email.

The TA is in charge of all the logistics of the course, and this allows me to devote more time to answering your questions about the material on Teams and preparing the lectures, practice questions, and exams. If the TA decides that your email requires my attention, they will contact me on your behalf.

Online student interface

This course has an online student interface. You can log in with your student number and the password provided on Brightspace under "Grades". The student interface currently has the following features:

1. **AI chat:** Chat with Albert AInstein, your trusty AI assistant! He can answer any questions you may have about the course material, and help you study for the exams.
2. **Exam booking:** Book a time slot for the on-campus computer exams. Will open about a week before each exam.
3. **Exam feedback:** If you took an exam, you can see your grade and which questions you got wrong, along with the correct answers. This will only be available at the end of the term.

You can access the online student interface at this link during the term.

Lecture videos, slides, and practice questions

The following lectures were recorded during Fall 2022 and Winter 2023 terms, but they are the correct lectures to be watched by the online sections this term and in any future terms. For your convenience, the lectures are also available as a YouTube playlist .

The slides used in each lecture are also posted here. However, please note that some slides have been updated since then (e.g. typos were fixed) and may not exactly match the slides in the recordings.

Some of the videos are currently marked as drafts. They are complete lectures, containing all of the material, but will gradually be replaced with non-draft versions once I finish editing them and verifying them for accuracy. You may wish to subscribe to my YouTube channel and click on the notification bell to be notified as soon as a new video is uploaded.

Note: Each of the following "units" refers to a video recording and slides that encompass multiple in-person lecture sessions.

- **ASTR 1P01:**
  - Unit 1: Introduction - video | slides | practice questions
  - Unit 2: Looking up to the sky - video | slides | practice questions
  - Unit 3: Ancient astronomy - video | slides | practice questions
  - Unit 4: Astrology (and why it's nonsense) - video | slides | practice questions
  - Unit 5: Modern astronomy - video | slides | practice questions
  - Unit 6: Newtonian physics - video | slides | practice questions
  - Unit 7: Astronomy & Earth - video | slides | practice questions
  - Unit 8: The solar system
    - Video: Part 1 ; parts 2 and 3 are draft versions and may be found in the YouTube playlist
    - Slides
    - Practice questions
  - Unit 9: The Sun
    - Video: Draft version may be found in the YouTube playlist
    - Slides
    - Practice questions
  - Unit 10: Objects in the solar system
    - Video: Draft version may be found in the YouTube playlist
    - Slides
    - Practice questions
- **ASTR 1P02:**
  - Unit 11: How stars shine
    - Video: Draft version may be found in the YouTube playlist
    - Slides
    - Black on White Slides
    - Practice questions
  - Unit 12: Starlight
    - Video: Draft version may be found in the YouTube playlist
    - Slides
    - Black on White Slides
    - Practice questions

- Unit 13: Properties of stars
  - Video: Draft version may be found in the YouTube playlist
  - Slides
  - Black on White Slides
  - Practice questions
- Unit 14: Star formation and evolution
  - Video: Draft version may be found in the YouTube playlist
  - Slides
  - Black on White Slides
  - Practice questions
- Unit 15: Dead stars and black holes
  - Video: Draft version may be found in the YouTube playlist
  - Slides
  - Black on White Slides
  - Practice questions
- Unit 16: Einstein's theory of relativity
  - Video: Draft version may be found in the YouTube playlist
  - Slides
  - Black on White Slides
  - Practice questions

Tips for watching the lectures

Here are some tips for watching the video lectures efficiently:

- You don't have to watch the lectures in real time. Take advantage of the fact that they are recorded, so if at any time you feel that you do not understand a portion of the lecture, you can rewind and re-watch that part, or even pause the lecture and look up additional information elsewhere.
- You can change the playback speed in the video settings, which are accessible via the gear icon on the bottom right. Make it slower if I'm speaking too fast, or make it faster if I'm speaking too slow. You can also press `<` (`Shift`+`,`) or `>` (`Shift`+`.`) on the keyboard to slow down or speed up respectively.
- The videos have subtitles. You can enable them in the video settings, or by pressing `C`.
- Some other YouTube keyboard shortcuts you may find useful include: `Spacebar` to play/pause, `←`/`→` to seek backward/forward 5 seconds, `F` to activate full screen, and `Shift`+`P` or `Shift`+`N` to go to the previous or next video in the playlist. You can find a full list of keyboard shortcuts here .

Exams and practice exams

IMPORTANT: The exams in ASTR 1P01/02 are all given **IN PERSON**, even for the online sections. To be perfectly clear, **being in the online section does NOT, under any circumstances, mean you**

can take exams online. There will be absolutely no exceptions to this rule.

The exams will be taken on a computer in a computer lab, as indicated below. There will be 3 in-person exams in each of the two courses. There are no assignments other than the exams. Both the online and in-person sections will take the same in-person exams, at the same day and time. To reiterate, there will not be any online exams. The final course grade will be the average of the 3 exam grades in each course, and the passing grade is 50%.

Each exam will be given at a precise day and time, as indicated below, and you will not be able to retake it if you miss it, unless you have legitimate reasons.

IMPORTANT: The dates are posted here in advance so that you have plenty of time to free up your schedule to take the exams. If you have an exam conflict that legitimately cannot be moved, please email the TA ASAP with proof of your conflict. If sufficient proof is provided, and if the TA judges your conflict to be legitimately unmovable, you will be allowed to skip the exam as described under missed exams. Please make sure to add the exams to your calendar **right now**, so that you don't forget them and fail the course!

- **ASTR 1P01:**
  - Exam 1:
    - Time: **Saturday, October 4, 2025 from 12:00 to 22:00.** There will be **10 batches** at 50 minutes per batch, with 10-minute breaks in between. Each batch starts exactly on the hour.
      - SAS students: Time and location will be received separately from SAS once you sign up to take the exam at the SAS exam center. **Please note that your accommodations can only be applied if you take the exam at the SAS exam center.** Please contact your case manager for more information.
    - Location: The Computer Commons in Scotiabank Hall.
    - Topics: Units 1-4.
    - Allowed materials: 42 pages of notes.
    - Duration: 50 minutes.
    - Number of questions: 25 multiple-choice, 4 choices per question.
    - Weight in final course grade: 1/3.
    - Practice exam: click here!
  - Exam 2:
    - Time: **Saturday, November 8, 2025 from 10:00 to 20:00.** Time slots must be booked by the students using the online booking system.
      - SAS students: Time and location will be received separately from SAS once you sign up to take the exam at the SAS exam center. **Please note that your accommodations can only be applied if you take the exam at the SAS exam center.** Please contact your case manager for more information.
    - Location: The Computer Commons in Scotiabank Hall.
    - Topics: Units 5-7. You will not be tested again on the topics of exam 1, but it will be assumed that you know those topics as background knowledge.
    - Allowed materials: 42 pages of notes.

        - Duration: 50 minutes.
        - Number of questions: 25 multiple-choice, 4 choices per question.
        - Weight in final course grade: 1/3.
        - Practice exam: click here!
    - Exam 3:
        - Time: **Saturday, December 6, 2025 from 10:00 to 20:00.** Time slots must be booked by the students using the online booking system.
            - SAS students: Time and location will be received separately from SAS once you sign up to take the exam at the SAS exam center. **Please note that your accommodations can only be applied if you take the exam at the SAS exam center.** Please contact your case manager for more information.
        - Location: The Computer Commons in Scotiabank Hall.
        - Topics: Units 8-10. You will not be tested again on the topics of exams 1 and 2, but it will be assumed that you know those topics as background knowledge.
        - Allowed materials: 42 pages of notes.
        - Duration: 50 minutes.
        - Number of questions: 25 multiple-choice, 4 choices per question.
        - Weight in final course grade: 1/3.
        - Practice exam: click here!
- **ASTR 1P02:**
    - Exam 1:
        - Time: **Saturday, January 31, 2026 from 10:00 to 18:00.** Time slots must be booked by the students using the online booking system.
            - SAS students: Time and location will be received separately from SAS once you sign up to take the exam at the SAS exam center. **Please note that your accommodations can only be applied if you take the exam at the SAS exam center.** Please contact your case manager for more information.
        - Location: The Computer Commons in Scotiabank Hall.
        - Topics: Units 11-13. You will not be tested again on the topics of ASTR 1P01 exams 1-3, but it will be assumed that you know those topics as background knowledge.
        - Allowed materials: 42 pages of notes.
        - Duration: 50 minutes.
        - Number of questions: 25 multiple-choice, 4 choices per question.
        - Weight in final course grade: 1/3.
        - Practice exam: click here!
    - Exam 2:
        - Time: **Saturday, March 7, 2026 from 10:00 to 18:00.** Time slots must be booked by the students using the online booking system.
            - SAS students: Time and location will be received separately from SAS once you sign up to take the exam at the SAS exam center. **Please note that your accommodations can only be applied**

if you take the exam at the SAS exam center. Please contact your case manager for more information.

- Location: The Computer Commons in Scotiabank Hall.
- Topics: Unit 14 in its entirety, and unit 15 up to slide 67 (i.e. all of unit 15 except for general relativity & black holes). You will not be tested again on the topics of ASTR 1P01 exams 1-3 or ASTR 1P02 exam 1, but it will be assumed that you know those topics as background knowledge.
- Allowed materials: 42 pages of notes.
- Duration: 50 minutes.
- Number of questions: 25 multiple-choice, 4 choices per question.
- Weight in final course grade: 1/3.
- Practice exam: click here!

- Exam 3:
  - Time: To be announced later by the university scheduling team.
  - Location: The Computer Commons in Scotiabank Hall.
  - Topics: Unit 15 from slide 68 until the end (i.e. general relativity & black holes), and unit 16 in its entirety. You will not be tested again on the topics of ASTR 1P01 exams 1-3 or ASTR 1P02 exams 1-2, but it will be assumed that you know those topics as background knowledge.
  - Allowed materials: 42 pages of notes.
  - Duration: 50 minutes.
  - Number of questions: 25 multiple-choice, 4 choices per question.
  - Weight in final course grade: 1/3.
  - Practice exam: click here!

Exam preparation

The exams can only be taken once. Do not take any exam without proper preparation! The best way to prepare for each exam is to:

- Attend or watch all of the professor's lectures. The exams will be based solely on the material taught in the lectures. Both the text on the slides and the information I add verbally during the lectures will be relevant.
- If you attend the in-person lecture, you should actively participate in them. If something is unclear, ask for a clarification. If a topic inspires you to ask a followup question, ask it. If I ask the class (or you personally) a question, do your best to answer it. In my experience, the students who participate the most in class are also the students who get the highest grades in the exams!
- Solve all the practice questions that are posted on the course website for each lecture. Figuring out the answers to the practice questions on your own, instead of just memorizing the solutions, is an extremely important part of the learning process, and will help you understand the material better.
- Solve as many practice exams as you can from the course website, until you get a score of 100%. Note that each time you refresh the page or click "get new questions", a new test ap-

pears with randomized questions. As for the practice questions, make sure to figure out the answers on your own instead of just memorizing the solutions.

- Participate in discussions of the material with other students and with the professor on Teams. Don't be shy to ask your own questions or answer other people's questions.
- Thoroughly read the appropriate chapters of the textbook (OpenStax Astronomy, 2nd edition) and solve as many exercises from the textbook as possible. Note that the textbook is only for additional reading and practice; the exams will not be based on the textbook.
- Take personal notes while reading the textbook. You can do this within the textbook itself - once you create an account on OpenStax, you can highlight any word or sentence and add your own notes in different colors.
- Summarize what you learned from each lecture and textbook chapter in your own words, as if you're explaining it to someone else - or better yet, find someone to actually explain it to!
- Connect with your fellow classmates on Teams and form study groups that will meet and review the material together. You can use the channel "Student Study Group" on Teams for this purpose.
- Chat with the official course AI, Albert AInstein, who can answer any questions you may have about the course material, create practice questions or exams for you, and much more. You can access the AI chat through the online student interface.

Note that you can search the online textbook by typing in the text box which says "search this book" at the top of each page, and you can search the slides by pressing Ctrl+F (or Cmd+F on macOS) in your PDF reader. In the YouTube lectures, if you click the three dots to the right under the video and choose "Show Transcript", you will be able to search the video for specific terms.

There may be questions in the exams which are not directly related to the practice questions, but for which the answer can easily be found in or deduced from the lectures. There aren't going to be any trick questions or questions that rely on very obscure pieces of information.

You are encouraged to look up more information online on your own, however:

- Please only use **reliable sources** such as Wikipedia , Encyclopedia Britannica , NASA , Astronomy Stack Exchange , and university websites.
- Beware, there are many websites that contain incorrect and/or misleading information! If you're not sure if a particular website is reliable, please post a link on Teams and I will let you know whether it seems trustworthy.
- In case of discrepancy between my lectures and another resource, my lectures should be considered the authoritative source. However, if you believe there is a mistake in my lectures, please let me know on Teams.

Warning: Both ASTR 1P01 and ASTR 1P02 have been completely rewritten from scratch in Fall 2022. Therefore, any material from previous years, such as lecture videos, lecture notes, or exams, will not be relevant for this year's course. In particular, exam questions from previous years will not appear in this year's exams. Students who rely on memorizing exams from previous years instead of properly studying the new course material will most likely fail the course.

Allowed materials and academic integrity

During each in-person exam, you may use up to 42 normal-sized double-sided papers containing any material of your choice, handwritten and/or printed. This may include, for example, your own notes, other people's notes, printouts of the lecture slides, and/or any other material you wish to use. There is no limit on what can be included in the notes, or in what format.

IMPORTANT: Please be aware that the printers in the Brock library and elsewhere on campus always get very busy before each exam. Therefore, it is highly recommended to print your notes ahead of time, or off-campus. If you wait until the last minute, you may not be able to print your notes in time for the exam!

Computers, phones, tablets, smart watches, smart glasses, and other digital devices cannot be used, but you can use a calculator. Any students found using a digital device of any kind during the exam will be charged with academic misconduct.

You will be taking the exams on a computer. The computer will have no Internet access, and the screen will be monitored to ensure academic integrity. **Writing implements (pencils, pens, etc.) are not needed and NOT ALLOWED in the computer labs.** Any student caught with a writing implement will receive an automatic zero in the exam even if they were not actively writing anything at the time.

Official statement from the Faculty of Mathematics and Science at Brock University regarding academic misconduct:

Academic misconduct is a serious offense. The principle of academic integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students should consult Section VII, "Academic Misconduct", in the "Academic Regulations and University Policies" entry in the Undergraduate Calendar to view a fuller description of prohibited actions, and the procedures and penalties. Information on what constitutes academic integrity is available at Brock University Academic Integrity Website .

The following are standard penalties imposed in academic misconduct cases in the Faculty of Mathematics and Science. Please be aware that the Associate Dean, Undergraduate Programs, may assign different penalties than those listed here, depending on the details of individual cases. Requests for special academic consideration, such as exceptions to academic regulations, will not be considered while academic integrity cases are ongoing.

Maximum penalties for misconduct in course work, including mid-term tests:

- First offense: Zero grade on assignment, additional penalty of 100% of the weight of the assignment to be subtracted from the final grade, mandatory completion of the AZLS Academic Integrity workshop.
- Second offense: Zero grade on assignment, 4-month suspension.
- Third offense: Zero grade in course, 1-year suspension, permanent removal from major program.
- Fourth offense: Permanent suspension / debarment.

Penalties for misconduct in final exams:

- First offense: Zero grade in course.
- Second offense: Zero grade in course, 4-month suspension.
- Third: Zero grade in course, 1-year suspension, permanent removal from major program.
- Fourth offense: Permanent suspension / debarment.

Missed exams

If you miss an exam due to legitimate medical, personal, or other issues, you must email the TA (DO NOT email the professor) within 7 days of the exam. The following forms are acceptable:

- For medical issues only, the Brock University Medical Verification Form should be used. The form must be filled out in its entirety and signed by both you and a health professional.
- For medical or non-medical issues, the Brock University Student Absence Self-Declaration Form can be used, but only once per term, only for term tests (Exam 1 and Exam 2), and only for absences of up to 72 hours.
- For non-medical issues only, if the Self-Declaration Form cannot be used, your email should simply explain why you missed the exam and include any necessary proof. The TA will determine whether your reason for missing the exam is legitimate.

If the TA is satisfied with the forms and/or proof you provided, the exam will be marked as "missed for legitimate reasons". At the end of the term, after the final exam (Exam 3), the missed exams will be handled as follows:

- If you missed a total of **one exam** for legitimate reasons, you will take **one makeup exam** that will be scheduled at the end of the term. The TA will let you know the date and time of the makeup exam.
- If you missed a total of **two exams** for legitimate reasons, you will be able to take **two makeup exams** that will be scheduled at the end of the term. The TA will let you know the dates and times of the makeup exams.
- If you missed a total of **three exams** (that is, all of them) for legitimate reasons, the professor will devise an appropriate solution on a case-by-case basis.

If you do not email the TA within 7 days, or if you cannot prove that you had a valid reason for missing the exam, **your grade in the exam will be zero**. There will be absolutely no exceptions to this rule!

It's easy to forget exams, especially if you are in the online section, so please make sure to add reminders for each exam to your calendar. Forgetting to do an exam will not count as a valid reason for missing it, and your grade will be zero with no option of improving it!

If you are late to an exam, you will not get any extra time, so please make sure to be at the exam room at least 15 minutes before the beginning of the exam.

Useful software

Interested students may find the following applications useful. They are **100% free** and available for Windows, Linux, macOS, Android, and iOS. Using them is optional, but might help you understand the material better.

- Stellarium : Shows you the sky as seen from any place on Earth at any point in time. You can zoom in or click on individual astronomical objects for more information. You can also highlight the constellations. If using it during the day, press "A" to turn off the atmosphere. Stellarium can also run directly in your web browser , but that version has fewer features. I often use Stellarium in my lectures.
- Celestia : Allows you to travel to different objects in the solar system, such as planets, moons, and asteroids, and shows you their orbits and positions at different times. You can also find eclipses, and travel to other stars in the galaxy.

Universe Sandbox is an astronomical simulation game. It's not free, but it's quite cheap and definitely worth it. It works on Windows, Linux, and macOS, and has an optional VR mode.

The are also several apps that you can use in the field for astronomical observations. Sky Map is available for Android phones only, while SkyView is available both for Android and iPhone . Simply point your phone to the sky, and the app will tell you exactly what you're seeing in real time!

Accommodations

Brock University is committed to fostering an inclusive and supportive environment for all students and will adhere to the Human Rights principles that ensure respect for dignity, individualized accommodation, inclusion, and full participation. The University provides a wide range of resources to assist students, as follows:

- If you need any accommodations related to exams, such as extra time, because of a disability or an ongoing health or mental health condition, please contact Student Accessibility Services (SAS) at askSAS@brocku.ca or (905) 688-5550 ext. 3240 as soon as possible to arrange your accommodations.
- If you require academic accommodation on religious grounds, you should make a formal written request to the TA during the first two weeks of the term, or as soon as possible after a need for accommodation is known to exist. Religious accommodations are not granted automatically, and will be considered on a case-by-case basis.
- If you are experiencing mental health concerns, contact the Student Wellness and Accessibility Centre. Good2Talk is a service specifically for post-secondary students, available 24/7, 365 days a year, and provides anonymous assistance: visit the website or call 1 866 925-5454 . For information on wellness, coping, and resiliency, click here .
- If you have been affected by sexual violence, the Human Rights & Equity Office offers support, information, reasonable accommodations, and resources through the Sexual Violence Support & Education Coordinator. For information on sexual violence, visit Brock's Sexual Assault and Harassment Policy or contact the Sexual Violence Support & Response Coordinator at humanrights@brocku.ca or (905) 688-5550 ext. 4387.
- If you have experienced discrimination or harassment on any of the above grounds, including racial, gender or other forms of discrimination, contact the Human Rights and Equity Office at

humanrights@brocku.ca .

Intellectual property notice

Any and all course materials created by the instructor in this course, including but not limited to notes, slides, homework problems, homework solutions, exams, exam solutions, and photo, audio, and/or video recordings, are the intellectual property of the instructor.

Any student who, without the instructor's express consent, **publicly posts or sells** the instructor's work, or takes a **photo, audio, and/or video recording** of the instructor's lectures, will be charged with misconduct under the university's Academic Integrity Policy and/or Code of Conduct, and may also face adverse legal consequences for infringement of intellectual property rights.

What's next?

If you enjoyed this course, you may also be interested in my 2nd-year astronomy course, ASTR 2P42: Astrophysics & Cosmology. This is a more advanced course, which delves much deeper into the material, including all the relevant math and physics. It therefore requires first-year physics and calculus as mandatory prerequisites. The course is open to students from all majors, as long as they have the proper background. Please see the course website for more information. I hope to see you there! 😊