

*We recognize and acknowledge that McMaster University meets and learns on the traditional territories of the Mississauga and Haudenosaunee nations, and within the lands protected by the “[Dish With One Spoon](#)” wampum, an agreement amongst all allied Nations to peaceably share and care for the resources around the Great Lakes.*

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## **ASTRON 1F03 – Introduction to Astronomy and Astrophysics**

**2023 Fall Term**

**Version 2 (30th August 2023; updates from version 1 highlighted in yellow)**

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**Office Hours:** To be announced

### **Course Description**

Astronomy 1F03 is a one-term survey of astronomy and astrophysics, primarily for students in science or engineering programs. No previous university-level courses in mathematics, physics, or other science courses are required. This course is preparation for later astronomy courses. The basic aim of this course is to present the major themes in present-day astronomy and astrophysics, and to show how they have evolved historically from our earliest concepts about the universe. Topics include orbital motion, electromagnetic radiation, the solar system, stars and stellar evolution, the Milky Way Galaxy, galaxies and quasars, the evolution of the universe. Changes in course content over and above the following outline may occur, depending on time available and the needs of the class. Students are encouraged to contact the instructor(s) and indicate areas of astronomy they would like to see covered in greater detail.

**Prerequisite(s):** One of Grade 12 Calculus and Vectors U, Grade 12 Advanced Functions U (or equivalent: e.g., MATH 1F03, MATH 1K03 – speak to your academic advisor if necessary)

## Course Technology Information

**Avenue to Learn:** <http://avenue.mcmaster.ca/>  
**MS Teams:** <https://teams.microsoft.com/>  
**Crowdmark:** <https://crowdmark.com/>

## Course and Learning Objectives

By the end of this course, students should have a good understanding of the nature of the universe including the modern practice of astronomy and astrophysics. This includes how physical and mathematical knowledge can be used to predict and understand the behaviour of astronomical objects. This course aims to prepare students for specialized upper-year astronomy classes.

## Course Expectations

This course is organized as follows:

- Pre-recorded lectures for 2-3 textbook chapters per week
- 1 online quiz every two weeks – i.e., “biweekly” quizzes (a major component of the assessment and replaces midterms and exams)
- 1 instructor-led class (in person and recorded) per week
- 1 TA-led tutorial (in person and not recorded) per week
- 1 biweekly help session (on the “off” weeks of biweekly quizzes)
- 2 projects
- 4 assignments

The course will combine a conceptual understanding with problem-based explorations of astronomy and astrophysics. The course will be offered in a blended format (i.e., some components will be in person and some components will be online). The blended course will have pre-recorded lecture material covering the full set of weekly topics as listed (this includes all textbook chapters which can be read in the same order). Watching pre-recorded lecture material prior to tutorials is required. The lecture material and slides are the definitive guide to key course concepts and content. Reading ahead in the textbook is strongly encouraged. The text complements lecture material. Detailed expectations,

assigned work, and due dates will be given on Avenue. A draft schedule is included below. Tutorial time will be used for individual and small-group work to reinforce the material covered in class. Help sessions will primarily be used for assignments and projects, but can also be used for general help.

Everyone will complete all assignments. Projects are chosen individually from a wider set and will include observing projects and activities designed to improve understanding of lecture material. The anticipated amount of work of a project is similar to that of an assignment. The course is expected to take up 6-9 hours per week, including class time, preparation (reading and lecture viewing), and graded work.

### Class Communication

- **MS Teams:** We strongly encourage the class MS Teams channel as the main method of communication for content-related questions.
- **Email:** Communication for private matters (e.g., MSAFs and test/assignment-related questions) should go directly to the instructor via the email above. We will generally respond as soon as possible (within 24 hours), but please allow 2-3 business days for a reply during busy periods.
- **Tutorials:** You can also use tutorial time to ask questions about assignments and projects with TAs and instructors.

If you have any questions about expectations or due dates, please ask your instructor for clarification – don't guess or rely on chatting with your peers.

### Class Schedule and Activities:

Day	Time	Activity	Location
Mon	8:30-9:20 am	Instructor-led in-person tutorial (recorded)	See Mosaic
Wed	8:30-9:20 am	Alternating weekly between: <ul style="list-style-type: none"> <li>• In-person help sessions (starting in week 2)</li> <li>• Online biweekly quizzes (starting in week 3)</li> </ul>	See Mosaic
Various	Various	TA-led in-person tutorial (starting week 2)	Various

## Required Materials / Resources

- **Textbook** (required)

Astronomy, Fraknoi, Morison, Wolff et al, 2018, OpenStax Text is free (Creative Commons Licence). The PDF is available online at <https://openstax.org/details/books/astronomy> and optional paper copies are available for purchase via OpenStax

- **Calculator** (recommended)

The McMaster Standard Calculator is the recommended and ideal calculator for tests. For details on what the McMaster Standard Calculator is and what models are acceptable please visit:

<https://registrar.mcmaster.ca/exams/requirements/>

- **Course notes**

Full copies of the lecture slides will be posted on Avenue along with the lecture recordings.

## Blended Course Delivery

To follow and participate in virtual components of this course, it is expected that you have reliable access to the following:

- A computer that meets performance requirements [found here](#).
- An internet connection that is fast enough to stream video.
- Computer accessories that enable class participation, such as a microphone, speakers and webcam when needed.

If you think that you will not be able to meet these requirements, please contact [uts@mcmaster.ca](mailto:uts@mcmaster.ca) as soon as you can. Please visit the [Technology Resources for Students page](#) for detailed requirements. If you use assistive technology or believe that our platforms might be a barrier to participating, please contact [Student Accessibility Services](#), [sas@mcmaster.ca](mailto:sas@mcmaster.ca) for support. Logging out of Teams and restarting your computer on a regular basis is advisable for the best user experience. If you experience any issues with MacVideo, please see the [MacVideo documentation page](#).

## Course Overview and Assessment

Week	Topic	Chapters
1: Sep 5-8	Overview: The Universe, The Sky, History of Astronomy	1-2
2: Sep 11-15	Orbits, Kepler, Newton, Gravity, Earth, Moon, Sky, Seasons, Tides	3-4
3: Sep 18-22	Light, Spectra, Astronomy, Telescopes	5-6
4: Sep 25-29	Planets: Earth, Moon & Mercury	7-9
5: Oct 2-6	Venus, Mars, Jupiter, Saturn, Rings and Moons	10-12
Oct 9-13	Midterm recess (no classes)	N/A
6: Oct 16-20	Comets, Asteroids, Meteors, Planet Formation Leftovers	13-14
7: Oct 23-27	The Sun, Solar Weather, Stellar Structures, Nuclear Burning	15-16
8: Oct 30-Nov 3	Starlight: Brightness, Colour, Spectra; Stars: Mass and Size, Distances	17-19
9: Nov 6-10	Gas, Dust, Interstellar Space, Star and Planet Formation, Stellar Evolution, Star Clusters	20-22
10: Nov 13-17	Stellar Evolution: Star Death, Supernovae, Black Holes, Neutron Stars, Relativity	23-24
11: Nov 20-24	Milky Way, Stellar Populations, Galaxies, Quasars and Active Galaxies	25-27
12: Nov 27-Dec 1	Evolution of Galaxies, Dark Matter, Big Bang, Cosmology, Life in the Universe	28-30
13: Dec 4-6		N/A

## Evaluation

Assessment	Weight
1. Four assignments and 2 projects	40%
2. Participations	10% (+5% bonus)
3. Biweekly quizzes	50%

- **Assignments and projects:** Due dates will be spaced throughout the term.
- **Participation:** Marks are awarded for completion of online activities (practice problems and muddy points quizzes) and in-person TA tutorials. Practice problems have unlimited attempts, and you must get the right answer to get full marks. Each practice problem is worth 0.5% up to a maximum of 5%. The muddy points quizzes are the questions or comments you want the instructor to address in the instructor tutorial. Each muddy point quiz is worth 0.5% up to a maximum of 5%. There is also a possible bonus 5% participation for attending and participating

in TA tutorials (0.5% per tutorial up to a maximum of 5%; you can still get 100% in this course without these participation points, but you cannot exceed 100%).

- **Quizzes:** Occur every two weeks, are online (on Avenue), and are open book. "Open book" means that you are permitted to use your personal notes including formula sheet, a calculator, the textbook, and you may search for answers on the internet. You are NOT permitted to collaborate with others. If there is evidence of cheating, you will fail the quiz and be reported. By completing each quiz you agree to the following statement related to Academic Dishonesty: "By submitting this work, I certify that the work represents solely my own independent efforts. I confirm that I am expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. I confirm that it is my responsibility to understand what constitutes academic dishonesty under the Academic Integrity Policy."

Link: <https://secretariat.mcmaster.ca/app/uploads/Academic-Integrity-Policy-1-1.pdf>

To accommodate disruptions/absences, the top 5 out of 6 quizzes will be used for the final quiz grade (i.e., you do not need to submit an MSAF unless you miss a second or subsequent quiz). No exams are planned for this course, but students must average 50% on the biweekly quiz component to pass the course (i.e., you can get less than 50% on an individual quiz and still pass the course so long as you get at least 50% on the total quiz component).

- **Final grades:** Please contact your instructional team throughout the term about concerns you have regarding grades on specific course components. However, please do not email your instructor about when final grades will be released or to request grade bumps or make-up assignments. Final grades are calculated as soon as possible at the end of term after all course components have been completed. Final grades are then submitted to the Registrar's Office who will release your final grade. Make-up assignments are not offered in this course.

## Requests for Relief for Missed Academic Term Work

[McMaster Student Absence Form \(MSAF\)](#): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

### Policy Regarding Missed Work

Requests for missed academic work worth less than 25% of the final grade resulting from personal or medical situations, lasting up to 3 calendar days, can be reported, once per term, without documentation, using the McMaster Student Absence Form (MSAF). Relief for missed work for a longer duration or for other reasons must be reported to your Faculty office, and relief from term work may not necessarily be granted. When using the MSAF, report your absence to the course instructor or designate. You must then contact the instructor immediately (normally within 2 working days) by e-mail.

Please refer to the contact list on the first page of this outline for appropriate e-mail addresses. The instructor/instructional assistant will indicate what relief may be granted for the work you have missed, and relevant details such as revised deadlines, or time and location of a make-up exam/quiz/test. Please note that the MSAF may not be used for final deliverables, nor can it be used for a final examination or its equivalent. Please [review and follow the Academic Regulation in the Undergraduate Calendar under “Requests for Relief for Missed Academic Term Work” here](#).

### Course Specific Information for MSAFs and Late Penalties

- **Assignments and projects:** Work extended with an MSAF is due immediately after the MSAF period ends (i.e., three days after the original due date) otherwise late penalties will be incurred. The late penalty is a grade reduction of 10% per day up to a maximum of 40%. No assignments or projects will be accepted one week after the original due date.
- **Participation:** We do not recommend using MSAFs for online participation activities as each individual activity is worth very little, and only the top 10 are counted. You cannot MSAF the TA tutorials as these are bonus marks.

- **Quizzes:** Your lowest quiz mark is automatically dropped as noted above. If you need to MSAF a second or subsequent quiz, there is no make-up quiz and your lowest mark is no longer dropped, but your remaining quizzes will be reweighted.

If you have special circumstances, we advise contacting the instructor as soon as possible prior to the due date. MSAFs cannot be used for academic work that has already been completed or attempted. Attempting online includes opening a test/quiz on Avenue or another platform.

### **Note to Late-Arriving Students**

If you add this course after the start of term, you must catch up on all relevant material as soon as possible and ask the instructor for any clarification as needed. The course schedule and evaluation system take into account that some students may add the course after the start of term by having no assessment due before the add/drop due date. Students are not permitted to add the course after the add/drop due date.

### **Academic Accommodation of Students with Disabilities**

Students with disabilities who require academic accommodation must contact [Student Accessibility Services \(SAS\)](#) at 905-525-9140 ext. 28652 or [sas@mcmaster.ca](mailto:sas@mcmaster.ca) to make arrangements with a Program Coordinator. For further information, consult McMaster University's [Academic Accommodation of Students with Disabilities](#) policy.

### **Academic Accommodation for Religious, Indigenous or Spiritual Observances (RISO)**

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.



## Courses with an On-Line Element

In this course we may be using Avenue to Learn, Teams, Echo360, Turnitin.com, and Crowdmark. Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

## Online Proctoring

**Some courses may** use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins. If you have questions or concerns about the use of the proctoring software, please contact the Instructor.

## Academic Integrity

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

**It is your responsibility to understand what constitutes academic dishonesty.**

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy, located here](#).

**The following illustrates only three forms of academic dishonesty:**

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

### **Concerning the use of generative artificial intelligence**

Students may use generative artificial intelligence ("genAI"; e.g., ChatGPT, Bing, Bard) in this course in accordance with the guidelines outlined for each assessment, and so long as the use of generative AI is referenced and cited. Use of generative AI outside assessment guidelines or without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use for each assessment and to be clear on the expectations for citation and reference and to do so appropriately.

- You may NOT use genAI in the biweekly quizzes.
- You may use genAI in the assignments and projects *\*if\** the assessment says you may do so (otherwise, you may NOT use genAI).

### **Authenticity / Plagiarism Detection**

***Some courses may*** use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal**

**verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com [please go to the office of Academic Integrity website.](#)

## Conduct Expectations

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities \(the "Code"\)](#). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online.**

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

## Senate Student Policies

[Students can view full policies here on the University Secretariat website.](#) Senate Policy Statements are also available from the Senate Secretariat Office, Room 104, and Gilmour Hall.

## Student Code of Conduct

You acknowledge that your behavior in all aspects of this course should meet the standards of the McMaster University Student Code of Conduct. You understand that any inappropriate behavior directed against any of your colleagues, teaching assistants, or the instructional team will not be tolerated. Disruptive behavior during any session (e.g. lecture, seminar, lab, tutorial) such as talking, sleeping or non-class computing while an individual presents information, or constantly being late, will also not be tolerated. Abuse, ridicule, slander, inappropriate language, and discrimination towards instructors teaching staff, teaching assistants and other students will not be tolerated in any capacity. Shared spaces

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including e-spaces such as the Avenue to Learn course discussion board are to be considered inclusive and safe. [For more information, please follow this link.](#)

## **Inclusivity and Academic Integrity**

The University values integrity, inclusiveness and teamwork, and strives to support the personal and collective growth of the McMaster student community. These values are foundational to ensuring campus environments – both in-person and virtual – are conducive to personal wellbeing and academic success.

## **Inclusive Learning**

McMaster University aims to foster a supportive and inclusive learning environment that encourages both individual and collective growth. Students are invited to speak with the Instructor immediately if they encounter any challenges related to accessing or using the technological requirements expected for successful participation in this course.

## **Course Statement on Equity, Diversity, and Inclusion (EDI)**

Every registered student belongs in this course. Diversity of backgrounds and experiences is expected and welcome. You can expect your instructional team to be respectful of this diversity in all aspects of the course, and the same is expected of you. The Department of Physics and Astronomy is committed to creating an environment in which students of all genders, cultures, ethnicities, races, sexualities, abilities, and socioeconomic backgrounds have equal access to education and are welcomed and treated fairly. If you have any concerns regarding inclusion in our department, in particular if you or one of your peers is experiencing harassment or discrimination, you are encouraged to contact the Chair, Associate Chair of Undergrad Studies, Undergraduate Advisor (Level I), and/or Undergraduate Advisor (Levels II to IV) (contact details listed [here](#)) or to contact the [Equity and Inclusion Office](#). You are also always welcome to contact the instructor and/or your head teaching assistant – either with concerns and/or if you have any suggestions to improve the quality of the course materials.

In an ideal world, according to the Eurocentric/Western definition of science, science would be objective. However, much of science is subjective and is historically built on a small subset of privileged voices. In

this class, we will make an effort to acknowledge a diverse group of scientists but limits still exist on this diversity. We acknowledge that it is possible that there may be both overt and covert biases in the material due to the lens with which it was written, even though the material is primarily of a scientific nature. Integrating a diverse set of experiences is important for a more comprehensive understanding of science. We will discuss issues of diversity in science as part of the course from time to time.

To help accomplish our commitment to EDI: If you have a name and/or set of pronouns that differ from those that appear in your official McMaster records, please let us know. If you feel like your performance in the class is being impacted by your experiences outside of class, please don't hesitate to come and talk with us. We want to be a resource for you. We (like many people) are still in the process of learning about diverse perspectives and identities.

### Copyright and Recording

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course.

Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

### Additional Copyright Information

In this course students will have access to material that is subject to copyright laws. This includes (but is not limited to) textbooks and all resources developed by the Instructor such as lab manuals, demonstration videos, quizzes, assignments, tests, class notes and class slides.

Students are not allowed to share or redistribute this material in any printed or electronic form without the explicit written consent of the copyright holder. This includes posting any course material on Internet bulletin boards, course repositories, social networks, etc.

## **Research Ethics**

NA

## **Extreme Circumstances**

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.