Course Syllabus

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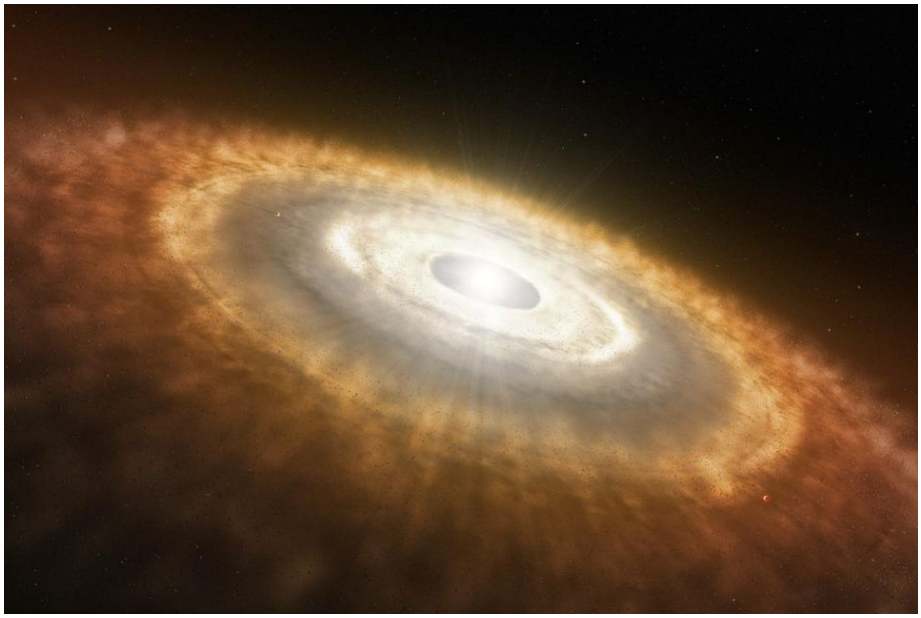

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AST 198H1: Great Astronomical Issues

Professor Rachel Friesen

Mondays 3-5pm, LM 123 (Lash Miller, 80 St. George St.)

Course description:

Welcome to Great Astronomical Issues! In this course we will cover a range of topics, from stars (birth, death, and everything in between!) and planets to black holes and gravitational waves. We will discuss some of the important and current questions astronomers are seeking to answer about our universe, with an emphasis on how we try to answer these questions with data and scientific analysis. I have set a general topic plan for the course, but your interest and questions can chart a new course in your learning. Together, I hope we can make this course exciting and eye-opening for you.

This course is open to any first-year student and designed to be accessible to everyone. There is no significant math required in this course.

Contacts:

Prof. **Rachel Friesen** (she/hers)

Office: Astronomy Building (AB), Room 211, 50 St. George St.

Email: friesen@astro.utoronto.ca

Office hours: Thursdays 1-3pm, or by appointment (time may be revised after the first class)

TA: Victor Chan (**chan@astro.utoronto.ca (mailto:chan@astro.utoronto.ca)**)

Email policy:

I will usually respond to emails within two weekdays (i.e., I may not answer emails on the weekend). You can email to ask questions or to set up a time to come by my office if you can't make the office hours. Please include the class code (AST198) in the subject line when emailing.

Learning Goals

In this course, we will discuss and learn together about a number of topics in astronomy. Much of your learning will be driven by you - the effort you put in, and how you search out the answers to the questions that are asked in each class. In that way, you will determine how much of the content you actually learn.

In this interactive class, students will be able to:

1. **Gain an appreciation for some of the pressing questions and new advances in astronomy today**, with a focus on understanding how we, as astronomers, use data to answer these questions.
2. **Communicate scientific ideas clearly and concisely**. Clear communication skills are universally useful. Your focus in this course should be on being able to communicate a small number of ideas with clarity and authority, rather than a large number of ideas poorly and temporarily.
3. **Think about and manage their own learning processes**. As you complete tasks in this course, I will occasionally ask you to reflect on your methods and how they might be improved if you were to tackle a similar challenge in the future.
4. **Assess critically sources of information.** Not all resources are equal in trustworthiness. With the sheer amount of information available to students online, being able to determine whether data (and analysis or interpretation of data) is trustworthy is a critical skill. We will do this through the lens of astronomy research, but this skill can be applied in any area of study.

Assessment & grading

The weight of each component of the course is as follows:

- Weekly assignments (40%)
- Research project (40%)
- Participation (10%)
- Oral final interview (10%)

The default penalty for work submitted late in this course will be 10% per calendar day. This means that if an assignment is due on Monday, and you hand it in on Tuesday, your maximum possible grade will be 90%. No

exceptions will be made to this policy without a doctor's note on the official University of Toronto Verification of Illness or Injury form, or other appropriate documentation.

Class Participation & Jigsaws

This course is highly interactive. You will spend the majority of most classes interacting with your peers. In the first half of each class, we will do what is called a "jigsaw" activity: at the end of each class, you will be given a question to research. In the following class, you will meet with the group of other students who have researched the same question. You will be expected to share the results of your research and to come to a consensus answer. You will then be placed into a group with students who researched different questions than your own. You will be expected to present the consensus answer to your question and to absorb the answers to the other students' questions.

You will be graded on your level of engagement and on how well you come to understand the answers to all of the questions. In each class, I will observe your interactions with the other students and during discussions among the entire class, and will assign you one of the following grades:

0	Not present
1	Present but participates minimally
2	Participates effectively, demonstrating that the expected level of preparation has been done
3	Participates often and exceeds expectations for the level of preparation

At the end of each jigsaw activity, I will ask for 2-3 volunteers to verbally summarize the answers to the questions they researched. So, as you are doing your research, you should plan how you would present your results verbally in two minutes. You may choose to prepare an image (on your laptop) to enhance your presentation. If there are no volunteers, I will choose at random. These presentations will also be graded on the 0/1/2/3 scale. Every student must complete this task once during the semester to earn full participation marks.

The goals of these exercises are not to "put you on the spot" or create scary public speaking scenarios. They are intended to help you develop your research skills and your capacity to express complex ideas clearly and concisely. If you're uncomfortable with the expectations for verbal participation, please speak to me and we will discuss appropriate strategies or accommodations.

To help me learn your names quickly so I can best credit you for your participation efforts, I will ask your permission to take a digital picture of you (in a group) holding a piece of paper with your name on it.

Research project

Early in the semester, you will develop a question related to the course material to research. As a project, you will research your question and write up your results in the form of a popular science article, and will create a five minute presentation to share with your peers in the last two classes. We will discuss how to focus your question to fit reasonably in a short report, how to assess the credibility of sources, and how to

write up your results using clear language.

Normally, students will be required to submit their course essays to Turnitin.com for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the Turnitin.com reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin.com service are described on the Turnitin.com web site.

Use of Turnitin.com is voluntary. Should you choose not to submit your article through the Turnitin.com service, you should inform me, and still submit your article online through Quercus.

Final exam

This course does not have a final exam. Instead, during the final week of classes, I will ask each of you to come individually to my office and do a very short verbal final interview. The interview will consist of a single question from the set of questions covered during the jigsaw activities all semester long.

Resources

Required materials

There is no required textbook for this course, but to prepare for the jigsaw activities in each class, you should consult a good introductory astronomy textbook, or equivalent online resources. There are many good textbooks available in the library. Here are three that I can recommend:

ASTRO, by Ghose et al., 2nd Canadian edition or later

The Cosmic Perspective, by Bennett et al., 7th edition or later

Astronomy Today, by Chaisson and McMillan, 7th edition or later

You can also use the free OpenStax online astronomy textbook:

https://openstax.org/details/books/astronomy **(https://openstax.org/details/books/astronomy)**

In some classes, you will be doing hands-on activities using a computer. If you have a laptop (MacOS, Windows, or Linux will all be fine), please bring it with you. If you don't have access to a laptop, please notify me as soon as possible and we will make alternative accommodations.

Quercus

We will be making use of Quercus, the online course management system. You are responsible for monitoring the course Quercus page and your @utoronto.ca email address for announcements, assignments, etc. on a daily basis. Please check right away that you can log in and seek help if you cannot.

Writing centres

One of the main goals of the 198/199-series of courses is to give you an opportunity to practice your

research and communication skills, including your writing skills. The University of Toronto offers several resources to help students excel at written communication, starting with an excellent guide to university writing: https://advice.writing.utoronto.ca/general/transition-to-university/ **(https://advice.writing.utoronto.ca/general/transition-to-university/)**

There are more than a dozen Writing Centres on campus, where you can get personalized help with any writing-related difficulties you may have: https://writing.utoronto.ca/writing-centres/ **(https://writing.utoronto.ca/writing-centres/)**

In addition to the other services they provide, the Writing Centres offer a series of drop-in writing workshops. No registration is required and you may attend any or all of the sessions: https://writing.utoronto.ca/writing-plus/ **(https://writing.utoronto.ca/writing-plus/)**

If English is not your first language and you would like some help improving your written and oral communications skills, you are strongly encouraged to make use of the English Language Learning (ELL) program: https://www.artsci.utoronto.ca/current/academic-advising-and-support/english-language-learning **(https://www.artsci.utoronto.ca/current/academic-advising-and-support/english-language-learning)**

Accomodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability or health consideration that may require accommodations, please feel free to approach me and/or the Accessibility Services Office (416-978-8060; https://www.studentlife.utoronto.ca/as **(https://www.studentlife.utoronto.ca/as)**) as soon as possible. The Accessibility Services staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations. The sooner you let them and me know your needs, the quicker we can assist you in achieving your learning goals in this course.

Course Summary:

Date	Details	
Mon Jan 13, 2020	**Assignment 1 - Distances (https://q.utoronto.ca/courses/136126/assignments/274484)**	due by 3pm
	Introduce yourself! (https://q.utoronto.ca/courses/136126/assignments/272025)	due by 3pm
Mon Jan 20, 2020	**Assignment 2 - Scale model of solar system (https://q.utoronto.ca/courses/136126/assignments/274558)**	due by 3pm
Mon Jan 27, 2020	**Assignment 3 - Telescopes (https://q.utoronto.ca/courses/136126/assignments/274544)**	due by 3pm

Date	Details	
Mon Feb 3, 2020	Research article draft topic & scope (https://q.utoronto.ca/courses/136126/assignments/272052)	due by 3pm
Mon Feb 24, 2020	Assignment 4 - Quality of research sources (https://q.utoronto.ca/courses/136126/assignments/274507)	due by 3pm
Mon Mar 2, 2020	Research article draft bibliography (https://q.utoronto.ca/courses/136126/assignments/272055)	due by 3pm
Mon Mar 9, 2020	Assignment 5 - Jargon (https://q.utoronto.ca/courses/136126/assignments/274542)	due by 3pm
Mon Mar 16, 2020	Final research article (https://q.utoronto.ca/courses/136126/assignments/272056)	due by 3pm
Mon Mar 23, 2020	Assignment 6 - Answering Scientific Questions with Clarity, Accuracy, and Precision (https://q.utoronto.ca/courses/136126/assignments/275230)	due by 3pm
Mon Mar 30, 2020	Oral presentation (https://q.utoronto.ca/courses/136126/assignments/272057)	due by 5pm
	Day 1 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272027)	
	Day 10 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272039)	
	Day 11 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272041)	
	Day 12 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272043)	
	Day 2 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272028)	
	Day 3 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272030)	
	Day 4 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272031)	
	Day 5 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272032)	
	Day 6 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272034)	

Date	Details
	Day 7 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272035)
	Day 8 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272037)
	Day 9 Participation Score (https://q.utoronto.ca/courses/136126/assignments/272038)
	Oral Final Interview (https://q.utoronto.ca/courses/136126/assignments/272058)
	Research article draft outline (https://q.utoronto.ca/courses/136126/assignments/272054)
	Summarize a jigsaw question (https://q.utoronto.ca/courses/136126/assignments/272026)