Astronomy 101 Syllabus, Fall 2018

Contact Information

- Instructor: Dr. Walter Freeman, wafreema@syr.edu, Physics Building room 215
- Class meetings: Tuesdays and Thursdays, 12:30-1:50 or 2:00-3:20 PM, Stolkin Auditorium
- Office hours: Wednesday 3-5PM and Friday 9:30-11:30AM, or other times – email me or drop by!
- Course website: http://walterfreeman.github.io/ast101/
- Lead TA: Scott Bassler, sdbassle@syr.edu
- Point of Contact for Registration Issues: Melissa Wike, pga@syr.edu

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Textbooks

- *Lecture Tutorials for Introductory Astronomy*, 3rd Edition, by Prather, Slater, and Brissenden.
    - This is a small book containing exercises that we will work through in class. It is absolutely essential (more important than the textbook, even!); we will spend a lot of time in class on these tutorials, which give you an opportunity to flex your astronomical-reasoning muscles as you learn the course content. Many of the exam questions will relate directly to the tutorials in this book.
- *The Essential Cosmic Perspective*, 7th edition or any other recent edition, by Bennett et al.
    - This is the main textbook for the course, containing most of the course content. We will follow the book somewhat closely, and there will be suggested readings before each course meeting.

Course philosophy

1. Reasoning and synthesis, not memorization

This course is emphatically not a class where you will come to lecture, sit there and listen to a presentation of some facts, and then repeat them back to me on exams. Rather, you wil need to think about how weâ€™ve gained the understanding that we have about our universe, and engage in scientific reasoning based on astronomical principles. You are not going to be learning a list of currently-accepted facts; you are going to be practicing skills and learning to see the universe as scientists see it.

2. Astronomy as a liberal art

Most peopleâ€™s interest in astronomy begins as children, when they look up at the night sky and say â€œWow, thatâ€™s gorgeous; I want to know more about that!â€ Or, perhaps, they watch *Star Trek* or *Battlestar Galactica* and want to know more about the universe outside our world that inspired the storytellers. The ancientsâ€™ interest in astronomy began with more pragmatic goals in mind: the night sky can be used to navigate. Weâ€™ve been to the moon, weâ€™ve sent robots to the planets, and two lonely spacecraft are floating out to the stars, keeping in fading contact with us for the time being using the dwindling power from their plutonium-powered transmitters. Perhaps, someday, we will follow them? Regardless of the reason, astronomy has captured the imagination of humanity like no other science, and we would be amiss in our study of astronomy not to look at the broader influence that the heavens have had on the larger sweep of human imagination and thought.

Most of you wonâ€™t become astrophysicists; you will become designers and businessfolk, architects and reporters, doctors and lawyers, and writers and thinkers, and I hope that you will take some of the inspiration, the poetry, the philosophy, the wisdom, and the wonder of astronomy into your chosen disciplines and your lives.

3. This is your class, too

As part of this philosophy, I welcome your input. If there is some aspect of astronomy that inspires or fascinates you, please ask; if you have feedback for me that will help you enjoy the class more, then please let me know.

Course Material

This course focuses mostly on the astronomy of the solar system, and is divided into four sections:

1. **What we can see from Earth:** the stars, the moon, and the sun, how the night sky changes, and why it looks the way it does

2. **Celestial motion:** why the planets move in the ways that they do, and the laws of gravity and orbits

3. **The nature of light:** what light is, how it tells us about the Universe, and how it affects the heavens

4. **Humans and the Universe:** the past, present, and future of spaceflight, and the possibility of life elsewhere

Learning Objectives

A more detailed version of the learning objectives for this class is on a separate page.

After this class, students will be able to…

- describe the characteristics of scientific thought and recognize sound and unsound science
- articulate astronomy's connection to the arts and humanities
- predict how things move in the sky based on knowledge of how they move in space
- describe the history of the development of the modern view of the solar system
- use Kepler's laws of motion and Newton's laws of mechanics to analyze and predict the motions of planets
- relate an object's chemical composition and temperature to the spectrum of the light it emits
- describe the basic properties and histories of the planets, and the role of atmospheres in determining their climate
- speak articulately about the mechanisms behind anthropogenic climate change and the evidence for it
- describe the past, present, and possible future of spaceflight

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Course Activities

Readings

Reading the text is an essential part of this class! Many textbooks (including most physics texts!) are rather awful, but ours is actually quite good.
I encourage you to read the assigned sections on the calendar ahead of time, as that way the presentation of the material in class will serve as reinforcement and enrichment rather than be the first time you see something.

Class Meetings

In the auditorium, we will alternate between presentation and practice. I will first introduce you to the new ideas we are studying, asking questions and getting your answers using colored cards. (These take the place of clickers.) If you have done the reading ahead of class, these presentations will serve as review and enrichment. Questions during the presentation are encouraged and

welcome! After the presentation, we will work through the **Lecture Tutorials.** These are activities designed for you to complete in small groups of 2-4; we will allot time in lecture for you to work through them and ask us questions as you proceed. This sort of practice â€“ thinking on your own â€“ will be absolutely necessary for you to do well on the exams, and much of the exam material will be drawn from the tutorials. If you are not sure about the solutions to the tutorials, please ask me during the help sessions (office hours), or talk to your classmates.

Written homework and projects

Throughout the semester I will assign several short writing assignments. These will focus on the connections between astronomy and the broader study of the humanities; astronomy is likely the scientific discipline that has
both exerted the greatest influence on, and been influenced the most by, the broader story of human intellect and philosophy. The topics will be, broadly, as follows:

- First paper: choose a historical, modern, or fictional calendar, and write about the connection between that calendar and cycles in the sky
- Second paper: an exploration of the nature of science, and a discussion of what scientific thought is and what it is not
- Third paper: any of a number of topics that explore the connections between astronomy and literature, history, sociology, or culture
- Final project: Extremely open-ended; a topic you didn't choose from earlier, or a topic or creative fine-art project that you propose yourself

Some of you, at some point in the semester, will probably ask me for extra credit. **This is it**; these papers will be graded out of ten points, but there is no limit on the grade you can achieve.
Truly exceptional work might get as high as a 20/10 or even a 30/10. (Last year there were perhaps ten grades out of 600 of 20/10 or better, and one of 30/10.)

Labs

AST101 satisfies the laboratory course requirement of the liberal arts core and so it has a compulsory lab component.
Many important course activities take place in the laboratories, and so attendance at the lab sections is required.
This is also a take-home lab that you complete by making observations of the Sun and/or the Moon over a period of several weeks.
Because the labs are a crucial element of the course, no student may receive a final grade for the course more than one letter grade
above their lab average. (That is, if you get a D for the lab, the highest grade you can get for the class is a C.)

Labs will be graded on a five point scale:

- 0: Nothing, or nothing relevant (F)
- 1: A minimal attempt, or severe errors (F)
- 2: The assignment is partially complete or contains multiple major errors (D)
- 3: The assignment is complete, but contains errors in the solutions (C)
- 4: The assignment is complete, but may contain several minor errors (B)
- 5: The assignment is complete and substantially correct. (A)

The lab attendance policy is as follows:

- Anyone coming to a lab section without completing the prelab will not be able to attend that week's lab.
- **You must attend your assigned lab** except in extenuating circumstances, such as serious illness or injury, caregiving responsibilities, or unavoidable conflicts with an academic or professional event (e.g. a job interview).
- If you miss your assigned lab for one of these reasons, you should:

- Send an email to your assigned TA and tell them what happened, and cc: the TA of another section if it's a different person. Also cc: me on this email.
- Ask the other TA if they have room for you to attend their section that week; note that since our class is very full,
  they might not have room for you.
- **If you show up to someone's section without contacting them first, explaining the situation, and seeing if there is room for you, it is quite possible you won't get a seat.**
- If you show up more than fifteen minutes late for your lab then the TA will likely ask you to leave; you will have missed so much of the day's activity that it will be difficult to get you caught up without burdening your
  group. If you are late for a compelling reason, the TA may make an exception to this policy by allowing you to attend a different section or complete the lab on your own.
- During lab you're expected to do the lab in collaboration with your group. The TA's have discretion to reduce the grades of people who are relying on their group to do the activity and just ``writing down the answers''.
  Your grade is based on your understanding of what is going on *as reflected by* what you turn in; it is not based only on a mechanical evaluation of whether you "wrote down the right answers or not".
- Your lab handout is due at the end of the lab period; these activities are designed for you to do in the lab with your partners, not at home as homework. If something unusual happens during the lab the TA may make
  arrangements for you to finish your work at home and turn it in later, but you should not do this without explicit instructions from your TA.
- TA's have wide latitude to make decisions, and they may allow for leniency on a case-by-case basis; however, this is the exception, not the rule.

Please don't interpret this explicit policy as any kind of desire for harshness on my part or anyone else's part. We're very willing to work with and around problems that you may encounter in helping you succeed in our
class; please let us know if something is going on that requires special accommodations. However, by default, this is the expectation.

Grading and Exams

Item	Date	Points
Paper 1	1 October	10+
Paper 2	TBA, around 1 November	10+
Paper 3	TBA, around 20 November	10+
Final project	TBA, during finals week	10+
Exam 1	25 September	15
Exam 2	16 October	15
Exam 3	6 November	15
Final Exam	11 December	30
Labs	Throughout the semester	25
Participation	Throughout the semester	10

The lowest 15 points of your exam grades will be dropped. (That is, I will drop your lowest exam grade, unless the final is your lowest exam grade; in that case, the final will only count for 15 points.)

Your lowest lab grade will also be dropped.

Your score will be converted to a percentage and your final grade will be determined from your score as follows:

- 88-100: A
- 80-88: A-

- 75-80: B+
- 70-75: B
- 65-70: B-
- 62-65: C+
- 58-62: C
- 55-58: C-
- 50-55: D
- 0-50: F

Note that this is a different grading scale than the common one used in American high schools. I will ask you to do challenging things in this class; I am aware of that, and do not expect everyone to be able to do everything perfectly.

Exams

There will be three exams and a final on the dates shown on the course schedule. These exams will involve multiple choice questions, and may involve free-response questions as well.
No makeup exams will ordinarily be given. I will ensure that no student loses credit for an exam due to medical or personal emergencies, but you must come talk to me
to receive accommodations.

Students who must miss an exam due to unavoidable emergencies must inform me as soon as possible.

Exam questions will be based on material from lectures, the text, and (to a significant degree) the lecture tutorials. You will need to bring only pencils to your exam.
If you believe your exam has not been graded correctly, come see me during office hours.
If you require accommodations for your exam, please contact me or the Office of Disability Services in advance so I can arrange for you to get the assistance you need.

Papers

The papers will be graded out of ten points, although there is no fixed maximum value for your grade; exceptional work will get substantial extra credit. (Both Dr. Freeman and the lab TA's will be helping grade the papers.)
We will be grading on the basis of:

- astronomical insight and factual correctness
- clarity of writing, including correct use of astronomical terminology. Note that we will not nitpick spelling or minor grammar issues, and will be particularly lenient to students who have not lived for long in an English-speaking country. Iâ€™m more interested in whether your ideas fit together to tell a coherent story.
- ambition and creativity
- **We are not looking for perfection; we are looking for insight.** I am aware that many of you speak English as a second language. Donâ€™t worry about your English skills; I want to know what you think. If you need help with your writing, we have
  multiple resources available for you – the Writing Center, and a few coaches who have specialized skills in helping students with their writing.

Academic integrity

While you are encouraged to discuss everything in the course (other than exams during the exam period) with your peers, all work you submit must reflect your own understanding.
My fundamental definition of academic dishonesty is "substituting someone else's understanding or work for your own"; we may impose a grade sanction up to course failure
for any instance of academic dishonesty. For purposes of clarity, we intend to seek this sanction for all instances of deliberate plagiarism or cheating on exams.

You are not allowed to communicate about the exam with anyone other than teaching staff during exams.
Consulting a cellphone for any reason during an exam without permission will be considered presumptive evidence of academic dishonesty.

Your papers and projects must reflect your own understanding. This means:

- You must show clearly which text is original to you, which reflects ideas which you found elsewhere but have digested and expressed in your own words, and which text is a direct quote from someone elseâ€™s words.
- You must cite any references that you use. If you consult a webpage or book for information, you should tell me this. I don't care what citation style you use.
- **Direct quotes must be indicated**, as must extensive near-direct paraphrases (i.e. taking the organization and content of someone else's writing and merely replacing words with synonyms, reordering words, omitting sentences or phrases, etc.). This is done by either blockquoting the other writer's text or by putting it in quotation marks.

(Boilerplate from the University)

Syracuse Universityâ€™s Academic Integrity Policy reflects the high value that we, as a university community, place
on honesty in academic work.
The policy defines our expectations for academic honesty and holds students
accountable for the integrity of all work they submit.
Students should understand that it is their responsibility
to learn about course-specific expectations, as well as about university-wide academic integrity expectations.
The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and
assignments, and the veracity of signatures on attendance sheets and other verification of participation in class
activities.
The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors.
Under the policy, students found in violation
are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the
School or College where the course is offered as described in the Violation and Sanction Classification Rubric.
Syracuse University students are required to read an online summary of the Universityâ€™s academic integrity
expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-
in on MySlice.

SU's academic integrity policy can be found at https://class.syr.edu/academic-integrity/policy/">class.syr.edu/academic-integrity/policy/.

Students with disabilities

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS)
at http://disabilityservices.syr.edu">disabilityservices.syr.edu, located in Room 309 of 8047 University Avenue, or call (315) 443-4498, TDD: (315) 443-1371 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

ODS also helps students with short-term injuries. If you have a concussion, a broken hand, or the like, *please let us know* so we can help you.

More generally, if there is anything I can do to help you, whether it is related to a disability, a medical condition, or anything else, please let me know. I have an excellent working relationship with ODS and will do anything in my power to make your experience in my class a good one.

Religious and personal observances

(The following is common to all SU classes)

SUâ€™s religious observances notification and policy, found at http://hendricks.syr.edu/spiritual-life/index.html, recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holidays according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. An online notification process is available for students in My Slice / StudentServices / Enrollment / MyReligiousObservances / Add a Notification.

(The following is specific to my classes)

I believe that SU's religious observance policy discriminates against nonreligious people by privileging religious observances over
equally important secular events.

Thus, events of equal solemnity to major religious observances, occurring on inflexible dates, will be given the same deference as religious observances.
This includes weddings and commitment ceremonies of immediate family members, funerals, caregiving duties for sick family members, other family emergencies
or singularly-important events, job interviews, and the like. Note that I treat exceptionally close friends and romantic partners as family members.

If you need to miss class or lab for such a reason, please notify Dr. Freeman as far in advance as practical to discuss arrangements.