

Monday and Wednesday

11:00 a.m. – 12:15 p.m.

Instructor: Prof. Neal Weiner

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Office Hours: M 1:30p.m.- 2:30 p.m.,

W 10:00am-11:00am or by appointment

Course Description

This course aims to introduce you to the modern understanding of the universe. This is a big topic, so

Lab Section	Day	Time
2	Wed	9:00 am – 10:40 am
3	Wed	1:00 pm – 2:40 pm
4	Wed	3:00 pm – 4:40 p.m.
5	Wed	5:00 pm – 6:40 p.m.
6	Thur	9:00 am – 10:40 am
7	Thur	11:00 am – 12:40 pm

it's likely we won't get to everything, but topics to be included are: stars and their relatives, such as white dwarfs, neutrons stars, supernovae and black holes; the structures of the universe, namely galaxies and galaxy clusters; the expansion of the universe, and the big bang theory, and the light from the birth of the universe; the constituents of the universe, including "ordinary" matter, dark matter and dark energy. We will emphasize not only the concepts, but how we have arrived at them, and the challenge of testing ideas about cosmology, when we only have one

universe, and we can only directly probe a limited scope of it.

Course Objectives

- Learn how to absorb qualitative information about a variety of science topics and discuss it,
- See how we understand the natural world through observation, experimentation, and theory.
- Show how light is a messenger carrying information about the cosmos.
- Understand how to make measurements of the distant universe, including distances and motions
- Understand how the sun and other stars generate energy.
- See how stars form and evolve into white dwarfs, neutron stars and black holes.
- To understand what black holes are, what evidence there is for them.
- Look at the evidence for dark matter, and understand what it might be
- Understand the expansion of the universe, and the evidence for dark energy
- Provide an overview of the big bang theory, and the imprints of the early universe in the leftover radiation from the big bang.

Online resources

This course will utilize various online resources for the distribution of class material, information and schedule updates, and so forth. The core materials and announcements will be available on the NYU Classes site (see below). Depending on reception, I'll try other social-media outlets for posting material.

Class Web Site

A NYU Classes web site for this class will exist and will be accessible through your *NYUHome* account. You must have an active NYU email account to access the site.

Course texts

1. *Astronomy Today, Volume II: Stars and Galaxies*, 8th edition **or** 9th edition, Chaisson and McMillan
2. *Quarks to Cosmos: Laboratory Manual*, 2018.

Lectures

Lectures are to help you learn the material, clarify what you are responsible for and to help you succeed on exams. Questions handed out each lecture and will form the basis of what you are responsible for from our twice-weekly meetings. Some of these questions are answered in your books, but all will be discussed in class. A given lecture sheet will be available on the day it is discussed, and will be available in class until it is posted online (usually a week after the lecture).

NY Times readings

A major goal of this course is to expose you to the wealth of research that is going on. To this end, you will be required to submit weekly three-paragraph summaries of one article (*any article*) in the NY Times science section. These will be submitted via the NYU classes site. *The first NYT assignment is due Sept 14 at 5pm.*

Course Examinations

The examinations will be based on (1) the lecture questions and text material, (2) exercises assigned in class, and (3) material covered in lab sections.

We will have two exams, in a multiple choice format. For exams, you will need to bring a calculator (not a phone). The midterm will focus on detailed aspects of the course. The cumulative nature of the final exam will be reflected in concepts from the mid-term exam that were the subject of those questions that had the most incorrect responses. The final exam will be cumulative with a design to test you on concepts from the mid-term exam that the most students had trouble with. Whichever exam you do better on (in terms of absolute percentage) you will have 5% of total course weight allocated (X% below).

Examination Schedule and Course Grade

Midterm examination (in Meyer 121):	20+X%	Wednesday, October 31 in class
NY Times summaries	10%	Due Fridays, 5PM (9/14 start)
Laboratory:	40%	Weekly (9/10 start)
Final examination (in Meyer 121):	25+X%	Monday, December 17, 10-11:50 am

Review sessions

There will be review sessions prior to the exams. The first will be Oct 30, starting at 7pm. The second will *tentatively* be on Dec 16 (the night before the final), however that's a Sunday so I need to confirm a room.

Homework

Homework assignments will be given out in class and posted online by the end of the week for those who missed class. Homework assignments are to help you understand the material and to prepare you for course examinations. Homework problems are to be handed in with your lab the week following their assignment and will constitute 1 point out of 10 of that weeks lab score.

Laboratory Sessions

These weekly sessions are an important part of the course. You must be registered for one lab section, which will meet in Meyer 161. You will have to submit a lab report for each experiment performed. The lab report has to include answers to all questions and any data you may have collected. Most lab reports should be completable within the lab period, however you will have *no more than five days* to submit the final report if you cannot do so in the lab session. **The laboratory sessions will be held in Meyer and will begin the week of September 10-14.** They will be devoted to

1. Doing experiments described in your laboratory manual.
2. Discussing the homework problems.
3. Going over questions from class.

Attendance The lab instructor will deduct points from your lab grade for arriving late or leaving early.

Absence Policy Excused absences will only be given in the case of illness (with a doctor's note) or observation of a religious holiday. You must notify your lab instructor in advance in writing if you miss a lab due to religious reasons, **this must be done in the first two weeks of the semester.** All other absences will be considered unexcused and will result in a lab grade of zero. **You cannot make up a lab by attending a laboratory session that you are not registered for.**

Late Assignments Late assignments will be penalized for each day late (excluding weekends). If you wish to submit a late lab report you must do so only at your laboratory instructor's office.

Late NY Times summaries NY Times summaries will not be accepted late for any reason other than illness, supported by a doctors note.

Lab Instructors Each lab instructor will hold a weekly office hour or be available by appointment where you can discuss lecture and laboratory material. Office locations and office hour schedule will be announced in lab.

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Missed Exams

There are no make-up exams for students who miss the mid-term exam. If you miss the midterm because of illness, you must contact Prof. Weiner by phone or email **before** the start of the exam and follow up with a doctor's note. If you miss an examination, for a valid reason (illness, injury or family emergency), your grade will be based on the following allocations:

Midterm	20+X%	x
NY Times:	10%	10%
Laboratory:	40%	40%
Final examination (cumulative):	25+X%	50%

Final Exam A make-up for the final examination will be given under truly exceptional circumstances, which must be discussed with Prof. Weiner before the examination. A doctor's note must be provided in the case of illness. In this case a grade of incomplete will be assigned and **the make-up will entail taking the final exam for the next offering this course, which is no sooner than Spring 2019.**

Please avoid making travel plans before the date of the final exam. No alternative date for the final examination will be offered before the end of the Fall 2018 semester.

Religious Holidays If you will be absent for a religious holiday during the semester, you must inform your lab instructor and Prof. Weiner **in the first two weeks of the semester.**

Tentative Weekly Schedule of Topics and Laboratories

<i>Date</i>	<i>Lecture Topic</i>	<i>Reading</i>	<i>Weekly Lab</i>
W Sept 5	Overview: Science and the Universe	TBA	
M Sept 10	Observing the cosmos and the Seasons		Mathematics Review
W Sept 12	Kepler's Laws of Planetary Motion Newton's Laws of Motion		
M Sept 17	Waves of Electricity and Magnetism		Kinematics
W Sept 19	Thermal Radiation and the Doppler Effect		
M Sept 24	Spectral Lines and Atomic Structure		Parallax
W Sept 26	Spectral Line Analysis		
M Oct 1	The Sun: Energy Generation and the Interior		Young's experiment
W Oct 3	Stellar Parallax, Luminosity and Temperature		
M Oct 8	No class - Fall Recess		Spectroscopy
T Oct 9	Stellar Sizes, the H-R Diagram and Masses		
W Oct 10	Stellar Evolution of Stars like the Sun		
M Oct 15	Supernovae		Photoelectric effect
W Oct 17	Supernovae		
M Oct 22	Neutron Stars and Pulsars		Midterm Exam Review
W Oct 24	Black Holes and Einstein's General Relativity		
M Oct 29	The Milky Way Galaxy: Size and Structure		Inverse Square Law
W Oct 31	Midterm Exam		
M Nov 5	The Milky Way Galaxy: Mass and the Galactic Center		Newton's Law
W Nov 7	Galaxy Classification and Hubble's Law		
M Nov 12	Active Galaxies, Quasars and their Nuclei		Principle of Equivalence
W Nov 14	Dark Matter		
M Nov 19	The Expanding Universe and the big bang		No lab this week
W Nov 21	Thanksgiving Break (no class)		
M Nov 26	Quarks and matter in the early universe		Redshift
W Nov 28	The accelerating universe		
M Dec 3	The Cosmic Microwave Background Radiation		Hubble's Law
W Dec 5	Inflation and "before" the Big Bang		
M Dec 10	Catch up		Final Exam Review
W Dec 12	Final Exam Review		
Monday, Dec 17 Final Exam 10:00 to 11:50 a.m.			

Frequently Asked Questions

Q: What email address should I use to contact you?

A: Use weiner.academic@gmail.com. My nyu email address generally receives ~100 emails/day and so lots of emails got lost in the noise. If you use this gmail address, I can go back and check that I've responded to you.

Q: I missed my lab because of sickness, can I make it up?

A: No. The lab stations are disassembled every week and all labs are full, so there are no opportunities to make up labs. If you miss a lab, provide your TA and me with a doctor's note and that zero will not be counted against you.

Q: I missed a lab or a test because I was sick, but didn't get a doctor's note. Can I still have that lab not counted?

A: No. If you are too sick to be in class, that's very sick, extremely sick, even, your-parents-would-want-you-to-see-a-doctor sick, and you should see a doctor.

Q: I will miss a lab or labs due to religious holidays. Can I make it up?

A: You'll either be able to make it up or you'll be excused from it if that's not possible. However, you must notify me in the first two weeks of the semester (so, by Sept 19)

Q: I missed a lab due to religious holidays! Can I make it up?

A: Did you notify me about it in the first two weeks of the semester?

Q: I missed the midterm, can I make it up?

A: No. If you have a note from a doctor, the final will have added importance. If you have no note, you will receive a zero.

Q: I missed the final, can I make it up this semester?

A: No. If you have a note from a doctor, then you will have the opportunity to take the final from the next time this course is offered in the Spring or next Fall. There will be no makeups this semester. That includes showing up or emailing later in the day of the final.

Q: I'm going to Aruba on the day before the midterm/final. It's going to be so sunny and warm. Can I take the test early?

A: Nope. Sorry.

Q: No, but seriously, Aruba is so nice.

A: I've never been! But I believe you.

Q: I have special needs for test taking, which the university is aware of. What should I do?

A: No problem. Please contact me directly and we'll arrange this.

Q: Can I use a previous year's textbook?

A: So in my experience, the books do not change **too** much so I'm allowing 8th and 9th editions. Before that I won't be checking so will be on you to make sure you have the relevant info.

Q: Do I need to know all the material from the book?

A: Tests are based upon lectures, labs, and HW. Some material in the lecture will not be found in the book. Some material will come from additional web resources or handouts. However, what of this you should know is what I cover in class, thus the best resources for what you need to know are the class lecture sheets, your labs, and your HWs.

Q: I want to change my lab section. Can I?

A: I don't actually handle such changes. Contact the Core office and they'll let you know what can be done.

Q: Will you post the answers to the lecture sheets online?

A: Nope, but I or your TAs will happily go over any lecture sheet in office hours should you miss class.