

MSE 2103: HOW OLD IS THE UNIVERSE**Vintage: Spring 2021**

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VIRTUAL OFFICE HOURS

Tue 2pm – 4pm
Thu 11am – 12:30pm
Fri 9am – 11am

other times by appointment

In this class we value each person as part of a learning community for their insights, perspectives and opinions, irrespective of gender, gender identity, race, sexual orientation, disability, spiritual values, political beliefs or nationality. We celebrate diversity and highlight its principal role in enriching our academic, professional and personal lives.

Course time and location:

Tue/Thu 9:35-10:50, M154 (1st floor Mendel)

Course homepage:

<http://aprsa.villanova.edu/?q=hoitu>

Course textbook:

D. Weintraub: How Old is the Universe, 3rd Ed. (Princeton UP, 2013; ISBN 9780691156286)

Please refer to the webpage above for most up-to-date information on the course. Test dates, past tests in pdf form and all other information will be made there available in due time.

This course satisfies one semester of the 2-semester Natural Science requirement for students in the College of Liberal Arts and Sciences, under the provisions of the Mendel Science Experience (MSE). Students must also be enrolled in the concurrent laboratory course *Astronomy Laboratory*.

Course content:

Today we know, rather than guess, that the age of the Universe is 13.7 billion years. The uncertainty in this number is remarkably small, smaller than 1%. It is of course natural to ask ourselves: how do we know? What observations, what reasoning and what inevitable conclusions shaped this bold statement and shrunk the corresponding uncertainties? Join me for a ride of epic proportions, where we will jointly endeavor to understand the steady advancement of comprehending our Universe, starting from our home turf, the Earth, then shooting for the stars, and finally discussing the mind-boggling concepts of dark matter and dark energy! We will leave the comfort of this world and strive to understand the physical laws that govern the largest scale dynamics – galaxies and clusters of galaxies – and tie it all to form a consistent picture that answers our question: how old is the Universe? Since the path to get there is much more rewarding than the answer itself, brace yourselves for a thought-provoking semester filled with unexpected twists, turns and new information that will enrich and empower you in the modern world today where science shapes the advancement of our civilization.

Course objectives:

Once you have successfully completed the How Old is the Universe course, you will be able to:

- understand and appreciate the process of scientific discovery, from hypothesis to theory;
- educate and partake in a scientifically backed discussion on the age of the Universe;
- have the foundation for reading and following the news and advances from this field;
- gain proficiency with the basic astronomical vocabulary to propel you to other related field;
- gain independence and critical thinking to assess reasonableness of information content.

Know your professor:

Who am I and why I might be qualified to teach this course? I am a professor of Astrophysics, with ~20 years of professional experience teaching and doing research in the fields of computational astrophysics, stellar physics and exoplanetary astronomy. I am a member of the *Kepler* Science Working Group – a NASA mission dedicated to discovering planets around other stars. I am also involved in the Transiting Exoplanet Survey Satellite (*TESS*), galactic astrometry mission *Gaia*, and the Large Synoptic Survey Telescope (*LSST*). I hail from Slovenia, a small Alpine country in Europe. When teaching, I put foremost emphasis on critical thinking, causal deductive reasoning and scientific thought and illustrate the power of science across history, geology, biology, physics and astronomy.

Course work and grading:

Your final grade will reflect your effort and the scores you earn on **quizzes, tests and the final**.

- Every week (Tuesday – but that's up for discussion) there will be an in-class quiz. Every quiz has 10 questions, with additional two questions for extra credit. Each quiz question is worth 10 points, 100 points total + 20 points for extra credit;
- there will be two 1-hour essay-type tests during the semester. These tests will have 5 questions, with an additional question for extra credit. Each question is worth 100 points, 500 points total + 100 points for extra credit;
- at the end of the semester there will be a **cumulative** final. The final will have 5 questions, with an additional question for extra credit. Each question is worth 200 points, 1000 points total + 200 points for extra credit;
- occasionally there may be other opportunities given for extra credit, such as an in-depth presentation of research topics and homeworks. Please see me to find out more about these opportunities.

If you do the math, you'll see that quizzes carry 1/3 of the grade, tests carry 1/3 of the grade, and the final carries 1/3 of the grade. Grading will be done according to the following breakdown:

0-56%	F	68-72%	C-	84-88%	B
56-60%	D-	72-76%	C	88-92%	B+
60-64%	D	76-80%	C+	92-96%	A-
64-68%	D+	80-84%	B-	96-100%	A

Attendance:

Talking about attendance in the covid19-infested 2021 is a bit tricky. I will never insist on your presence in lecture, be it in person or remotely. There will be no attendance sheets and no penalties for missing the lecture. You never need to provide me with any evidence for missing any lectures. You are

all adults and I will treat you as such. You take full responsibility for your actions.

That said... regular attendance is essential for uninterrupted understanding of the course material. As this course covers a significant amount of content in a not-so-significant amount of time, each missed class will hurt. Really hurt. The topics are not trivial and continuous work is required to remain on top of things.

Please do not miss quizzes and tests. If you must miss a quiz or a test, you must inform me of that in advance, and you must have a formal note excusing your absence. Health center visits and subsequent "call us and we'll confirm that he/she was here" do not count as a valid excuse. Provided that you follow these rules, I will excuse you from a missed quiz (i.e. there are no make-ups for the quizzes), and I will provide you with a make-up opportunity for the test or the final.

Test dates will be scheduled by majority vote. I will provide you with a 2-week window and I will go with the date that the majority of the class agrees works best for everyone. Once the date is set, we will stick to that date.

The etiquette for using laptops and cell phones in class:

This is another tricky one given the current pandemic situation, but I'd *like* to say that the use of laptop computers or cell phones in class is strictly prohibited. You will be publicly flogged with a wet noodle if caught using cell phones in class for texting, social media or web surfing. If you're taking the course online, the no-laptop/cellphone policy might be "a bit" of a hindrance, so obviously that doesn't apply. Again, you are adults so figure out how your lecture time is best spent on the other side of the screen.

Academic integrity and Special needs:

Finally, here goes the standard fingerprint: any violation of the Code of ethics will be grounds for failing the course. Any cheating, copying, duplication of work, etc, will get you into trouble. If you have any concerns, come talk to me and we will figure it all out.

It is the policy of Villanova University to make reasonable academic accommodations for qualified individuals with special needs. If you are a person with special needs, please contact me after class or during office hours and make arrangements to register with the Learning Support Services by contacting 610-519-5176 or by emailing learning.support.services@villanova.edu. as soon as possible. Students approved for accommodations should use ClockWork to register and book tests.

Epilogue:

Please remember that the syllabus is a formal contract between you (the student) and me (the professor). I will give it my all to help you succeed, but you need to do the work. Please do not wait until it is too late to address any issues. Be proactive, work hard, and make this a truly fun learning experience! I promise that the material is both exciting and mind-boggling, so let's enjoy it together! :)