

MSE 2100: BIRTH AND DEATH OF STARS

Vintage: Spring 2023

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OFFICE HOURS

Mon noon – 2pm
Tue 2pm – 4pm
Wed 2pm – 4pm

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:

Mon/Wed/Fri 10:40-11:30, M341 (3rd floor Mendel)

Course homepage:

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

Course textbook:

Palen & Blumenthal, 21st Century Astronomy, 7E (ISBN 978-0-393-53915-8)

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:

Stars are the main constituents of our Universe. Understanding the physical processes that are happening in their interiors and in their envelopes means understanding the Universe as a whole. When we say “stars,” we usually think of Sun-like objects, but it turns out that our Sun is neither particularly typical nor special in any way (other than the fact that it enables life to you, me, everyone and everything on this planet). The stars, ranging from the hottest blue giants, all the way to the coolest red dwarfs, from red giants and supergiants to tiny white dwarfs, neutron stars and black holes, share a common story that we will cover in detail over the course of the semester. For example, do you know how stars form? How long does it take to form a star? How about how long do stars typically live? What does it take for stars to have planetary systems around them? Why are some red stars tiny dwarfs just a tad bigger than Jupiter while the other red stars are supergiants the size of our entire solar system? What powers the stars? For how long? And what happens then? It is my sincere hope that you embrace the most important question that you can ask me, and one another: “How do we know all this?” On our path to understanding the physics and chemistry of stars, and the processes that govern their lifetimes, we will study the process of scientific inquiry and we will learn to apply it to other topics in science in general, and astronomy in particular. Above all, remember: astronomy is just soooo cool that we will have tons of fun covering all this good stuff!

Course objectives:

Once you have successfully completed The Birth and Death of Stars course, you will be able to:

- understand and appreciate the process of scientific discovery, from hypothesis to theory;
- authoritatively partake in a scientifically backed discussion on the contents of the Universe;
- have the foundation for reading and following the news and advances in this field;
- gain proficiency with the basic astronomical vocabulary to propel you to other related fields;
- gain independence and critical thinking skills to recognize BS when you hear it in the news.

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 (Monday – 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:

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 slips 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 one is important: 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 want to take notes on a tablet, please take them by *writing* rather than typing. It has been repeatedly shown that there is no such thing as "learning types" and that note-taking beats all other learning strategies. Don't trust me? Google it and you'll see. Internet never lies.

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! :)