Astronomy 130, Spring 2019: *The Universe*

Explanation (from Astronomy Pic of the Day 2015 Dec 16): The Horsehead Nebula is one of the most famous nebulae on the sky. It is visible as the dark indentation to the red emission nebula in the center of the above photograph. The horse-head feature is dark because it is really an opaque dust cloud that lies in front of the bright red emission nebula. Like clouds in Earth's atmosphere, this cosmic cloud has assumed a recognizable shape by chance. After many thousands of years, the internal motions of the cloud will surely alter its appearance. The emission nebula's red color is caused by electrons recombining with protons to form hydrogen atoms. On the image left is the Flame Nebula, an orange-tinged nebula that also contains filaments of dark dust. Just to the lower left of the Horsehead nebula featured picture is a blueish reflection nebulae that preferentially reflects the blue light fromnearby stars.

Image Credit & Copyright: José Jiménez Priego

Lectures: Tu and Th 2:00-3:20 pm @ Science Center 1343
Labs: Tu (section 1) or Th (section 2), 7-9 pm @ Science Center 1343 and/or observatory

Instructor:

Prof. Dipankar Maitra
Email: maitra_dipankar@wheatoncollege.edu **Phone**: x5697 (but email is far better!)
Office: Science Center 1330
Office Hours: Tu 11am - 1pm, Wed: 2-4pm, or email me to schedule a time.

TA: Ryan Kirby (will join us during the labs)
Tutoring: Dylan Schmitt. In Kollett Hall (Filene Center) on Sundays from 8-9pm.

Course Goals: Discover the nature of stars, black holes, nebulae, supernovae, galaxies, and other cosmic phenomena. We will learn what these objects are, how they formed, and what is ultimately in store for the universe. Explore the roles of light, energy, and gravity in astronomy. Get hands-on experience with telescopes. By the end of this course, you will have a greater appreciation for and understanding of the universe, and we look forward to working with you as we explore it together.

Expectations: If you would like to work hard and learn a great deal, then AST 130 is definitely for you. The material may not be easy, but few things of value are. As a rule of thumb, expect to spend 2-3 hours studying outside class for each hour of class time. This implies that you should allow 6-9 hours a week to study for this course. Taking AST 130 as a fifth course has proven to be a bad idea many times.

- We encourage you to approach us with any kind of questions as soon as they arise, and to attend the office hours if you need assistance.
- Collaboration with classmates is also highly encouraged.
- If at any point in the lectures or lab you are confused or we are moving through the material too quickly, do not hesitate to ask a question. If you have a confusion, someone probably else does too, and far from judging you, we will respect you for thinking critically, speaking up, and taking ownership of your education.

Course Book: *The Cosmic Perspective: Stars, Galaxies & Cosmology,* Bennett et al., 6th or newer edition, and additional handouts or online readings. The bookstore should have copies of the text. The library should also have a copy on reserve. You can also search online for inexpensive copies (but make sure to get the correct version). Please keep in mind that the textbook will be a general guide only. We will cover certain aspects in more detail than the book. Exam/HW problems will be based on topics discussed in the class.

Website: An onCourse site has been established for the course; please check it regularly for information about the class/assignments/lab, etc.

Communication: I will be using email extensively to communicate with everyone. We will not be FaceBook-ing, tweeting, instagram-ing and such. ***Please check your email frequently.***

Attendance Policy: Class attendance and participation is expected. Absences for school-sanctioned events will be excused. Please know that it is your responsibility to inform us in case of absence due to serious or prolonged illness.

Grading scheme:

- Exams (two, 20% each) ……...…….……... 40%
- Homeworks and Labs: …….…… 40%
- Reading, pre-quizzes, class participation: …… 5%
- Presentations:
    - Team presentation: ……... 7%
    - Paper on presentation: …….. 5%
    - Peer-evaluation of presentations: ……. 3%

Exams: There will be 2 exams (closed book/notes), each worth 20% of the final grade. There will be no make-up exams under ordinary circumstances, so please plan accordingly. The exams are not cumulative, but you will need to know/understand stuff from Exam 1 in order to do well in Exam 2. Please check the class schedule at the end of this document for the exam date/times.

Homework: Weekly HWs will include questions and problems covering class topics, and will represent 20% of your grade. HW will be assigned (typically) on Thursdays and will be due the following Tuesday.

Labs and Observing Opportunities: Labs, done in groups of 2-3 students, will incorporate hands-on activities to illustrate topics discussed in class. When weather permits, telescopic observing will be scheduled and announced via email or in class. Observation/Lab reports need to be handed back at the end of each lab.

- *Lab reports will have equal weightage as HWs, and will represent 20% of your grade.*
- *If you miss three labs and are unexcused, you will fail the lab course.*
- *A lab for which you do not turn in any work constitutes a missed lab.*

Class Participation (APOD/Astronews/in-class quizzes/attentiveness and/or focus during class):

- *APOD/Astronews:* Every class we will have someone present either a recent Astronomy Picture of the Day, or a recent astronomy related news. The idea is to convey the excitement generated by this APOD/astronews in less than 2 minutes.
- Class participation includes problem solving, class discussions etc. The learning process requires your dedication and involvement; it is not just the instructor lecturing to you. Your active participation in class is required, not just expected.

Team presentations: Early in the semester, students will be randomly assigned to work in teams of two. Teams will work together on projects in class and also give a team presentation near the end of the semester. The topics for the presentations will be decided by lottery during the middle of the semester.

Paper on team presentations: Will be based on the presentation given by you and your teammate. Both team members will collaborate and write a single paper (1200 words minimum, plus references, figures, graphs, plots, images, tables etc.).

Peer-evaluation of presentations: Evaluate presentations of other teams. Take short notes (e.g., good points, what you learned, what could be improved, etc.) on a form that we will hand out.

Extra-credit challenges: We want you to get inspired and have new experiences, and to learn science and astronomy through trying new things. So, throughout the term, we will issue special challenges to the class. Some challenges may ask you to make a special observation, others may ask you to construct something, and others may ask you to take a crack at actual Hubble Space Telescope data. The rewards for completing these challenges will vary, but enticements may include things like 10-20% improvement on your worst exam, an automatic perfect score on a homework, etc. You are also strongly encouraged to attend **Physics/Astronomy Seminars** held during the semester. Submitting a 100-word summary of the seminar will earn you 2% extra credit. *Please note however that the extra-credit projects require some planning, original thinking, and often times cooperation of nature (which we instructors cannot guarantee, especially if you come two days before the last day of classes! Plan ahead.).*

Grading Scale: You will not be graded on a curve. Your test grades will be scaled according to the table on the right. This absolute scale is designed, in part, to encourage you to work together. Please help one another inside and outside of class!

Grade	+		-
A	**>96**	**92-96**	**88-92**
B	**85-88**	**81-85**	**77-81**
C	**72-77**	**67-72**	**63-67**
D	**60-63**	**56-60**	**52-56**
F	**<52**		

Late Work Policy: Except in case of lateness due to illness or school-sanctioned events, homework and labs must be turned in by the stated deadline to get full credit. Every week's worth of delay will cost 10% of the maximum score. E.g. if you turn in a HW (that is originally worth, say, 10 points) 3 weeks late, then you can get only 7 points max for that HW.

Academic Integrity and Honor Code: I encourage you to work together on homework assignments, but straight copying of someone else's work is a violation. When in doubt, please acknowledge the work of the students that you studied with. Signing another person's name on an attendance sheet is an Honor Code violation. Tests are closed-book, and you will be asked to sign the Wheaton College Honor Code statement.

Accommodations: Wheaton is committed to ensuring equitable access to programs and services and to prohibit discrimination in the recruitment, admission, and education of students with disabilities. Individuals with disabilities requiring accommodations or information on accessibility should contact Autumn Grant - Associate Director for Accessibility Services at the Filene Center for Academic Advising and Career Services. ~ accessibility@wheatoncollege.edu or (508) 286-8215