PS 101: Introductory Astronomy

Fall 2015

Lecture:	Tues./Thurs. 3:00 pm - 4:15 pm, S277
Lab:	Mon. 4:00 pm - 5:50 pm, S277 (but see below)
Instructor:	Dr. Jon M. Saken
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Phone:	696-2753
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Office Hours:	Mon. 2:00-4:00 pm Wed. 1:00-3:00 pm or by appointment
Final Exam:	Tuesday, Dec. 7, 3:00 pm - 5:00 pm
Suggested Text:	*Astronomy: A Beginner's Guide to the Universe;* Chaisson & McMillan, 7th ed.
Required Text:	*Lecture-Tutorials For Introductory Astronomy;* Prather et al., 3rd ed.

Catalog Description:
(*4 hours*) A survey of the past, present, and future of the Universe, from our solar system, to the nearby stars, our Milky Way galaxy and far beyond.

Fuller Course Description:
In Introductory Astronomy we will take a tour through the Universe, starting with our own little corner of the galaxy and working our way outward. Along the way we will examine both the origins and future fate of our solar system, galaxy and the Universe itself.

Our emphasis will be on the history, development, and evidence for our current astronomical understanding of the solar system, stars, galaxies and the Universe. Starting with the efforts of the ancient Greeks to decipher the structure of the solar system, through the early investigations of stars and the debate over the nature of the "spiral nebulae" (galaxies), the conflict between the Steady State and Big Bang cosmologies, the current quest to understand Dark Matter and Dark Energy, and ending with the question of whether or not we are alone in the Universe, we will examine the evidence and models that lead to our current picture of the cosmos, keeping a wary eye out for crashing planets, exploding stars, and lurking black holes.

Through laboratory exercises you will have a chance to make your own observations and learn about the tools and techniques astronomers use to study the Universe, as well as their inherent limitations. You will also have a chance to make your own contribution to astronomical research.

Note that this class will follow, to some extent, a "flipped" model. You will be expected to do most of your reading before class so that lecture time can be kept to a minimum and more time can be spent answering questions, having discussion, and working in groups to enhance your conceptual understanding of the material.

It is critically important to your success in this class that you complete the readings ahead of time.

Grading:

A	90 - 100
B	80 - 89
C	70 - 79
D	60 - 69
F	0 - 59

Evaluation: Note - You **MUST** pass the lab to pass the class.

Lecture	
Homework	10%
Lecture-Tutorials	5%
Paper	15%
Quizzes	10%
Midterm	20%
Final Exam	20%
Lab	20%

Textbook: This course will follow the chapters in Chaisson & McMillan's *Astronomy: A Beginner's Guide to the Universe*. The homework (see below) will also be based on this textbook. However although the textbook is highly recommended, you are **NOT** required to purchase it if you do not feel it will be helpful. Alternative readings are provided from an excellent course website, *astronomynotes.com*. This site covers almost all the same material, and will in fact be used extensively in lectures. Some students find the textbook more helpful, some prefer on-line resources. You may make whichever choice you feel will be best for you.

Do be advised that, for detailed information on individual planets, astronomynotes.com is a bit lacking. Alternative sites for this information will be provided as well.

Assignments & Due Dates: As weather and/or new discoveries may necessitate some schedule adjustments, please check the website regularly for course announcements.

Homework: Homework will be conducted using the textbook publisher's *Mastering Astronomy* system. An access code should have been bundled with the textbook if you bought it at the campus bookstore. Otherwise, you may register on-line. The course ID is: **PS101FALL2015** Note that the access code and the course ID are **NOT** the same thing.

Homework will be due on Sundays, except for the very last assignment of the year, as shown on the course schedule. As these exercises are meant to help you understand the material, they will be graded on a mostly participatory basis. You will be allowed multiple attempts and the full use

of the on-line hints for every question with no penalties.

A Few Notes on Homework: Please do the homework. Please allow enough time on the homework so that you can think about your responses and pay close attention to the questions. It is not intended to be mere busy work but is instead an important part of the learning experience. Believe it or not, education research has been conducted to show what may be obvious - students who do the homework for themselves (not copying off of someone else or looking up the answers on-line) do much better in the class.

I can't make you do the homework. I can't make sure that you always do it for yourself. But I can guarantee that you will severely lower your chances of getting a good grade, or even passing, if you don't do the homework. *So, please do the homework.*

Lecture-Tutorials: You are **required** to purchase a **new, not used** copy of Lecture-Tutorials For Introductory Astronomy. These will be completed partly on your own and partly in class, although there will be ample opportunities to discuss the tutorials during lecture. These too will be graded on a participatory nature. Workbooks checks will be made at the midterm and at the end of the semester. See the course schedule for exact dates.

Quizzes: Short quizzes, taking no more than 20 minutes, will be conducted on most Thursday class sessions. Sometimes these will occur at the beginning of class, sometimes at the end. Late comers will not be allowed to take the quiz. Please remember the policy on excused absences if you miss a Thursday quiz.

Final Exam: The final exam *will* be cumulative.

Drake Equation Paper: Recent discoveries call for a re-evaluation of the prospects for intelligent life in the Universe. In this paper you will give your own estimate of how many such civilizations may exist. Due dates and specific requirements will be discussed in class. This paper is part of the the *Critical Thinking* requirements for the course.

Lab: Note that this course includes a separate 2-hour lab that counts 20% towards your final grade. You **MUST** pass the lab to pass the course. Laboratory exercises are designed to give you a chance to practice the use of the concepts presented in class and/or see exactly how the observations are performed. Labs will be due in lab the week after they are assigned. Again, see the course schedule for a detailed list.

In order to accommodate the demand for this course, labs have been moved to a mostly on-line format. Almost all the labs are computerized and can be completed during the week. "Lab" time will be used to give you a short introduction to the lab assignment and go over any details specific to that lab. Afterwards you may go to the library or any computer lab on campus to work on the assignment.

To enhance your understanding of astronomical objects and their motions through the sky, two of the labs will involve "naked-eye" observations conducted on your own. Due dates for these are given in the Course Schedule. **Do not wait until the last minute to start your observations!** You have been given plenty of time to complete the observations. Last minute bad weather will **NOT** be considered a valid reason for an extension. Start your observations early!

One of the most interesting developments in modern astronomy is the rise of "citizen science". More and more, astronomical observatories are producing so much data that professional astronomers must appeal to the general public for assistance in analyzing the results. This trend is only accelerating, and not only in astronomy. In this lab you will see how you can make a real contribution to our understanding of the Universe, now and on a continuing basis.

University Policies:
By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy be going to http://www.marshall.edu/academic-affairs and clicking on "Marshall University Policies." Or, you can access the policies directly by going to:
http://www.marshall.edu/academic-affairs/?page_id=802

Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment

Course Policies:

- **ALL** work submitted must be typed (word-processed) and stapled with your name written clearly on the front. No exceptions.
- Any work handed in late will suffer a 10% penalty per **calendar** day. This does not apply for any day for which there is an excused absence.
- Makeup work will **NOT** be allowed except for *documented* emergencies.
- If you must miss a class contact me immediately. Also, be sure to let me know at least a week ahead of time if a university activity will require an absence from class.
- If you do miss a class, even for an excused absence, contact me immediately if you are unsure what was covered or what you need to make up. If you wait too long to discuss a make up you may be denied the opportunity to do so.
- Cell phone use is not permitted in the classroom. Please turn cellphones to OFF or vibrate while in class.
- Except for calculators, *all other electronic devices must be turned off in class.* Laptops, tablets, etc.
- Any act of academic dishonesty of any kind will result in a final grade of F for the class.

Tips:

- *Don't fall behind* - This is mainly a conceptual science course, but it is still a science course. Many of the topics may be unfamiliar. If you have to catch up while trying to cover new topics you will probably end up missing something.

- *Come prepared to ask questions* - We will spend a great deal of time in class discussing the material and answering questions from the text, homework, activities, etc. If you are unprepared to engage in the discussion then you will probably not get what you need out of the scheduled class time and your performance will likely suffer. Write down questions as they occur to you so you are prepared. I really mean it. There are NO "dumb questions."

- *Engage in active learning* - You will probably not do well if you passively read a science text. Study the diagrams and illustrations, make sure you understand their purpose and all the details. Look for their relation to the material. Try the example problems. Then read everything again and look for things you might have missed. If there is anything you don't understand, write it down and ask in class.

- *Do your homework* - Actual educational research has been conducted to show that, yes, doing homework really matters.

- *Pay attention to the "Lecture Tutorials"* - These are designed to both help solidify your conceptual understanding of the material and to provide you a check (formative assessment) on that understanding. If you have trouble on any of them, it means you didn't quite understand something. So please come talk to your professor to get some additional assistance.

- *Again, come talk to your professor!* - Office hours are time that is set aside for YOU. Take advantage. Stop by often, even just to talk about science in general.

Course Goals and Learning Activities

Learning Outcomes *Students will:*	**MDP Domains**	**Practice**	**Assessment**
Characterize, in both time and space, the scales of objects in the Universe.	4	Lecture-Tutorials (LT); Ranking Task Exercises; Homework.	Tests
Describe the relationship between the Earth, Solar System, Milky Way galaxy, and the Universe.	6	LTs; Ranking Tasks; Fermi questions; Homework.	Tests
Define essential astronomical quantities.	4	Lab activities; Homework.	Homework
Demonstrate that the same physical laws and processes observed on Earth are applicable across the Universe.	1	LTs; Lab activities; Homework.	Lab reports
Examine the role of experiments, observations, models, and theories in refining our understanding of the Universe.	1, 4, 6	Lab activities; LTs.	Lab reports
Compare the types, roles and degrees of uncertainty in science.	4, 6	Lab activities.	Lab reports
Describe how solar systems, stars, galaxies and the Universe change over time.	6	LTs; Ranking Task exercises; Homework.	Tests
Apply basic principles from mathematics and related sciences (i.e. chemistry, physics, geology, biology) to topics in astronomy.	1, 3, 4, 6	Lab activities; Homework; LTs.	Test; Paper
Relate the results from other scientific disciplines to topics in astronomy.	3, 5, 6	LTs; Homework.	Homework; Paper
Explain the major paradigm shifts in the history of astronomy.	5	Homework; LTs.	Tests
Identify objects in the night sky visible to the naked eye.	...	LTs; Homework; Lab activities	Lab reports
Explain and/or describe how the appearance of the night sky changes with time and position on Earth.	...	LTs; Ranking Task exercises; Lab activities; Homework.	Homework; Tests

Marshall Degree Profile (MDP) Domains:

1: Integrative Thinking
3: Information Literacy
4: Quantitative Thinking
5: Communication Fluency
6: Inquiry-Based Thinking