

West Chester University

PHY 105-01: Structure of the Universe Spring 2012

Course Overview: This course examines the application of modern physics to the science of astronomy. Our ultimate goal is to understand how models of the physical world are constructed, tested, and modified or discarded; this process is illustrated in the context of studying stars, galaxies, and the universe as a whole. We will begin by examining our place in the universe, and how the motions of stars and other celestial bodies appear to us as observers on Earth. From there, we will study the modern theories of motion, light, and matter which can help us make sense of the world around us. The rest of the course applies these physical theories to the study of the universe and its contents. Here we shall see how our physical models are further tested and refined, and how experiments and observations can indicate a need for the creation of new physical theories. We will also discuss the history of these physical theories and those who made them possible. Throughout the course, we will develop and build analytical reasoning and problem solving skills which are widely applicable to our modern life.

Course Credit: This is a 3 credit course.

Course Requirements: This course has no prerequisites. However, we will be using some basic algebra at the high school math level; I will assume that you have done this sort of math before, though it may be a few years since you've seen it or used it. We will also be reading and interpreting graphs, and applying the physical theories we learn to new situations in order to understand them. I will assume that you have some experience reading and interpreting graphs, but not a whole lot of experience applying physical theories to new situations.

Meeting Times: Tuesdays and Thursdays from 11 AM to 12:15 AM
Merion Science Center, Room 113

Required Course Materials:

- *The Essential Cosmic Perspective, 6th Ed.*, by Bennett, Donahue, Schneider, and Voit. It should have a road running down the center, and a wispy nebula at the top. The title should be in all lower-case letters in the middle of the cover.

- A calculator that is **not** part of an iPod/iPad, cell phone, etc.
- A-B-C-D cards, which will be handed out the first day

Instructor Information:

Dr. Michelle A. Caler

office: 135 Merion Science Center

office hours: Mondays, Wednesdays, and Fridays from 11:00AM–12:00PM

Tuesday and Thursday from 1:00–2:00PM

... and by appointment

email: mcaler@wcupa.edu

office phone: 610-436-2320

webpage: This course has a D2L webpage. The syllabus and all other related course materials will be posted to this webpage. Please let me know if you are unable to access it. Being able to access the D2L webpage will be critical to student success in this course.

Course Goals: The ultimate goal of this course is for you to gain an understanding and appreciation for the process of science and how it works. One of the ways we will accomplish this goal is by applying modern physical theories to astronomical objects. During the span of the course, we will survey a wide variety of phenomena and objects in the universe, from the very smallest scales to the largest in the cosmos. While I hope that you will gain an appreciation of these objects for the beautiful things they are, our larger goal in studying them is to illustrate how the process and ideas of science inform our understanding of these objects, and of the universe which contains them. We will see how the process of science is applied to astronomy, and how this process has led to modern physical theories about the universe. In addition, we will engage in a historical consideration of the developments of modern theories of the physical world, to help you see how the process of science has worked to produce the ideas we use today.

As we work to achieve these goals, I will be emphasizing the ability to reason with and work with concepts and equations rather than strict fact memorization or complicated mathematics. (We will need to memorize some terms, though.) In doing so, we will learn analytical thinking skills, how to make connections between concepts, and how to communicate your reasoning to others. We will also be making quantitative predictions about phenomena, which *does* require some basic mathematical ideas. These ideas include, but are not limited to, simple algebra, proportionality, scaling, and working with powers of 10. **DO NOT PANIC** if it's been awhile since you've seen these mathematical terms! We will develop them as we go through the course.

As we strive to achieve these course goals, we will achieve a number of the more basic goals of the general education curriculum at West Chester University, including the:

1. Ability to communicate effectively;
2. Ability to employ quantitative concepts and mathematical methods;
3. Ability to think critically and analytically.

Grading: Attendance: 5%
Wrap-Up Activities: 15%
Homework: 15%
Exams: 45%
Cumulative Final Exam: 20%

Attendance: You are expected to attend all scheduled classes for the entire scheduled time. Half-credit will be awarded for late attendance, or for leaving class early. I do understand that on occasion something unforeseen will pop up and prevent you from attending class; therefore, I will grant you up to three (3) unexcused absences (no questions asked, no note needed) this term. Any additional unexcused absences will result in **zero** attendance credit for that date. Excused absences are limited to University-Sanctioned Events (which follow the Excused Absence Policy for University-Sanctioned Events as described in the West Chester University Undergraduate Catalog), and absences due to serious illness or injury, or the death of family members (each of which is to be verified in writing by a practicing, non-related, physician). In cases of extreme illness or emergency that will require prolonged absence, *you are responsible* for contacting Dean Bricketto (Student Affairs). His office will contact your professors and make appropriate recommendations. If you are absent, whether excused or unexcused, ***it is your responsibility*** to get the notes you missed from a classmate, **including** notes on any mathematical problems we worked on in class, and to learn of any important announcements that were made in class.

Homework: All homework will be posted and submitted online on the course's D2L page. **Homeworks will be posted at 8PM on Sundays.** This will be true of all homework assignments this term. Generally speaking, homeworks will be due at 8PM on the Sunday following their posting. There will be three exceptions to this pattern during the term: once for the week of spring break, once for Easter, and once for the final week of classes. **YOU ARE RESPONSIBLE FOR CHECKING D2L AND KEEPING UP WITH ASSIGNMENTS;** this means checking to see that an assignment has been posted, knowing when it is due, and ensuring that it is completed before the deadline. To help you with this, I have included a column in the class schedule at the

end of this syllabus that tells you **BY WEEK** what homeworks will be posted and when they will be due. Life can get very busy during a semester, so it can be hard to remember to log in to do homeworks even when you know when they are being posted. Thus, you may wish to set up a periodic reminder to check in on our course's D2L site. Writing it in a daily or weekly planner may also help. **I will not always remind you in class about homeworks!** It is **YOUR RESPONSIBILITY** to remember to do them.

You may re-do a homework as often as you like before it is due; I will keep only the highest score of the attempts you made for my gradebook. But regardless of how many times you attempt one, **homeworks are due on the due date indicated on D2L, at the time listed on D2L**. No homework will be accepted late, **no exceptions**. Homework solutions will be posted shortly after the homework's due time. At the end of the semester, I will drop your lowest homework grade. This way, it's not a big deal if you miss one assignment. But if not doing homework becomes a habit, your grade **will** suffer quite a bit come the end of the semester. If you have a question or a computer problem, you must notify me at least 48 hours before the homework due date. Plan on your internet access and/or computer failing at the *worst possible time*, so have a go at the homework at some point before the day it is due. Report any problems with D2L ASAP by calling 1-877-730-6235 or visiting the ACC help desk in Anderson 20 (610-436-3350).

I encourage you to discuss the homework problems with each other, but **the work you do on homeworks must be your own**. (See the Academic Integrity statement on page 5 of this syllabus.) I also encourage you to discuss and review course material with your classmates. But be sure to study and think about the material on your own, because your classmates cannot help you on exams.

Please note that problems with technology can be unexpected, and for this reason I reserve the right to change details about how online assessments are conducted. You will be notified of any such changes both in class and in writing (through D2L and email).

Wrap-Up Activities: At the end of each lecture, we will complete a wrap-up activity. I'm not doing this to stress you out, or to make you feel like you're being quizzed every single time you come to class. Rather, these activities are designed to get you thinking more about what we went over that day in class, and to let you get your hands and brains around some of the new terms, concepts, and equations we discussed while they are still fresh in your mind. All wrap-ups will be open book, and will consist of four multiple choice questions. I will base them partly on the assigned readings for that class, and partly on the lecture we just completed. You will complete wrap-ups in groups of two or three, and will have about 5 minutes to do them. After I collect wrap-ups, **there will be no further opportunity to do them**. I will drop your lowest two (2) wrap-up activities, so if you need to bug out of class early a couple of times it won't hurt your grade.

Wrap-ups will be worth 5 points. You will get 1 point just for turning the activity in, and each correctly answered question will be worth 1 point. Wrap-ups will **NOT** be given on test days. During weeks where 2 wrap-up activities are scheduled to be done, I will grade only one of the two of them; the one to be graded will be chosen at random. This way, they won't always count, so if you have a bad day it's less likely to impact your grade. Keep in mind that I intend wrap-up activity points to be easy for you to accumulate, so give them your best go!

Exams: There will be four in-class exams given over the course of the semester. The dates of these exams are:

<p>February 9 March 6 April 3 April 24</p>

The range of chapters each exam covers is given in the course schedule, which can be found at the end of this syllabus. If the course schedule is adjusted from what appears at the end of this document, it will be posted to D2L and there will be an announcement made in class. **PLEASE** pay attention to all in-class announcements to make sure you know what chapters the exam will be on, and check D2L regularly to make sure you have an up-to-date course schedule. **You** will be responsible for knowing what chapters will be covered on an exam, and when it is.

YOUR LOWEST EXAM GRADE WILL BE DROPPED. Thus only your three (3) highest test grades will be counted. Each of these three exams will count 15% toward your final grade, so a total of 45% of your final grade depends on your performance on exams. **THERE WILL BE NO MAKE-UP EXAMS GIVEN.** If you miss an exam, it will count as your dropped one. Only under very special circumstances will there be any change to this policy, and in those cases, exceptions will be made **ONLY** when I am notified prior to the scheduled exam time of a conflict.

Tests will consist of multiple choice questions and 1 open-ended problem, which I will design to be similar to example and practice problems done in class. A constant curve will be applied to an exam if the class average drops below 75% to increase it to this value. The scope of each test (with the exception of the final) is limited to the chapters listed in the class schedule at the end of this syllabus; however, even though earlier material is not explicitly tested it may still appear on an exam. You have been warned!

Tests will be *closed book*, but you will be permitted to use one 8.5 x 11" sheet of paper (front only!) with your own, handwritten notes. I reserve the right to refuse the use of typed sheets, or sheets which contain information on the front and back, during an exam. Also, you are permitted to use calculators during exams, but **ONLY** a calculator that is **not** part of an iPod/iPad, cell phone, etc. If I catch you using an iPod/iPad, cell phone, Kindle, etc. as a calculator during an exam, I will take your exam and you will get a zero on it. No exceptions. I will NOT bring extra calculators for you to use during exams. It is **YOUR RESPONSIBILITY** to make sure you have a working stand-alone calculator for an exam if you want to use one.

You will get graded exams back, but you are not allowed to keep them; you **will**, however, get to keep a sheet of paper that tells you your exam grade and how you did on the multiple choice portion of the exam. I will hold graded exams in my office after you have seen them; you can make an appointment any time you like to come look at an exam.

Final Exam: The final exam for this course will be given on Thursday, May 10 from 10:30AM–12:30PM. This is the time scheduled by the University registrar for our final exam. The final **will be cumulative**, and **it is mandatory**.

Extra Credit: I am offering **one** extra credit opportunity this semester. It is entirely optional; you are not required to do it. It will involve the semester-long observation of a single astronomical object that is **NOT** Polaris. Details of the project will be provided during the first class period. If you want to do the extra credit project, you **MUST** submit a plan to me by email by February 3 at 5PM. No plans will be accepted after this date. Projects will be due on May 3 at the start of class. Successful completion of this extra credit project will raise your lowest kept homework score to a 15/15.

Teaching Style: I will be using MS PowerPoint slides a great deal when going over course material in class; occasionally, I will be making use of the white board to work through a problem. I will try to write big enough so that everyone can see, but if you do have trouble seeing what I write please move to the front of the room. I will post modified copies of the MS PowerPoint slides I use in class online on our course's D2L page before each lecture. I do so to provide you with a *supplement* to the notes you are already taking in class. The slides I put up on D2L are **NOT** meant to take the place of your own personal note-taking. **YOU** will be responsible for that. The purpose of providing you with modified copies of the slides used in class is to give you the text for all in-class activities we will do, so that you don't need to worry about copying down those words but instead concentrate on thinking about said activities. I also try to leave plenty of room for you to write down key equations, words, and other ideas so that you'll remember these things later. Please note carefully that these modified slides will **NOT** contain the solutions to the example problems I do in class. If you want notes on those, you'll need to take them as I solve the problem on the board in class. I will do my best to engage you interactively with the material during class time. Activities may include, but are not limited to, conceptual questions to be discussed with a neighbour, tutorial activities, practice quantitative problems, and interactive demonstrations. I hope these activities both enhance your learning and help make class a little more exciting for you.

Intellectual Property Statement: The instructor for this course utilizes copyrighted materials under the "Freedom and Innovation Revitalizing United States Entrepreneurship Act of 2007" (Fair Use Act). Apart from such copyrighted materials, all other intellectual property associated with this course is owned and copyright protected by the instructor, including, but not limited to, lectures, course discussions, course notes and supplementary materials posted or provided to students authored by the instructor, assessment instruments such as quizzes and exams, and Power Point presentations. No recording, copying, storage in a retrieval system, or dissemination in any form, whether electronic or other format, by any means of the intellectual property of the instructor, either in whole or in part, is permitted without the prior written permission of the instructor. When such permission is granted, it must specify the utilization of the intellectual property and all such permissions and waivers shall terminate on the last day of finals in the semester in which this course is held.

Links and references to on-line resources provided by the instructor may lead to other sites. The instructor does not sponsor, endorse or otherwise approve of any information appearing in those sites, nor is responsible for the availability of, or the content located on or through, external sites. Apart from materials used in accordance with the Fair Use Act, the instructor takes no responsibility for material that is otherwise offered at web sites and makes no warranty that such material does not infringe any third party rights. However, should any of this type of material be present and this fact is brought to the attention of the instructor, they will remove references to it from course materials.

Ye Olde Technology Policy: Please turn off all cell phones, iPods, iPhones, smart phones, BlackBerrys, etc. before class. If you are expecting an emergency call, change your phone to vibrate mode and answer the call outside of our classroom. You are ***not allowed*** to use cell phones for texting or gaming during class. Doing so is distracting to your classmates and instructor. If I catch you using your cell phone inappropriately during class, ***I will take 5 points off of the nearest exam grade!*** **NO EXCEPTIONS.** If you feel the temptation will be too great, be on the safe side and leave your cell phone stored in your bag.

I do not allow the use of laptops in my class. However, I am willing to make an exception for those who bought an e-copy of the required textbook, provided that I see proof of the e-copy on your computer. Terms of laptop use in these cases can be discussed with me on an individual basis.

Academic Integrity: It is the responsibility of each student to adhere to the University's standards for academic integrity. Violations of academic integrity include any act that violates the rights of another student in academic work, that involves misrepresentation of your own work, or that disrupts the instruction of the course. Other violations include (but are not limited to): cheating on assignments or examinations; plagiarizing, which means copying any part of another's work and/or using ideas of another and presenting them as one's own without giving proper credit to the source; selling, purchasing, or exchanging of term papers; falsifying of information; and using your own work from one class to fulfill the assignment for another class without significant modification. Proof of academic misconduct can result in automatic failure and removal from this course.

For questions regarding Academic Dishonesty, the No-Grade Policy, Sexual Harassment, or the Student Code of Conduct, students are encouraged to refer to their major department's handbook, the Undergraduate Course Catalogue, the Rams Eye View, or the University Web Site. Please understand that improper conduct in any of these areas will not be tolerated and may result in immediate ejection from the class.

Disability and Special Needs: We at West Chester wish to make accommodations for persons with disabilities. Please make your needs known by contacting the Office of Services for Students with Disabilities at extension 3217 as well as myself. Sufficient notice is needed in order to make the accommodations possible. The University and I desire to comply with the ADA of 1990.

Tutoring: Tutoring for many 100 level courses is offered by the Learning Assistance Resource Center (LARC), 223 Lawrence Center, x2535. As of the current moment, PHY 105 is not one of those courses; however, the folks at LARC will work with you to try and find a tutor if you need one. See the following website for more information: <http://www.wcupa.edu/ussss/larc/>. LARC tutoring is free of charge, but you must sign up at the beginning of the semester. Physics majors MAY offer tutoring in PHY 105 during the semester. An announcement will be made in class if this is the case.

Withdrawal Notice: A syllabus constitutes a contract between student and instructor. Your continued enrollment after the **January 28 drop deadline** indicates that you accept all instructional practices, requirements, and policies. If you find the standards to which you will be held accountable too rigorous, if you are unable to *reliably* access the internet to log on to D2L, or if an ongoing scheduling conflict prevents you from attending class regularly and punctually, you must officially withdraw (grade "W") through the Registrar's Office by the **March 30 course withdrawal deadline**. You are responsible for checking your grades before this withdrawal deadline so you aren't surprised by your standing as the end of the course approaches. You can contact me anytime to get an estimate of your grade as it stands at the moment.

Public Safety: All students are encouraged to sign up for the University's free WCU ALERT service, which delivers official WCU emergency text messages directly to your cell phone. For more information and to sign up, visit www.wcupa.edu/wcualert. To report an emergency, call the Department of Public Safety at 610-436-3311.

Study tips:

- Keep up with the readings and do them before class!
- Don't blow off the homework! It's a good way to accumulate points, and good practice for exams.
- Try the Visual Skills Check problems at the end of the chapter once we're done with it. The answers are in the back! The problems are meant to test your skills at interpreting graphs presented in the chapter, and mathematical ideas introduced in the chapter. It's tempting to blow them off, but try not to! If you can't do these problems, you may be unable to do some problems on the test. Just note that if the Visual Skills Check references a section I told you not to read, you don't have to worry about knowing how to do it.
- Practice makes perfect! Before an exam, pick some of the problems from the end of the chapter questions and do them. Play "what-if" games with the concepts presented in class: What if I gave you two quantities and asked for a third? What's your plan for that? How about if one of those quantities gets bigger? If you have an action plan for these things in your head, you're less likely to freeze up and panic if you see them on a test.
- When you see a physical explanation for some phenomenon come up in the textbook, try asking yourself what would happen if something about that phenomenon changed: what would the new physical explanation for it be? For example, what would happen if the Solar Nebula had had an initial clockwise rotation instead of a counterclockwise one ... what would we expect the orbits of the planets to be like? And why would we think that?
- Please make use of my office hours, and don't hesitate to email me questions about the homework or to schedule a time to meet outside office hours.

CLASS SCHEDULE

This is the tentative schedule; I will try to follow it as closely as possible. I will post any changes to this schedule to D2L, and announce in class that an updated schedule has been posted. ***IT IS YOUR RESPONSIBILITY*** to make sure that you have an up-to-date class schedule.

It is also ***your responsibility*** to read the assigned selections from the text before you arrive in class. I will not always cover in class everything that is contained in the readings.

Week	Class Meeting	Topic	Readings Due	Homework
1	January 24	Welcome, Course Intro, Meet the Universe	--	None
	January 26	Scales of stuff in the universe	Ch. 1	
2	January 31	Finding your way in the night sky + seasons	Ch. 2.1–2.2	HW #1 posted
	February 2	Wanderers: the Moon and the Planets	Ch. 2.3–2.4	
3	February 7	Ancient Astronomy and the Copernican Revolution	Ch. 3	HW #1 Due; practice set
	February 9	TEST #1	Chapters 1–3	
4	February 14	Newton's Laws of Motion	Ch. 4.1–4.2	HW #2 posted
	February 16	Angular Momentum and Energy	Ch. 4.2–4.3	
5	February 21	Gravity: It's not just Newton's equation, it's a law!	Ch. 4.3–4.4	HW #2 Due; HW #3 posted
	February 23	Light and Matter: What really matters	Ch. 5.1–5.2	
6	February 28	Light gets excited + Telescopes	Ch. 5.2–5.3	HW #3 Due; HW #4 posted
	March 1	Tour de Solar System + Origin of the Solar System	Ch. 6.1 & 6.3	
7	March 6	TEST #2	Chapters 4 & 5	HW #4 Due; HW #5 posted
	March 8	Making planets here and there + Extrasolar planets	Ch. 6.4–6.5	
8	<i>March 13</i>	<i>Spring break!</i>	--	None! It's a break!
	<i>March 15</i>	<i>Spring break!</i>	--	
9	March 20	Earth and its Rocky Neighbours: The Terrestrial Planets	Ch. 7.1–7.4	HW #6 posted
	March 22	Earth's Gassy Neighbours: The Jovian Planets	Ch. 8.1–8.2	
10	March 27	Comets and Asteroids and Pluto! Oh my.	Ch. 9.1–9.3	HW #6 Due; HW #7 posted
	March 29	Your local star: Sol	Ch. 10.1–10.2	
11	April 3	TEST #3	Chapters 6–9	HW #7 Due; HW #8 posted
	April 5	Star Properties + The Main Sequence	Ch. 11.1–11.2	
12	April 10	Star Clusters and the Main Sequence	Ch. 11.2–11.3	HW #8 Due; HW #9 posted
	April 12	Random Star, This is Your Life!	Ch. 12	
13	April 17	Stellar Corpses: WD, NS, BH ... WTH?	Ch. 13	HW #9 Due; HW #10 posted
	April 19	The Milky Way: It's more than just a candy bar, it's home!	Ch. 14	
14	April 24	TEST #4	Chapters 10–13	HW #10 Due; HW #11 posted
	April 26	Other Galaxies: "Island Universes"	Ch. 15.1–15.3	
15	May 1	Dark Matter and Dark Energy: What we don't know	Ch. 16.1, 16.2, & 16.4	HW #11 Due; HW #12 posted
	May 3	A brief history of the universe + the Big Bang	Ch. 17	
xx	May 10	FINAL EXAM	10:30 AM–12:30 PM	All done!