West Chester University

PHY 105-02: Structure of the Universe
Fall 2011

Course Overview: This course examines the application of modern physics to the science of astronomy. Our 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 theories of motion, light, and matter by which we can 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 models. We will also discuss the history of accepted 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. 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 112

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 from 11AM-12PM, and from 5PM-6PM
Tuesdays from 5PM-6PM
Wednesdays from 11AM-12PM, and from 3PM-4PM
... and by appointment
email: mcaler@wcupa.edu
physics department's phone: 610-436-2497

Please note that I am providing the physics department phone number here, because I do not yet have my own. When I am issued an office phone number, I will post it to the D2L website and update this syllabus.

webpage: This course has a D2L webpage. The syllabus and all other related course materials will be posted to this website. Please let me know if you are unable to access it.

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 grandest 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 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 fact memorization or fancy 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, 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%
Warm-Up Activities: 15%
Homework: 15%
Exams: 45%
Cumulative Final Exam: 20%

Attendance: You are expected to attend all scheduled classes. Half-credit will be awarded for late attendance, or for attending only part of the class. I do understand that on occasion something unforeseen will pop up and prevent you 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, 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. Generally speaking, they will be posted on a Sunday and will be due the following Sunday. ***You are responsible for checking D2L and keeping up with assignments***; this means checking to see when assignments have been posted, knowing when they are due, and ensuring that they are completed before the deadline. This can be hard to remember to do, so you may wish to set up a periodic reminder to check in on our course's D2L site. I will not always remind you in class about homeworks! 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).

You may re-do a homework as often as you like before it is due, but **homeworks will be 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.

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).

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 will not be able to help you on exams.

Warm-Up Activities: At the start of each lecture, we will complete a warm-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 about astronomy and talking about astronomy before class starts. This way, all our heads will be in astronomy mode when we start into the class material for that day. All warm-ups will be open book, and will consist of five multiple choice questions. I will base them on the assigned readings for that class. You will complete warm-ups in groups of two or three, and will have between 5 and 10 minutes to do them. After I collect warm-ups, *there will be no further opportunity to do them*. I will drop your lowest two (2) warm-up activities, so if you need to be late to class a couple of days it won't hurt your grade.

Warm-ups will be worth 10 points. You will get 5 points for turning the activity in, and each correctly answered question will be worth 1 point. I will grade only one of the two warm-ups we do each week; 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 these warm-up activity points to be easy for you to accumulate, so give them your best go!

I realize that some students may be coming from a previous class on South Campus to this one, and that this may interfere with their ability to do warm-up activities as scheduled. For this reason, I reserve the right to change the time in class when warm-ups are completed. You will be notified of any such changes both in class and in writing (through D2L and email).

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

September 15
October 6
November 1
November 22

The range of chapters each exam covers is given in the course schedule. If the course schedule is adjusted from what appears in this syllabus, 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. ***THERE WILL BE NO MAKE-UP EXAMS GIVEN***. If you miss an exam, it will count as your dropped one. Tests will consist of multiple choice questions and 1 or 2 short problems, 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; however, even though earlier material is not explicitly tested it may still appear on an exam. 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. 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, December 15 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 by September 1 at 5PM. No plans will be accepted after this date. Projects will be due on December 8 at the start of class. Successful completion of an extra credit project will boost your lowest *kept* exam score by 5%.

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 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, and interactive demonstrations. I hope these activities both enhance your learning and help make class a little more exciting for you.

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 book, 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 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 **September 3 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 **October 28 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.

Date	Topic	Readings Due
Aug 30	Welcome, Course Intro, Meet the Universe	--
Sep 1	Scales of stuff in the universe	Ch. 1
Sep 6	Finding your way in the night sky + Seasons	Ch. 2.1—2.2
Sep 8	Wanderers: the Moon and the Planets	Ch. 2.3—2.4
Sep 13	Ancient Astronomy and the Copernican Revolution	Ch. 3
Sep 15	***TEST #1***	***Chapters 1—3***
Sep 20	Newton's Laws of Motion	Ch. 4.1—4.2
Sep 22	Angular Momentum and Energy	Ch. 4.2—4.3
Sep 27	Gravity: It really pulls you down	Ch. 4.3—4.4
Sep 29	Light and Matter: What really matters	Ch. 5.1—5.2
Oct 4	Light gets excited + Telescopes	Ch. 5.2—5.3
Oct 6	***TEST #2***	***Chapters 4 & 5***
Oct 11	FALL BREAK	--
Oct 13	Tour de Solar System + Origin of the Solar System	Ch. 6.1 & 6.3
Oct 18	Making Planets Here and There	Ch. 6.4—6.5
Oct 20	Earth & its Rocky Neighbours: The Terrestrial Planets	Ch. 7.1—7.4
Oct 25	Earth's Gassy Neighbours: The Jovian Planets	Ch. 8.1—8.2
Oct 27	Comets and Asteroids and Pluto! Oh my.	Ch. 9.1—9.3
Nov 1	***TEST #3***	***Chapters 6—9***
Nov 3	Your local star: Sol	Ch. 10.1—10.2
Nov 8	Star Properties + The Main Sequence	Ch. 11.1—11.2
Nov 10	Star Clusters + The Main Sequence	Ch. 11.2—11.3
Nov 15	Any Star, This is Your Life (cycle)!	Ch. 12
Nov 17	Stellar Corpses: WD, NS, BH ... WTH?	Ch. 13
Nov 22	***TEST #4***	***Chapters 10—13***
Nov 24	THANKSGIVING	--
Nov 29	Our (inedible) Milky Way Home	Ch. 14
Dec 1	Other Galaxies: “Island Universes”	Ch. 15.1—15.3
Dec 6	Dark Matter: It Can't See the Light (really)	Ch. 16.1, 16.2, & 16.4
Dec 8	A brief history of the universe + the Big Bang	Ch. 17
Dec 15	***FINAL EXAM***	***10:30 AM—12:30 PM***