

West Chester University
Department of Physics
Physics 105 – Structure of the Universe
Sections 02 and 01

Meeting Time: TR 12:30 - 01:45 pm for Section 02
TR 02:00 - 03:15 pm for Section 01

Meeting Place: Merion Science Center 112 for Section 02
Merion Science Center 222 for Section 01

Instructor: Jeffrey J. Sudol (Dr. Jeff)

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Office Hours: T 10-12, W 11-12, R 10-12

Course Description

Physics 105 is a course about everything, the whole enchilada, the Universe, which is, by definition, all that is. The content areas of the course include: Newton's Laws, Kepler's Laws, Nuclear Physics, Quantum Mechanics, Stellar Properties, Star Formation and Evolution, Galactic Structure and Evolution, the Structure and Evolution of the Universe, and (briefly) Life in the Universe (also known as Astrobiology).

Required Course Materials

- ✓ *Lecture Tutorials in Astronomy, 3rd edition*, Prather et al.*
- ✓ a scientific calculator

* You must have a clean copy of this workbook. You must bring this workbook with you to class every day. If you fail to bring this workbook with you to class, I will dismiss you from class for the period during which the workbook is in use.

Course Goals

PHY 105 is an approved General Education course in the Sciences. Throughout this course, we will engage in a number of in-class activities designed to help you meet the following General Education goals: (2) employ quantitative concepts and mathematical methods and (3) think critically and analytically (for more information on the General Education goals at West Chester University, click here: [Undergraduate Catalog: General Education Requirements](#)). In-class activities include think-pair-share exercises, ranking tasks, lecture tutorials, interactive lecture demonstrations, and interactive problem solving sessions. A description of these activities and how to get the most out of them appears in the document *How to Succeed in Physics* available on the D2L website for this course. Outside of class, you are responsible for completing the pre-lecture and post-lecture assignments associated with each lecture. These assignments are described in separate documents, one for each lecture, on D2L.

Website

This course has a D2L website associated with it. I will post all of the course documents and announcements on the D2L website on a regular basis. Please check D2L at least once a day for updates.

Pedagogical Notes

Let's talk about door knobs.

Consider the door knob. If you go to a hardware store looking for a door knob, you are likely to find a hundred different varieties. Door knobs come in different shapes and sizes and colors and styles, but you expect all of them to work the same way. You have in your head a "mental model" about how doorknobs work. You grab the door knob, turn the knob to the right (clockwise), the latch moves free of the catch, and the door is free to open. Despite all of the varieties of doorknobs out there, all of them function in the same way, more or less. So, instead of having to learn to recognize all of the varieties of doorknobs in the world and how each particular doorknob works, you need only this one mental model of how a doorknob works in order to open doors without having to stop and think about how to open a door each time you encounter one. That is, until you go to Japan. You reach for the handle, you turn to the right, and nothing happens. That's because doorknobs in Japan turn to the left.

I will admit that I do not actually know if door knobs turn to the left in Japan, but I want to illustrate the point that sometimes your expectation of how things should work is inconsistent with how things do in fact work because your mental model is either incomplete or broken. That particular moment, when your expectation (the door is open) and reality (the door is not open) are in conflict, is quite powerful. It is in that moment that your brain is prepared to change its mental model of the world.

This whole thing about door knobs is highly simplified, but the point is this. You have in your head "mental models" about how things work that are often broken or incomplete. You have many "misconceptions" about how things work, especially when it comes to "physics." It's ok. It's expected. It's "human nature."

I have designed this course to expose and challenge your existing mental models and to help you change them and build more robust and accurate mental models. I want you to know right now that there is no "natural talent" for physics. Anyone who is good at doing physics has had to go through the same process that you will go through: challenging and advancing their mental models about how the world works.

For a cogent discussion about "mental models," I recommend *The Implications of Cognitive Studies for Teaching Physics* by E.F. Redish, available at the following website: <http://www.physics.umd.edu/perg/papers/redish/cogsci.html>

Assessment

Your "grade" in this course will be based on your performance in the following categories of assessment with the following weights.

Regular Exams.....	80%
Final Exam	20%

Regular exams are those exams that occur in lecture during the course of the semester. **At the end of the semester, I will drop your lowest regular exam score and average the remaining exam scores.** The final exam is cumulative, and it counts.

It sounds nice, but here's the catch!

Except for University sanctioned events, there are no excused absences. There are no makeup exams, and you cannot take an exam early or late.

What does this mean? It means that if you miss a regular exam, you receive a score of a zero on that exam. I drop the lowest exam score, so you can miss one regular exam, and it will not affect your final grade. I recommend, however, that you make arrangements with me to take the exam as it will serve to test your knowledge of physics and prepare you for the final exam, which is cumulative, and it counts.

I do this for the following reason. It takes me about eight hours to write an exam. The exams are exquisitely crafted to test the objectives of the course, and the exam scores represent an accurate measurement of how well the students (and I) have met the objectives of the course (we are a team). If I were to allow students to take exams at different times, I would have to write multiple exams to preserve the integrity of each exam (this reflects a professional code of ethics; it's nothing personal), and I would have

to do so in a way that all of the exams test the same objectives equally well. So, "makeup exams" represent a huge time sink, and I cannot simultaneously commit to such a large time sink and provide you with a low cost, high quality education.

I assign letter grades according to the following scale.

96.7 - 100.0	A+ (the same as an A here at WCU)
93.4 - 96.6	A
90.0 - 93.3	A-
86.7 - 89.9	B+
83.4 - 86.6	B
80.0 - 83.3	B-
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and so on...	

I do not norm-reference (or scale) grades.

I also reserve the right to introduce different forms of assessment as needed and to alter the weight of each of the categories of assessment in the event of some unforeseen circumstance.

Attendance Policy

Attendance is required.

Email Policy

Per the Undergraduate Catalog, you are required to activate and maintain the email account created for you by West Chester University. I will not use any other email account to communicate with you. I do not have internet access from home. I do not forward my email to my phone. I check my email twice a day. I am not "wired" to the internet like most people. I follow the rules of productivity laid out in *The Time Trap* by Alec Mackenzie. This means that a full day might pass before I respond to any messages that you send to me. Plan ahead.

Disability Statement

If you require special accommodations because of a disability, please meet with me as soon as possible to discuss your needs. Supporting documentation from the [Office of Services for Students with Disabilities](#) (OSSD) is required. For more information regarding this policy, click here: [Undergraduate Catalog: Services for Students with Disabilities](#).

Policy Regarding Grade Assignments

Grade assignments are final and cannot be changed once submitted at the end of the semester, unless a clerical or computational error is discovered. "No Grade" assignments are made only under extraordinary circumstances. Credit by Examination is not available for this course. For more information, click here: [Undergraduate Catalog: Grade Changes](#).

Academic Integrity Statement

If you commit a violation of academic integrity, you will receive zero credit for the entire course. This is not negotiable. For more information regarding violations of academic integrity, click here: [Undergraduate Catalog: Academic Integrity Policy](#).

Student Code of Conduct

I will dismiss students from class for any violation of the Student Code of Conduct and initiate the disciplinary action appropriate to the violation. For more information regarding violations of the student code of conduct, click here: [Student Code of Conduct](#).

University Sanctioned Events

If you will be participating in a University sanctioned event that occurs at the same time as an exam (the exam dates on the **Course Schedule** will not change), you must notify me one week prior to the exam. Documentation supporting your participation in this event is required. We will then make arrangements for you to take the exam at a later date or at the scheduled exam time through a proctor. For more information on University Sanctioned Events, click here: [Undergraduate Catalog: University Sanctioned Events](#).

Intellectual Property Statement

All of the course materials, including the PowerPoint lectures and exams, are the intellectual property of the instructor or another author. Your use of these materials is restricted to your own studies for the duration of this course. It is a violation of Federal Law for you to distribute copies of these materials to anyone in any format at any time.

Electronic Equipment in the Classroom (Unplug)

Except for calculators, I do not permit the use of cell phones, cameras, voice recorders, computers, or similar electronic equipment in the classroom unless you need to use such a device to accommodate for a disability, in which case you should schedule a meeting with me to discuss the proper use of the device and the data obtained with that device as soon as possible. The spirit of the rule is that the classroom should be an electronic free zone where we tune out the distractions of the world and focus on learning physics. The classroom is a place of dialogue, and the electronic gadgets of our modern culture are not necessary for that dialogue to take place.

Course Schedule

		<u>Date</u>	<u>Topic</u>
1	T	Aug. 30	Space is Big
2	R	Sep. 01	Scale Models
3	T	Sep. 06	Lookback Time
4	R	Sep. 08	Newton's Laws
5	T	Sep. 13	Newton's Law of Gravitation
6	R	Sep. 15	Mass vs. Weight, Surface Gravities, Escape Velocities
7	T	Sep. 20	Kepler's Laws
-	R	Sep. 22	Exam #1
8	T	Sep. 27	Nuclear Physics
9	R	Sep. 29	The Electromagnetic Spectrum
10	T	Oct. 04	Types of Spectra
11	R	Oct. 06	Blackbody Radiation
-	T	Oct. 11	<i>Fall Break - No Class</i>
12	R	Oct. 13	Atoms and Light
13	T	Oct. 18	The Doppler Shift
-	R	Oct. 20	Exam #2

		<u>Date</u>	<u>Topic</u>
14	T	Oct. 25	Parallax
15	R	Oct. 27	The Magnitude System
16	T	Nov. 01	Luminosity, Radius, Temperature
17	R	Nov. 03	Spectral Classification and the HR Diagram
18	T	Nov. 08	Spectroscopic Parallax
19	R	Nov. 10	Stellar Evolution
-	T	Nov. 15	Exam #3
20	R	Nov. 17	Galaxies
21	T	Nov. 22	The Big Bang
22	R	Nov. 24	<i>Thanksgiving Break - No Class</i>
23	T	Nov. 29	The Big Bang
-	R	Dec. 01	The Formation of the Solar System
24	T	Dec. 06	Life in the Universe
-	R	Dec. 08	Exam #4
-	R	Dec. 15	10:30 - 12:30 Final Exam for Section 02
			01:00 - 03:00 Final Exam for Section 01