West Chester University

Department of Physics

Physics 100 – Elements of Physical Science

Section 08 - The Energy Crisis

Meeting Times: MWF 9:00 - 9:50 am

Meeting Place: Merion Science Center 109

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Office Hours: MRF 10-11, M 2-3, W 1-2

Course Description

This particular section of Physics 100 – Elements of Physical Science offers you the opportunity to develop a deep understanding of the meaning of the term "energy". By the end of this course, you will be able to use the principles of physics to calculate the energy costs of many day-to-day human activities and to evaluate popular claims regarding energy costs and savings on local and global scales. The content areas of this course include kinematics, dynamics, thermodynamics, electromagnetism, electronics, quantum mechanics, and nuclear physics.

Required Course Materials

- ✓ *Physics: A Conceptual World View*, Kirkpatrick, 7th edition (2010).
- ✓ a scientific calculator (one that can handle powers of 10, otherwise nothing special).

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.

Course Goals

PHY 100 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 two of the six General Education goals at West Chester University: (goal #2) employ quantitative concepts and mathematical methods and (goal #3) think critically and analytically. (Click here for more information: Undergraduate Catalog: General Education Requirements). The in-class activities include think-pair-share exercises, interactive lecture demonstrations, and interactive problem solving sessions, along with short lectures that incorporate Socratic dialogue and modeling. 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, also available on D2L.

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%

I assign letter grades according to the following scale, rounding appropriately.

93 - 100	A
90 - 92	A-
87 - 89	B+
83 - 86	B
80 - 82	B-
.	
.	
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.

Categories of Assessment

Exams

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 (see below), 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, regardless of the reason for missing the exam. I drop the lowest exam score, so you can miss one regular exam, and it will not affect your final grade. Some events in life are more important than a physics exam. If you do miss an exam, you should make arrangements with me to take the exam. Even though your score on the exam will not count towards your final grade, the exam 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. The exam scores therefore represent an accurate assessment 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 follows from 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 the structure of our education system does not afford me the luxury of time to sink.

While on the subject of exams, please note that exams are not a learning tool. Exams represent summative assessment. (If you are unfamiliar with the concept, enter "formative vs. summative assessment" in your favorite internet search engine.) I keep all exams in my office. Your exams are always available for review during office hours, but keep in mind that the reproduction of any exam question in any manner represents a violation of academic integrity.

Homework

I run what I call a "partially-flipped" classroom. In a standard flipped classroom, you would review the content of the course at home ("lecture" as homework), and you would work at your own pace on a variety of exercises in the classroom ("homework" as lecture). The instructor helps you as needed and occasionally calls students together for small or large group work. In a "partially-flipped" classroom, you review the content of the course at home (pre-lecture homework), the instructor guides the entire class through a series of exercises in the classroom (lecture) then you do additional exercises at home as homework (post-lecture homework). See *How to Succeed in Physics* for more details.

The "partially-flipped" classroom structure demands that you complete the pre-lecture homework on schedule. Failure to complete the pre-lecture homework creates drag. In other words, individual students can prevent the rest of the class from making positive progress toward the goals and objectives of the course, so, for the sake of your fellow students, do the pre-lecture homework.

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. This means that a day or two 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

		Date	Topic
1	M	Aug. 28	Unit Conversion
2	W	Aug. 30	Units of Energy
3	F	Sep. 01	Units of Energy
-	M	Sep. 04	*No Class - Labor Day*
4	W	Sep. 06	Distance and Displacement
5	F	Sep. 08	Speed and Velocity
6	M	Sep. 11	Acceleration
7	W	Sep. 13	Kinematics; Free-Fall
8	F	Sep. 15	Newton's Laws; Forces
9	M	Sep. 18	Newton's Laws; Forces
10	W	Sep. 20	Newton's Laws; Forces
-	F	Sep. 22	**Exam I**
11	M	Sep. 25	Force Analysis
12	W	Sep. 27	Force Analysis
13	F	Sep. 29	Force Analysis
14	M	Oct. 02	Friction and Drag
15	W	Oct. 04	Mass and Weight
16	F	Oct. 06	Work done by Forces
-	M	Oct. 09	*No Class - Fall Break*
17	W	Oct. 11	Work done by Forces
18	F	Oct. 13	Work and Kinetic Energy
-	M	Oct. 16	**Exam II**

		Date	Topic
19	W	Oct. 18	Conservation of Energy and Momentum
20	F	Oct. 20	Conservation of Energy and Momentum
21	M	Oct. 23	Temperature, Thermal Energy, Heat
22	W	Oct. 25	First Law of Thermodynamics
23	F	Oct. 27	Specific Heat; Latent Heat
24	M	Oct. 30	Thermal Equilibrium
25	W	Nov. 01	Engines, Refrigerators, Efficiency
26	F	Nov. 03	Global Warming
27	M	Nov. 06	Second Law of Thermodynamics
-	W	Nov. 08	**Exam III**
28	F	Nov. 10	Electrical Potential Energy
29	M	Nov. 13	Potential Difference; Batteries; Resistance; Current
30	W	Nov. 15	Ohm's Law; Power
31	F	Nov. 17	Resistors in Series; Resistors in Parallel
32	M	Nov. 20	Household Circuits
-	W	Nov. 22	*No Class - Thanksgiving Break*
-	F	Nov. 24	*No Class - Thanksgiving Break*
33	M	Nov. 27	Nuclear Physics
34	W	Nov. 29	Nuclear Physics
35	F	Dec. 01	Nuclear Physics
36	M	Dec. 04	Energy in Chemical Bonds
37	W	Dec. 06	Photosynthesis; Food Supply and Population Limits
-	F	Dec. 08	**Exam IV**
38	M	Dec. 11	Energy Density; It's Not Easy Being Green
-	F	Dec. 15	**Final Exam (8:00 - 10:00 am)**