

West Chester University
Department of Physics
Physics 100 – Elements of Physical Science
Section 01 - Special Topics: The Energy Crisis

Meeting Times: MWF 10:00 - 10:50 am
Meeting Place: Merion Science Center 109
Instructor: Jeffrey J. Sudol (Dr. Jeff)
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Office email: jsudol@wcupa.edu
Office Hours: MF 1-3, W 1-2

Course Description

This is a Special Topics section of Physics 100 – Elements of Physical Science, offering 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, electricity and magnetism, 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-

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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.

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. I recommend, however, that if you miss an exam, 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. 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 education system does not afford me the luxury of time to sink.

Finally, exams are not a learning tool. Exams represent summative assessment. (If you are unfamiliar with the concept, an internet search for "formative vs. summative assessment" will enlighten you.) I keep all exams in my office, and exams are only available for review up until the next exam. In other words, after each exam, all previous exams will no longer be accessible to you for review. The reproduction of any exam question in any manner represents a violation of academic integrity.

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.

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](#), and here: [Undergraduate Catalog: Disruptive Classroom Behavior](#).

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	W	Jan. 21	Powers of Ten, Scientific Notation, Unit Conversion
-	F	Jan. 23	<i>No Class</i>
2	M	Jan. 26	Units of Energy
3	W	Jan. 28	Distance and Displacement
4	F	Jan. 30	Speed and Velocity
5	M	Feb. 02	Acceleration
6	W	Feb. 04	Newton's Laws
7	F	Feb. 06	Newton's Laws
8	M	Feb. 09	Newton's Laws
9	W	Feb. 11	Newton's Law of Gravitation; Weight; Free-fall
-	F	Feb. 13	Exam I
10	M	Feb. 16	Free-Body Diagrams
11	W	Feb. 18	Free-Body Diagrams
12	F	Feb. 20	Friction
13	M	Feb. 23	Force Analysis
14	W	Feb. 25	Force Analysis
15	F	Feb. 27	Force Analysis
16	M	Mar. 02	Work done by Forces
17	W	Mar. 04	Work done by Forces
18	F	Mar. 06	Work and Kinetic Energy
-	M	Mar. 09	<i>Spring Break</i>
-	W	Mar. 11	<i>Spring Break</i>
-	F	Mar. 13	<i>Spring Break</i>
-	M	Mar. 16	Exam II
19	W	Mar. 18	Conservation of Energy
20	F	Mar. 20	Conservation of Energy
21	M	Mar. 23	Conservation of Momentum
22	W	Mar. 25	Temperature, Thermal Energy, Heat
23	F	Mar. 27	First Law of Thermodynamics

		<u>Date</u>	<u>Topic</u>
24	M	Mar. 30	Specific Heat; Latent Heat
25	W	Apr. 01	Thermal Equilibrium; Conduction, Convection, Radiation
26	F	Apr. 03	Engines, Refrigerators, Efficiency
27	M	Apr. 06	Global Warming; Second Law of Thermodynamics
-	W	Apr. 08	Exam III
28	F	Apr. 10	Electrical Potential Energy
29	M	Apr. 13	Potential Difference; Batteries; Resistance; Current
30	W	Apr. 15	Ohm's Law; Power
31	F	Apr. 17	Resistors in Series; Resistors in Parallel
32	M	Apr. 20	Generators; Transformers; Household Circuits
33	W	Apr. 22	Nuclear Physics
34	F	Apr. 24	Nuclear Physics
35	M	Apr. 27	Nuclear Physics
36	W	Apr. 29	Photosynthesis; Food Supply and Population Limits
-	F	May 01	Exam IV
37	M	May 04	Energy Density; It's Not Easy Being Green
-	T	May 05	Final Exam (10:30 am - 12:30 pm)