Physics 1104 Syllabus: World of Energy: Light, thermodynamics, Energy Sources

In Physics 1104, students explore the basic principles of physics in the context of energy use and its consequences for our environment. The course includes discussion and examples of various energy sources and energy conservation techniques to help students make informed decisions on energy use and energy policy. The semester course consists of two 80-minute classes per week. A summary of the topics for each of the 26 class periods is attached.

Physics 1104 is a three-credit hour, one semester Physical Science course in the Natural Science category of the GEC. The goals and objectives for this category are:

Goals/Rationale:
Courses in natural sciences foster an understanding of the principles, theories and methods of modern science, the relationship between science and technology, and the effects of science and technology on the environment.

Learning Objectives:
1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students learn key events in the history of science.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

Activity Book:

Physics 1104 uses a hands-on approach to investigate physics concepts and energy use, giving students an opportunity to experience first-hand the laws of physics. Physics concepts are conveyed by student activities and instructor lectures and demonstrations. To help organize, understand, and remember the information from the demonstrations and class activities, students complete and turn in activity sheets for each class. Each completed activity sheet is a summary of that class period. Activity sheets are contained in the Physics 1104 Activity Book. Appended to each Activity Sheet are homework exercises to be completed and turned in at the beginning of the following class. The Activity Book also contains sample exams and multiple choice questions and review questions for each class period.

Textbook:

Each chapter of the textbook corresponds to one class period. To help students grasp the material, the text contains Concept Check questions with answers in an appendix to check students' understanding. The Textbook also includes many worked examples of calculations and Skills and Strategies help boxes with problem solving strategies.

Both the Physics 1104 Activity Book and Textbook are available from OSU's UniPrint. Activity Books and Textbooks can be ordered in advance for pickup at UniPrint. Book orders can be placed online at www.unprint.osu.edu . The Activity Book and Textbook are also available for downloading at the Physics 1104 web site: www.physics.ohio-state.edu/1104

Course Website:
The Physics 1104 course web site can be accessed at www.physics.ohio-state.edu/1104 or by visiting the OSU Department of Physics web page at www.physics.ohio-state.edu, clicking on "courses" and selecting "1104." The course web site contains the slide presentations seen in class as well as the materials in the Physics 1104 Activity Book and Textbook. Students are encouraged to visit the site frequently to see these materials and course announcements.

Examinations:
The course examinations consist of two midterm exams and a comprehensive final examination. All exam questions are multiple choice. Exams include a sheet with useful equations and constants. Equation sheets are provided because Physics 1104 emphasizes understanding concepts, rather than memorizing equations and constants. However, it is essential that students understand the meaning of the equations, their symbols, and their units. The Activity Book includes six practice exams with equation sheets.

Examinations cannot be given at times other than those scheduled. In particular, early examinations and examinations at alternate times are not given. **Students must bring their University Identification card to every exam.** You may be requested to show this identification to an exam proctor.

Class Attendance:
Students must be present during a Laboratory Section Meeting to receive credit for the homework and activity sheets due during that period. If for some particular period you cannot attend your assigned Laboratory Section Meeting, you may attend any of the other Laboratory Section Meetings. To obtain credit for attending an alternate Laboratory Section Meeting, have the instructor sign the written materials due and ask the instructor to forward those materials to your regular instructor. It is your responsibility to check with your Laboratory Section instructor to confirm that he or she has received these materials.

Excused Absences:
A missed Laboratory Section Meeting or an Examination may be treated as an excused absence under some circumstances. If you miss or know you will miss a Laboratory Section Meeting or an Examination, you may provide timely documentation of the reason for the absence and request an excused absence from your Laboratory Section Meeting instructor.

In the case of an approved excused absence from a Laboratory Section Meeting, ask your instructor for information regarding the possibility of obtaining credit for the missed Laboratory Section Meeting. In the case of an approved excused absence from a Midterm, a grade for that Midterm will be determined based on your grade on the Final Examination. No makeup examinations will be given for missed midterms. In the case of an excused absence from the Final Examination, you will receive an incomplete for the course. A default grade will be assigned unless you request and take a makeup Final Examination following the University rules for Incompletes.

Reading Assignments and Written Assignments:

Reading assignments are given for each period. Unless otherwise noted, the assignments are from the Textbook. Each Textbook chapter corresponds to one class period. These assignments should be read before the class meeting for which they are assigned.

Students are required to turn in completed activity sheets and written homework assignments for each class period. Homework assignments consist of calculation and/or concept questions. A page of homework questions for each period can be found in the Activity Book following the activity sheets for that period.

During the semester, students view six videos related to the course material. DVDs of these videos are on reserve at the OSU Science and Engineering Library. Students write and turn in an essay on each video that summarizes the major points of the video and relates these points to the material covered in class. The Activity Book contains a list of question for each video to help students identify important concepts in the videos.

Grading Policy:

Course policy is that grades will be based on the two midterms (45 points each), the comprehensive final (72 points) and the written assignments (26 points from the homework Exercises, 26 points from the Activity Sheets, and 6 points from the video summaries for a total of 58 written assignment points). The total course consists of 220 points.

Academic Misconduct:

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct (http://studentaffairs.osu.edu/info_for_students/csc.asp).

Students with Disability:

Please contact your Laboratory Section Instructor at the start of the semester so that arrangements can be made to accommodate you. Students needing the services provided by the Office for Disability Services (ODS) need to be certified by that office. The ODS is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.

Physics 1104 Periods and Topics

Period / Chapter	Chapter Title	Topics Covered
1	Intro to Physics 1104	Review of math used in the course: ratios, efficiency, exponential notation, and powers of ten Energy content of common fuels
2	Forces and Energy	Definition and examples of four fundamental forces, ten forms of energy, energy and work, and frictional force
3	Electricity	Definition of Q, I, and I=Q/t Generate electricity with coils and magnets Electricity generation, storage, and distribution. Cost of electricity
4	Transfer of Thermal Energy	Thermal energy and temperature Thermal energy transfer via conduction, convection, and radiation
5	Thermal Energy: The Microscopic Picture I	Molecular model of temperature; temperature scales Experiments with evaporative cooling Temperature and phase change
6	Thermal Energy: The Microscopic Picture II	Definitions and experiments with heat capacity, specific heat and latent heat
7	Entropy and the Laws of Thermodynamics	Definition and examples of entropy and equilibrium Probability of obtaining ordered and disordered systems Reversible and irreversible processes
8	The Ideal Gas Law and Internal Energy	Demonstrate and define variables of the Ideal Gas Law Examples of internal energy: $W = Q - \Delta U$ Energy conservation and internal energy
9	Applications of the Laws of Thermodynamics	Definition of heat engines: examples of internal and external heat engines Efficiency of heat engines, heat pumps, and air conditioners Geothermal energy
10	Chemical Energy and Fossil Fuels	Chemical reactions: endothermic and exothermic Reactions involving fossil fuel combustion Chemical energy: assembling a battery

11	Sensitive Systems, Earth's Atmosphere, and the Earth's Energy Balance	Definition and examples of sensitive systems Chemical content and characteristics of layers of Earth's atmosphere Earth's energy balance of incoming and outgoing radiation
12	Consequences of Fossil Fuel Use	Types of pollution resulting from burning fossil fuels Consequences of fossil fuel pollution Mitigation strategies for fossil fuel pollution
13	Greenhouse Gas Effect and Climate Change	Role of greenhouse gases in the Earth's energy balance Consequences of changing the Earth's energy balance
14	Causes of Climate Change	Discussion of energy driving global climate Historical patterns in global temperature changes Evidence for anthropogenic sources of temperature rise Possible consequences of rising temperatures
15	Mass and Energy	Definition of nuclear energy $E=Mc^2$; mass deficit calculations Intro to binding energy
16	Ionizing Radiation	Stable and unstable nuclei; α, β, and γ particles Writing nuclear reactions Experiments with cloud chamber Neutrinos
17	Safety with Ionizing Radiation	Ionizing and penetrating ability of ionizing radiation Source of ionizing radiation in the environment Health consequences of exposure to ionizing radiation
18	Applications of Beta Decay	Composition of nucleons: quarks Nuclear reactions involving beta decay Nuclear decay rates: applications of half-life to radiocarbon dating
19	Consequences of Nuclear Energy Use	Types of nuclear reactors and reactor fuel. Reactor safety: Chernobyl/Three Mile Island/ Storage of nuclear waste
20	Waves and Photons	Wave nature of electromagnetic radiation: $E = hf$ Examples of various wavelengths/frequencies Quantum model of electromagnetic radiation
21	Solar Energy I	Applications of radiant solar energy for heating Model solar water heater Experiments with focusing light with lenses and mirrors Focused solar energy for solar ovens

22	Solar Energy II	Converting solar energy to electricity: solar cells How solar cells operate: frequencies required to generate electricity Efficiency calculations for solar cells Applications of solar cells
23	Energy from Stars	Nuclear fusion reactions in stars Energy release from stars' cores Types of stars: H-R diagram Life cycle of stars
24	Energy from Water	Description of the hydrological cycle Advantages and consequences of hydroelectric power Implications of tropical glacier melting for hydroelectric Energy consequences of water use
25	Other Alternative Fuels	Causes of local and global wind pattern; wind generators Causes to tides; tide and wave electric generators Sources of biomass; use for transportation and electricity
26	Energy Conservation	Discussion of transportation alternatives to gasoline engines, reducing personal electricity use, and energy efficient homes and buildings