

## **Physics 1103 Syllabus: World of Energy: Forces, Electricity, Magnetism, Machines**

In Physics 1103, students explore the basic principles of physics in the context of energy use. The course includes practical examples from everyday life to prepare students to use energy safely and wisely. The course helps prepare students to make rational, informed decisions regarding 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 1103 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 1103 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 1103 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 1103 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](http://www.unprint.osu.edu). The Activity Book and Textbook are also available for downloading at the Physics 1103 web site: [www.physics.ohio-state.edu/1103](http://www.physics.ohio-state.edu/1103)

**Course Website:**

The Physics 1103 course web site can be accessed at [www.physics.ohio-state.edu/1103](http://www.physics.ohio-state.edu/1103) or by visiting the OSU Department of Physics web page at [www.physics.ohio-state.edu](http://www.physics.ohio-state.edu), clicking on "courses" and selecting "1103." The course web site contains the slide presentations seen in class as well as the materials in the Physics 1103 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 1103 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](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 1103 Periods and Topics

Period/ Chapter	Chapter Title	Topics Covered
1	Intro to Physics 1103	Review of math used in the course: ratios, efficiency, exponential notation, and powers of ten Energy content of common fuels
2	Forms of Energy	Definition and examples of ten forms of energy
3	Motion and Force	Velocity and acceleration Definition of force $F = Ma$
4	Forces	Net forces on horizontally and vertically moving objects Frictional force
5	Newton's Laws of Motion	Definition of the four fundamental forces Examples of Newton's three laws of motion Center of mass of objects
6	Gravity	Center of mass = center of gravity Acceleration of gravity Difference between mass and weight
7	Work and Energy	Definition of work Work done by gravitational potential energy Conversions between potential and kinetic energy
8	Energy Conservation and Efficiency	Energy conservation and friction Energy conservation and efficiency Efficiency of a series of energy conversions
9	Simple Machines - Levers	Definition of fulcrum, lever and load arms Examples of levers Mechanical advantage
10	Simple Machines – Pulley Systems	Mechanical advantage of pulley systems Efficiency of pulley systems
11	Wheel & Axles, Gears, Hydraulic systems, and Complex Machines	Efficiency of a winch (wheel and axle example) Efficiency of a hydraulic system Mechanical advantage of a gear system Mechanical advantage of a bicycle
12	Power	Power requirements of sample appliances Power required for human activity Kilowatt hours and cost of electricity use Payback time for energy efficient appliances and vehicles
13	Electric Charge and Voltage	Electric charge and electric force Separated charge on a Leyden jar Definition of voltage
14	Electric Current, Voltage, and Capacitance	Introduction to electric circuits Voltage boosts and drops in a circuit Charge stored on a capacitor

15	Resistance and Power	Relationship between resistance and voltage Experimental verification of $V = I R$ Experimental development of $P = I V$
16	Electrical Resistance and Joule Heating	Experimental development of the resistance of a wire $R$ $R = (L \rho)/A$ Relationship between resistance and temperature of a hot incandescent bulb and a liquid-nitrogen cooled resistor
17	Electric Circuits	Examples of series and parallel circuits Voltage and current relationships in combination circuits
18	Electricity Use and Electrical Safety	Linear and exponential growth of electricity use Safety devices: fuses, circuit breakers, GFCI
19	Magnetic Forces and Electromagnets	Properties of magnets Magnetic forces and fields Moving charges and induced magnetism
20	Induction	Electromagnets Induced current and magnetism Induced magnetism in a cooled superconducting disc
21	Transformers	Step-up and step-down transformers Calculation of turns of wire in a transformer Transformers and the transmission of electricity
22	DC Motors and Generators	Explanation of DC motors and commutators Comparison of motors and generators
23	AC Motors	Definition of AC motors Explanation of universal and induction motors Example of electromagnetism: students build a buzzer
24	Radiant Energy	Description of the electromagnetic spectrum Examples of radio waves, microwaves, infrared, visible, ultraviolet, X-ray, and gamma portions of the spectrum Wave nature of radiant energy
25	Information Transfer	Explanation of microphones and loudspeakers Students build a loudspeaker Examples: Morse code, coaxial and fiber optic cables
26	Broadcasting	Microwave and visible light transmissions Radio broadcasts, carrier waves, AM and FM waves