

**WINTHROP UNIVERSITY**  
**PHYS 305 Course Syllabus**  
**Department of Chemistry, Physics, Geology & the Environment**

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**Semester:** Fall 2025 **Course:** PHYS 305

Energy Sources and Their Uses and Effects on The Environment

**Credit hours:** 3 **Pre-requisite:** A grade of C or better in PHYS 211 or PHYS 201

**Lecture:** TBD Section 001 – SIMS 205

**Professor:** Dr. Fatima Amir

Office: 203, SIMS, Office Hours: **T 1-2 and W 1-2**, or by appointment.

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**Cell phones, tablets, and computers are not allowed in class**

**Course Description:**

Course covers crucial environment questions arising from our energy use that currently are receiving much public attention such as global warming, radioactive waste, green energy, and municipal solid waste. The course also examines different aspects of each energy resource, including the principle involved and the economic consequences of its use, and seeks to explain the basic physical principles behind the different energy transformation including the study of mechanics, electricity and magnetism, thermodynamics, and atomic and nuclear physics. These principles are presented conceptually with limited math and the help of everyday examples.

**Course Objectives:**

- Develop an understanding of the fundamentals of energy by introducing the concept of energy and the context for energy production, energy resources, and the impacts of energy on the environment
- Explores energy mechanics including a discussion on the different forms of energy and the consequence of their consumption to the environment and climate change.
- Develop an understanding on the energy conversion, energy-conversion efficiencies, and energy equivalencies, as well as exploring how energy production correlates with industrialization.
- Develop an understanding on energy from fossil fuels, from coal, natural gas and petroleum, and the historical trends on production.
- Develop an understanding of the environmental and economic benefits of developing renewable energy sources such as solar, hydro, wind, geothermal, biomass etc.
- Develop an understanding of greenhouse effect, and an overview of global climate change.
- Develop an understanding of electricity production from solar, wind, and hydropower, and recent growth and economics of each energy source.
- Develop an understanding of advances in energy storage, fuel cells, and electric vehicles.

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- Get an overview of nuclear power from fission, and an overview of radiation and the biological effects of radiation, and its uses in medicine and industry.

**University-Level Competency**

The Energy and the Environment course introduces students to the role of scientific reasoning via solving energy problems (e.g., energy transformations and energy transfer, thermodynamics laws, thermodynamic limit on energy efficiency). They will apply the scientific methodologies of inquiry for predict outcomes. They will also be introduced to the history of scientific discovery (development of energy efficient devices is introduced with historical perspectives). In addition, they will see how the scientific advances made in a laboratory transform into useful technological devices (e.g., energy efficient light bulbs, fuel efficient cars, and electric & hybrid vehicles).

**Attendance:** Although roll is not formally taken in class, I strongly recommend regular attendance. The course has a significant component of interactive learning, and the activities done in class reinforce the material discussed. If there is a reason that you must miss class, please talk with me to make arrangements to cover the material. The attendance policy described in the Winthrop University undergraduate catalog will be followed.

**Class Policy:**

**Lecture:** The PHY305 lecture will meet once to twice a week for 2 hours. The instructor will arrange the class meetings with the students.

**Homework:** You will be assigned problems every week or every other week. These are no take home exams. You are encouraged to work the problems with your classmates as long as there is contribution from each one of you.

Homework problems **are due on the dates indicated on the class calendar**. Your work is due on time, with the exception of reasonable **documented** excuses. **Late work will be docked 50% of face value and 100% after solutions have been posted.** For any questions regarding assignment or any topics covered in class, you are encouraged to come for help during office hours. If you cannot make office hours, please email me, and I can meet you any time that works for you.

**Academic Dishonesty/Plagiarism:** Collaboration on assignments is welcome, but please keep in mind that your final, turned-in work should be your own and not copied. However, no form of cheating/plagiarism will be tolerated in this class. If anyone is suspected of academic dishonesty, I will privately speak with them in an attempt to reach a solution to whatever the problem is. If anyone is without doubt determined to be cheating on a given assignment/test and no resolution can be offered, *negative credit will be given*. In extreme cases, the Department and/or College administration will become involved. The policy on student academic misconduct is outlined in

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the “**Student Conduct Code Academic Misconduct Policy**” in the online *Student Handbook*: (<http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf>)

**No use of generative AI tools permitted:** In this course every element of the class assignments must be fully prepared by the student. The use of any generative AI tools for any part of your work will be treated as plagiarism. If you have questions, please contact me.

**Course Communication:**

- Be sure to check your Winthrop email account daily, as I may send out course related announcements that will come \*only\* to Winthrop email addresses.
- If you email me, please be sure to use your Winthrop email account I will respond to email within 24 hours except from Saturday morning through Sunday afternoon when my response may be slower.

**Students with Disabilities/Need of Accommodations for Access:** Winthrop University is committed to providing access to education. If you have a condition which may adversely impact your ability to access academics and/or campus life, and you require specific accommodations to complete this course, contact the Office of Accessibility (OA) at 803-323-3290, or [accessibility@winthrop.edu](mailto:accessibility@winthrop.edu). Please inform me as early as possible, once you have your official notice of accommodations from the Office of Accessibility.

**Syllabus change policy:** I will make changes to this syllabus as deemed necessary for the progression of the course

**Exam Policy:** There are three in class exams that are 75 minutes' duration. All relevant equations and physical constants will be provided. If you are going to miss a test, you **must notify me in advance (preferably one week) so alternate arrangements can be made. If you miss a test and your absence is not excused, a grade of zero points must be assessed for that particular piece of work.** You must take all four in-class exams in order to pass the course.

**Grading:**

Homework 10%

Three in Class exams 30% each

The letter grade will be assigned as follows:

100 - 93 = A; 92.9 - 89 = A- ; 88.9- 86 = B+; 85.9 - 80= B; 79.9- 76 = B- ; 75.9-73 = C+ ; 72.9 - 67 = C ; 66.9 - 64 = C-; 63.9-60= D; 59.9- 0 = F

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<b>DATE</b>	<b>TOPIC</b>	<b>CHAPTER</b>	<b>ASSIGNMENTS</b>
<u>Week 1</u> -08/25	Introduction to energy, energy production, impact of energy use on the environment	Ch. 1	
<u>Week 2</u> -09/03	Energy Mechanics, Forms of energy Conversions, Motion, Newton's Law of Motion	Ch. 2	<b>HW#1</b>
<u>Week 3</u> -09/08	Energy and Power, Energy and work, Units of Work, Power, Per Capita Energy and Power use, Simple Machines	Ch. 3	
<u>Week 4</u> -09/15	Conservation of Energy, Law of Conservation of Energy, Energy-Conversion Efficiencies- Energy Use in Developing Countries- Energy Equivalencies: Barrels, Calories and Btus	Ch. 4	<b>HW#2</b>
<u>Week 5</u> -09/22	Heat and Work, and the first law of Thermodynamics- Temperature and Heat-Heat Transfer Principles-Heat Engines- The Second Law of Thermodynamics	Ch. 5	
<u>Week 6</u> -09/29	Home energy Conservation and Heat Transfer Control-Building Materials-Home insulation -Cooling- Air conditioning and heat pumps	Ch. 6	<b>HW#3</b>
<u>Week 7</u> -10/06	Solar Energy: Characteristics and heating-History, solar heating-solar Domestic Hot Water-Active Solar Space Heating Systems	Ch. 7	
<u>Week 8</u> -10/13	Energy from Fossil Fuels-Petroleum, Natural Gas-Coal-Future Sources of Oil	Ch. 8	<b>HW#4</b>
<u>Week 9</u> -10/20	Greenhouse Effect and Climate Change-Observations-Climate Change Data, Impacts, Mitigation and Adaptation	Ch. 9	
<u>Week 10</u> -10/27	Environmental Impacts of Energy Production-Properties and Motion of the Atmosphere- Air Pollutants and Their Sources-Air Quality Standards-Emission Control Devices- Thermal Pollution-Cooling Towers and Ponds.	Ch. 10	
<u>Week 11</u> -11/03	Electricity: Circuits et Superconductors-Electrification- Restructuring of The Electric Utility Industry-Electrical Charges and Currents-Ohm's Law- Superconductivity	Ch. 11	<b>HW#5</b>
<u>Week 12</u> -11/10	Electromagnetism and the Generation of Electricity-Magnetic Forces and Fields-Generation of Electricity-Transmission of Electrical Energy-Co-Generation	Ch. 12	
<u>Week 13</u> -11/17	Electricity from Solar, Wind, and Hydro- Solar Cell Principles- Cell Manufacture-Photovoltaic and Economics-Wind Energy-hydropower-Solar Thermal Electric Facilities	Ch. 13	
<u>Week 14</u> -11/24	Energy Storage: Batteries, Electric Vehicles, and Fuel Cells	Ch. 14	<b>HW#6</b>
<u>Week 15</u> -12/1	The Atom and Its Nucleus- Nuclear Power: Fission	Ch. 15- Ch.16	