

2013

108-01 Environmental Physics

Steve James
jamess1@xavier.edu

Follow this and additional works at: https://www.exhibit.xavier.edu/physics_syllabi_fall_2013

Recommended Citation

James, Steve, "108-01 Environmental Physics" (2013). *Physics Syllabi Fall 2013*. 21.
https://www.exhibit.xavier.edu/physics_syllabi_fall_2013/21

This Restricted-Access Syllabus is brought to you for free and open access by the Physics Syllabi 2013 at Exhibit. It has been accepted for inclusion in Physics Syllabi Fall 2013 by an authorized administrator of Exhibit. For more information, please contact exhibit@xavier.edu.

Environmental Physics

Physics 108
Fall 2013
Tu/Th 11:30-12:20
Lindner 101

Steve James
203 Lindner

james1@xavier.edu

Office Hours: T/Th 10:00-11:30, and by appointment

Text: Environmental Physics by Clare Smith, Routledge - Taylor & Francis Group, ISBN 10: 0-415-20191-8, paperback.

Abstract: Environmental physics has its roots in physics but includes the other sciences and engineering, especially environmental engineering, in exploring the environmental processes within the environment in which we live. The course will examine natural and human-induced causes affecting the environment. In addition to physics and environmental engineering aspects, the course will address technology, policy and ethical issues. Through a series of lectures and laboratories, the student will develop a greater knowledge and understanding of the physical environment, processes, and its complexity, and a scientific and engineering appreciation for current and future threats to the environment and for the solutions to these problems. A basic understanding of high school mathematics will be used in problem sets, modeling exercises, and laboratories.

Course Objectives:

The course has several objectives with the overall goal of having the student pursue critical thinking of the environment in which we live based on an understanding of physical and environmental engineering processes. Major objectives are:

1. Science-based examination of the environment founded on understanding physical and environmental engineering concepts and processes.
2. Discussing and applying the basic mathematical concepts to understand the physical environment and solve problems.
3. Understanding the local and global problems that arise from minor to major impacts on various aspects of the environment.
4. Leaving the student with a comprehensive understanding of the environment and environmental processes such that they will be able to make scientific-based decisions for understanding and protecting the environment in the future.

Tentative Schedule:

Week 1 – August 26.

Introduction to environmental science, engineering, and policy.

Forces of Nature

Readings: Chapter 1 (Environmental Physics).

Week 2 – September 2.

Forces of Nature

Readings: Chapter 1 (Environmental Physics).

Week 3 – September 9.

Energy

Readings: Chapter 2 (Environmental Physics).

What You Need to Know About Energy, National Academies Press
Chapter 2 - Energy Notes

Week 4 – September 16

Energy

Readings: Chapter 2 (Environmental Physics).

Week 5 – September 23

First exam will cover chapters 1 & 2, energy report and notes.

Heat and Radiation

Readings: Chapter 3 (Environmental Physics).

Chapter 3 - Energy, Heat and Radiation Notes

Week 6 – September 30

Heat and Radiation

Readings: Chapter 3 (Environmental Physics).

Week 7 – October 7

No class on October 8

Solids, Liquids and Gases

Readings: Chapter 4 (Environmental Physics).

Water notes

Drinking Water – National Academies' document

Week 8 – October 14

Week 9 – October 21

Solids, Liquids and Gases

Readings: Chapter 4 (Environmental Physics).

Week 10 – October 28

Solids, Liquids and Gases

Readings: Chapter 4 (Environmental Physics).

Second exam will cover chapters 3 & 4 and notes.

Week 11 – November 4

The Earth's Climate and Climate Change

Readings: Chapter 5 (Environmental Physics).

Understanding & Responding to Climate Change, National Academies Press

Week 12 – November 11

The Earth's Climate and Climate Change

Readings: Chapter 5 (Environmental Physics).

Week 13 – November 18

The Earth's Climate and Climate Change

Readings: Chapter 5 (Environmental Physics).

Week 14– November 25

Sound and Noise

Readings: Chapter 6 (Environmental Physics).

No class on Thursday, November 28.

Week 15 – December 2

Sound and Noise

Readings: Chapter 6 (Environmental Physics).

Radioactivity and Nuclear Physics

Readings: Chapter 7 (Environmental Physics).

Week 16 – December 9

Last week of class.

Radioactivity and Nuclear Physics

Readings: Chapter 7 (Environmental Physics).

Exam review.

Week 17 – December 16. Exam week.

Final exam: Tuesday, December 17. 10:30-12:20PM.

Final exam will cover chapters 6, 7, & 8 and climate report.

Grading:

Students will have a variety of grading opportunities throughout the semester. Grading opportunities will test reading and review of the textbook and handout materials for basic facts, understanding of concepts associated with the environment, and problem solving skills. Grading opportunities include:

Homework/paper/quizzes/problem sets	30%
1 st exam	20%
2 nd exam	20%
Final exam	30%

Environmental Physics Laboratory (PHY 109)

Steve James
203 Lindner
james1@xavier.edu

Dr. Gregory Braun
206 Lindner
745.4237
braung@xavier.edu

Office Hours: T/Th 10:00 -11:30,
and by appointment

Lab on Tuesday, 3-5 PM

Lab on Thursday, 1-3 PM

Abstract:

The laboratory will provide the student with a variety of activities building on the material and concepts discussed in the lecture (PHY 108). Some of the activities are conventional laboratory exercises, some are project orientated, and some are design orientated.

Laboratory Objectives:

1. To provide the student with a better understanding of environmental effects and impacts, such as the insulation and heat flow through windows and walls, operation of solar cells, design of drinking water treatment plants, etc.
2. To have the student undertake a variety of assignments that require critical thinking in carrying out the experiment/project and examining the results.
3. To have the student understand and develop a comprehensive laboratory report detailing objectives, procedures, data and data analysis, and conclusions in a format provided by the instructor.
4. To provide real-world experience through an environmental related field trip or lecture.

Laboratory Outline:

The laboratory will consist of the following types of activities:

1. Laboratory experiments. These can include analysis of various insulation materials and designs (such as double and triple pane windows) to examine heat flow through walls and windows, etc.
2. Laboratory projects. These can include the examination of basic climate change models; a population project to estimate future populations in selected cities and estimate future environmental impacts due to increases/decreases in population and implementation of technology advances, such as replacement of fossil fuel plants with solar energy, etc.
3. Design experiments. Design experiments can include bench-scale design/building of a drinking water treatment process.

Laboratory Grading:

Students will have a variety of grading opportunities throughout the semester. Grading opportunities will include laboratory reports, project/design reports, and field trip report. Grading opportunities include:

Lab/project reports	80%
Lab midterm exam	10%
Lab final exam	10%