

FALL 2019 PHY470
ENVIRONMENTAL PHYSICS
COMPUTATIONAL PROJECTS

MIRON KAUFMAN

DEPARTMENT OF PHYSICS
CLEVELAND STATE UNIVERSITY
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COURSE: ENVIRONMENTAL PHYSICS, PHY470, 3 credit hours

INSTRUCTOR: MIRON KAUFMAN

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COURSE WEB PAGE

<http://www.csuohio.edu/sciences/dept/physics/physicsweb/kaufman/physenv.html>

Class Meeting Times and Location:

LECTURE: M, W 4:00 - 5:50 PM, BH-430

OFFICE HOUR: M, W 3:00 - 3:50 PM, SI-116

REQUIRED MATERIALS:

McFarland, Hunt, Campbell, *Energy, Physics and the Environment*.

Kaufman *Environmental Physics Computational Projects*;

CD.

PREREQUISITES: PHY221 or PHY231 or PHY241 or PHY243 or PHY243H.

COURSE GOALS:

The main goal of the course is to foster rational thinking in complex decision situations related to environmental problems by studying the physical laws underlying environmental phenomena.

This course provides a middle ground, for science and engineering students on one hand and urban studies, law and education students on the other hand, to discuss, learn cooperatively and achieve a scientific understanding of important environmental issues such as: the global warming, urban heat island, heat pollution, radiation and health and conventional versus nuclear energy. Computer modeling is used to enhance the understanding of the issues through visualizations. The diffusion of pollutants in the atmosphere and radioactive decay are taught through Monte Carlo simulations. The computer modeling part of the course is performed using the industry standard MathCAD. The course incorporates four modules: Thermodynamics, Electromagnetism, Nuclear Physics, and Environmental Modeling. In each module after learning the basic physics the students study the environmental implications. For example during the Thermodynamics module we analyze heat pollution and the urban heat island effect. The Greenhouse effect is studied during the Electromagnetism module.

TENTATIVE SCHEDULE:

WEEK #1	Energy, Power	Ch.1
WEEK #2, 3	Consumption Model: Exponential	Ch.2
WEEK #4	Thermodynamics: Energy and Entropy Laws	Ch.4
WEEK #5	Heat Transfer	Ch.16
WEEK #6	Fossil Fuel Effect on the Environment: Heat and Air Pollution, Urban Heat Island	Ch.5
WEEK #7	Electricity	Ch.7
WEEK #8	Magnetism	Ch.8
WEEK #9, 10	Black-Body Radiation, Global Warming	Ch.6
WEEK #11	Power Lines and Health	Ch.9
WEEK #12, 13	Radioactivity	Ch.10
WEEK #14, 15	Nuclear Energy	Ch.10

PREREQUISITES: PHY221 or PHY231 or PHY241 or PHY243 or PHY243H

IMPORTANT DATES:

NO CLASSES: Monday September 2, Wednesday September 18, Wednesday October 16,
Wednesday November 6, Wednesday November 20, Wednesday December 4.

LAST DAY TO WITHDRAW: FRIDAY NOVEMBER 3.

EXAM #1 Ch.1, 2, 4, 5, 16 MONDAY, OCTOBER 14

FINAL EXAM COMPREHENSIVE MONDAY, DECEMBER 9

GRADING:

The final grade is the weighted average of:

- | | |
|----------------------|-----|
| ➤ Exam #1 | 30% |
| ➤ Final Exam | 35% |
| ➤ Computational Work | 25% |
| ➤ Homework, Quizzes | 10% |

There will be 10 homework assignments and 2 quizzes. The homework assignments, quizzes and exams are **not** multiple-choice and are graded by hand.

Grading scale: A 91-100; A- 86-90; B+ 81-85; B 76-80; B- 71-75; C+ 66-70; C 56-65; D 41-55;

F 0 - 40.

OTHER INFORMATION:

- Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal educational opportunities for all students regardless of their disability. Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services at (216) 687-2015. The Office is located in MC 147. Accommodations need to be requested in advance and will not be granted retroactively.
- There will be ten homework assignments and two quizzes. The homework assignments, quizzes and exams are not multiple-choice and are graded by hand. Derivations of the results have to be presented. No electronic devices with internet access are allowed during exams and quizzes.
- All exams must be taken. Otherwise the final grade will be F regardless of the numerical grades.
- Attending the lectures is essential for the proper understanding of the material. The students are responsible for all the material discussed in class. Attendance requirements are stated in the CSU Undergraduate Bulletin.
- Part of the course is computational work. On Wednesday September 4, Wednesday October 2, Wednesday October 30, Wednesday November 13, we will meet from 4PM to 5:50PM in the Physics Department Computer Lab in SI-150. Attendance of the computer sessions is obligatory and it is included in the grading of the computational work. We will do modeling projects on Environmental Physics by using the software MathCAD. You should save your work on a memory stick. On Wednesday December 4, each student will give me the memory stick with all the programs and a printout of the results.

ENVIRONMENTAL PHYSICS PHY470 CALENDAR

	Monday 4:00-5:50PM MC-431 or SI-150	Wednesday 4:00-5:50PM MC-431 or SI-150
Week 1		
Week 2	Sept. 2, no class	Sept.4, Comp. Lab. 1
Week 3		
Week 4		Sept.18, no class
Week 5		
Week 6		Oct.2, Comp. Lab. 3
Week 7		
Week 8	Oct. 14, Exam I	Oct.16, no class
Week 9		
Week 10		Oct.30, Comp. Lab. 4
Week 11		Nov.6, no class
Week 12		Nov.13, Comp. Lab. 6
Week 13		Nov.20, no class
Week 14		
Week 15		Dec.4, comp. proj. due, no class
Week 16	Dec.9, 4:00-6:00PM, Exam II	

ASSIGNMENTS

HOMEWORK #1

McFarland, Hunt, Campbell Ch.1

Exercises: 1, 2, 3, 4, 5, 6, 7.

Problems: 8, 11.

DUE: W 9-4-19

HOMEWORK #2

McFarland, Hunt, Campbell Ch.2

Exercises: 1, 2, 3;

Problems: 6, 7, 8.

DUE:

HOMEWORK #3

McFarland, Hunt, Campbell Ch.4

Exercises: 2, 3, 4, 5, 6;

Problems: 8, 9, 10, 11, 13, 17.

DUE:

HOMEWORK #4

McFarland, Hunt, Campbell Ch.16

Exercises: 2;

Problems: 7, 8, 9.

DUE:

HOMEWORK #5

McFarland, Hunt, Campbell Ch.5

Exercises: 1, 2, 7, 8;

Problems: 9, 10, 11, 12, 13, 14, 15, 16.

DUE:

HOMEWORK #6

McFarland, Hunt, Campbell Ch.7

Exercises: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12;

Problems: 13, 14, 15, 16, 17, 18, 19, 20, 21.

DUE:

HOMEWORK #7

McFarland, Hunt, Campbell Ch.8

Exercises: 1, 3, 5, 6, 7, 8, 9;

Problems: 10, 11, 12, 13, 14, 15.

DUE:

HOMEWORK #8

McFarland, Hunt, Campbell Ch.6

Exercises: 1, 2, 3, 4, 5;

Problems: 6, 7, 8, 9, 10, 11, 12, 14, 16.

DUE:

HOMEWORK #9

McFarland, Hunt, Campbell Ch.10

Exercises: 1, 2, 3, 4, 5, 6, 7;

Problems: 8, 9, 10, 11, 12, 15.

DUE:

HOMEWORK #10

McFarland, Hunt, Campbell Ch.10

Problems: 17, 18, 19, 20, 21, 22, 23.

McFarland, Hunt, Campbell Ch.11

1, 2, 3, 5.

DUE: