

Environmental Science (CHM 105)

Course Syllabus

Instructor: Mr. Butz

Course Description: CHM 105 Environmental Science is a course that is designed to be the equivalent of a one-semester, introductory college class in environmental science. The goal of this course is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving and/or preventing them. The following themes provide a foundation for the structure of the CHM 105 Environmental Science course: science is a process, energy conversions underlie all ecological processes, the Earth itself is one interconnected system, humans alter natural systems, environmental problems have a cultural and social context, and human survival depends on developing practices that will achieve sustainable systems.

Course Student Learning Objectives:

1. Demonstrate an understanding of the scientific process that includes observation, development of a hypothesis, measurement and data collection, experimentation, evaluation of evidence, interpretation and mathematical analysis.
2. Apply scientific data, concepts, and models in chemistry
3. Recall key facts and basic theories in the field of environmental science
4. Demonstrate an ability to work collaboratively on science projects.
5. Express verbally and writing an understanding of environmental science concepts which may include : energy flow, chemical cycling, human population and contamination of resources.
6. Perform mathematical calculations and graphing as they pertain to environmental science.
7. Demonstrate the ability to work safely and effectively in the science laboratory.
8. Apply laboratory skills to investigate phenomena which may include problems related to Environmental Sciences
9. Apply chemical theories to address current and potential environmental concerns in the field of environmental science
10. Analyze data derived from chemical experimentation
11. Evaluate the scientific validity of information presented to the public by the mass media.
12. Abstract and interpret chemical information in mass media sources as it pertains to the environment.

Course Prerequisites: Successful completion of Earth Science, Biology, Chemistry, and Algebra.

Summer Reading Assignment: During the summer preceding the school year, students are required to read a book that is related to the study of the environmental sciences. A list of acceptable books will be provided by the instructor prior to the summer. Each student is required to submit a formal book report, and be prepared to provide a brief overview of the book at the start of the school year.

Textbooks: *Environmental Science: Toward a Sustainable Future*, 12th edition by Wright

The Secret Life of a Lake: The Ecology of Northern Lakes and Their Stewardship, by Peter Tobiessen

Laboratory and Field Investigations: The laboratory component of AP Environmental Science is designed to complement the classroom portion of the course by allowing students to learn about the environment through first hand observation. In this course we will be conducting research both in the lab and in the field as often as possible. Experiences both in the laboratory and in the field provide students with important opportunities to test concepts and principles that are introduced in the classroom, explore specific problems with a depth not easily achieved otherwise, and gain an awareness of scientific investigation.

Long-Term Research Project: Throughout the year, the class will be conducting a long-term study of nearby Hedges Lake, the Battenkill River, and the Cambridge Aquifer. Once a month, we will visit these sites to perform chemical and biological tests in order to assess the health of these local water resources. The purpose of this study is to learn about water quality, how human activity may be affecting it, and how scientific skills learned in the classroom are applied to real scientific research. Our study will place special emphasis on invasive species and nutrient pollution. At the end of the year, each student will be required to prepare a formal research report presenting the results of our study.

Weekly Current Event Journals: Each week, all throughout the year, students are required to read, review, and submit an article that is relevant to an environmental science topic that is being covered in class. This important aspect of the course is designed to keep students informed of current events related to the environmental sciences.

Grading Policy: Grades will be based on laboratory reports (24%), current event articles (15%), activities and homework (15%), tests (46%), and a final project (23% of total grade).

Course Outline:

<u>Topics</u>	<u>Reading and Homework Assignments, Lab Investigations, and Activities</u>
<p>Water Resources (4 Weeks)</p> <ul style="list-style-type: none"> • Hydrologic Cycle • Properties of Water • Water Shortages • Irrigation • Standing Water Ecosystems/Limnology • Flowing Water Ecosystems • Watersheds • Long Distance Transport • Water Conservation 	<p>Chapter 10 <i>RQ 1, 2, 3, 6, 10, 11, 14,</i></p> <p>Water Use Worksheet Water Loss Worksheet Long Distance Transport Worksheet Map Lab: Local Water Resources Map Lab: Local Watersheds Local Water Resources Worksheet Hands-On Lab: Evapotranspiration Discharge Rate Worksheet Groundwater Flow Model Demo Map Lab: Groundwater Flow Virtual Lab: Landfills and Groundwater Pollution Hands-On Lab: Soil Salinization Drowning New Orleans Article</p>
<p>Water Pollution (5 Weeks)</p> <ul style="list-style-type: none"> • Point/Non-Point Pollution • Input/Output Controls • Sediment Pollution • Nutrient Pollution/Eutrophication • Thermal Pollution • Disease Causing Organisms • Toxic Organic Compounds • Heavy Metals/Toxic Inorganic Compounds • Water Quality Assessment • Groundwater Pollution • Water Quality Legislation • Wastewater Treatment • Primary Treatment • Secondary Treatment • Tertiary Treatment • Disinfection • Biosolid Disposal • Septic Systems 	<p>Chapter 20 <i>RQ 1, 2, 4, 5, 7, 10, 11</i></p> <p>Hands-On Lab: Algal Bloom Biological Oxygen Demand and Dissolved Oxygen Worksheet Hands-On Lab: Biological Oxygen Demand #1 Hands-On Lab: Biological Oxygen Demand #2 Hands-On Lab: Thermal Pollution (Effect of Temperature. on Dissolved Oxygen) Nitrates in Drinking Water Worksheet Chemical Dumping Worksheet Hudson River PCB videos Canaries in a Stream Worksheet Mercury in Northeastern Lakes Article Arsenic in Drinking Water Worksheet "Swim for the River" Video Hands-On Lab: Water Testing Hands-On Lab: Water Quality Index "A Civil Action" Film Groundwater Pollution Worksheet Wastewater Worksheet Wastewater Treatment Diagram Worksheet Hand-On Lab: Primary Wastewater Treatment Living Machine Article All About Sludge Worksheet Hands-On Lab: Solar Aquatic Wastewater Treatment(Water Hyacinths) Hands-On Lab: Biogas Generators</p>

<p>Atmospheric Science, Weather and Climate, Climate Change, and Air Pollution (6 Weeks)</p> <ul style="list-style-type: none"> • Atmospheric Structure • Weather • Climate • Paleoclimatology • Ice Core Data • Global Climate Change • The Kyoto Protocol • Ozone Depletion • The Montreal Protocol • El Nino and the Southern Oscillation • Coral Bleaching • Primary and Secondary Air Pollution • Photochemical Smog • Acid Precipitation • Indoor Air Pollution • Air pollution Control and Prevention • Air Pollution Legislation • Cap and Trade Programs 	<p>Chapter 18 RQ 1, 2, 3, 4, 6, 7, 9, 11, 13, 16, 17, 18 Chapter 19 RQ 1, 3, 5, 7, 9, 12, 14</p> <p>Koppen Climate Classification Worksheet Computer Lab: Climographs Computer Lab: Vostok Ice Core Data Computer Lab: Humans and Climate Change Data Global Warming and Sea Level Rise Worksheet Hands-On Lab: The Greenhouse Effect Humans and Global Climate Change Worksheet “An Inconvenient Truth” Video Ozone Depletion Worksheet Color the El Nino Activity El Nino La Nina Worksheet “What’s Up With The Weather” Video Is there Global Warming? Article Hands-On Lab: Automobile Exhaust Analysis Air Pollution Worksheet Computer Lab: Particulate Matter Air Maps Computer Lab: Ground Level Ozone Air Maps Air Pollution and Light Bulbs Worksheet Hands-On Lab: Effect of Acid Precipitation on Building Materials Hands-On Lab: Acid Rain and Radishes Cambridge High School Air Pollution Worksheet Indoor Air Pollution Worksheet Cap and Trade Game #1 Mercury Cap and Trade Game</p>
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<p>Population Dynamics (2 Weeks)</p> <ul style="list-style-type: none"> • Demography • Exponential Growth • Demographic Transition • Age Structure Diagrams • Carrying Capacity • Overpopulation • Population Control 	<p>Chapter 8 RQ 2, 4, 5, 7, 8, 9, 12, 11, 12, 13 Chapters 9 RQ 1, 2, 3, 7, 8</p> <p>Population Dynamics Worksheet World Population Map Activity Population Trends of the United States Worksheet Age Structure Pyramids Worksheet Computer Lab: Ecological Footprint World Population Growth Worksheet Doubling Time Worksheet World Population Internet Worksheet Population and Survivorship Worksheet Carrying Capacity in the Kaibib Worksheet Carrying Capacity and Oaks Worksheet Human Carrying Capacity Worksheet</p>
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<p>Energy Resources (6 Weeks)</p> <ul style="list-style-type: none"> • Fossil Fuels • Fossil Fuel Alternatives • Carbon Sequestration Technology • Energy Units of Measure • Electrical Power Generation • Nuclear Power • Hydropower • Wind Power • Biomass Power • Geothermal Power • Solar Power • Fuel Cell Technology 	<p>Chapter 14 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15 Chapter 15 RQ 1, 2, 3, 4, 6, 7, 8, 9, 10, Chapter 16 RQ 1, 2, , 3, 4, 5, 6, 7, , 8, 9, 10, 11, 12, 13, 14</p> <p>Energy Use Graphs Worksheet Geology of Oil Worksheet Hands-On Lab: Geology of Coal Coal Liquification/Gasification Demo Hands-On Lab: Ethanol Production Hands-On Lab: Methanol Production Hands-On Lab: Biodiesel Production America and Cars Worksheet Biodiesel Worksheet Ethanol vs. Gasoline Worksheet Hands-On Lab: Soap from Biodiesel Hands-On Lab: Energy Content of Fuels Energy Units Worksheet Hands-On Lab: Light Bulb Efficiency Efficiency of Power Plants Worksheet Nuclear Now! Article Hands-On Lab: Radiation and Radishes Wind Power Worksheet "Who killed the Electric Car?" Video "Fueling America's Future" Video Hands-On Lab: Photovoltaic Cells Hands-On Lab: Fuel Cells</p>
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Syllabus Statement:

Under Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act, a post-secondary student with a disability who is in need of academic accommodations or auxiliary aids is required to notify the College of the nature of the disability and to provide appropriate documentation which supports the request for reasonable accommodations or auxiliary aids.