

Course Title : **Environmental Science: What is Your Impact?**
 Course Code :
 No. of Credits/Term : 3
 Mode of Tuition :
 Class Contact Hours : 6 hours per week/2-3 hour lectures. At least two lecture periods will be used for field trips.

Category in Major Prog. : General Education Category D

Prerequisite(s) : Not Applicable
 Co-requisite(s) : Not Applicable
 Exclusion(s) : Not Applicable
 Exemption Requirement(s) : Not Applicable

Brief Course Description :

This course introduces students to the fundamentals of Environmental Science. The course is divided into three parts, dealing with the three most important biogeochemical cycles human activity has affected—these are the water cycle, carbon cycle, and the nitrogen cycle. As a result of the exploration of these biogeochemical cycles, students will learn the basics of global climate patterns, the underlying causes of human alteration of the nitrogen, carbon and water cycles, and the impacts of these alterations on ecosystems. Students will engage in exercises that examine student impacts, or “footprints” on the biogeochemical cycles, and the course will pay special attention to local examples of environmental problems resulting from human alteration of these cycles.

Commented [WU1]: Remember that the student will read this to gather information on the course so academic language needs to be moderated against comprehensibility for the student.

Aims:

1. To learn the science underlying the carbon, water, and nitrogen cycles.
2. To understand human impacts on the carbon, water, and nitrogen cycles.
3. To understand how these impacts have impacted the earth’s ecosystems.
4. To understand one’s own impact on the carbon, water, and nitrogen cycles
5. To be able to make informed decisions about life choices to reduce or minimize human impacts on the environment :

Commented [WU2]: Aspirations for the course from the teacher’s perspective. These aims do not need to be assessed.

Learning Outcomes:

On completion of the course, students will be able to:

1. Describe the individual components, and the connections between components of the carbon, nitrogen and water cycles.
2. Discuss the impact of food production, consumption and security, and water pollution on the global nitrogen cycle.
3. Relate fossil fuel combustion, population growth, and lifestyle choices to the global carbon cycle.
4. Assess the effects of human population growth, food production, human consumption and pollution on the water cycle.
5. Illustrate how alterations to the carbon, nitrogen and water cycles affect the earth’s ecosystems.
6. Propose how to reduce their own impact on these biogeochemical cycles and on the earth’s ecosystems

Commented [WU3]: These have to capable of measurement.

Commented [ITSC4]: This is where Bloom’s taxonomy applies. At undergraduate level, there is an expectation that the majority of learning outcomes will address the higher level intellectual activity. See the appendix for Bloom’s taxonomy that will help. The following learning outcomes have employed Bloom’s taxonomy for illustration purposes.

Commented [ITSC5]: Bloom’s Knowledge.

Commented [ITSC6]: Bloom’s Comprehension

Commented [ITSC7]: Bloom’s Synthesis

Commented [ITSC8]: Bloom’s Evaluation

Commented [ITSC9]: Bloom’s Analysis

Commented [ITSC10]: Bloom’s Synthesis

Indicative Content:

Conceptual Framework for Analysis of Human Impacts on Biogeochemical Cycles

The Flow of Energy on Earth and Global Climate Patterns

Human Population Growth

The Water Cycle

Food and Water

Species Extinction and the Water Cycle

The Carbon Cycle

Agriculture and the Carbon Cycle

Human Consumption and the Carbon Cycle

Global Climate Change

Species Extinction and Alteration of the Carbon Cycle

The Nitrogen Cycle

Human Alteration of the Nitrogen Cycle

Water Pollution and the Nitrogen Cycle

Food Security and The Nitrogen Cycle

The Impact of Increased Nitrogen on Ecosystem Function

Teaching Method:

Lecture, Film, Student Group Exercises, Field Trips

:

Measurement of Learning Outcomes

Quizzes will have 10 multiple choice questions and are designed for students to self test for exam material. Quizzes will be administered on Moodle.¹

Exams are made up of 8-10 short answer/essay questions that will test the comprehension, application and problem solving level of learning.² For example:

Question: Explain the relationship between the carbon cycle and the water cycle using what you know about agricultural practices in developed countries.

Student Project Papers are based on analysis of individual use of water and water footprint, individual carbon footprint/waste analysis, and nitrogen footprint/diet analysis. Papers are 4-5 pages in length, include graphs and data analysis, and must include at least 2 sources outside of material presented in class³.

An example of a project paper topic would be:

Paper Prompt

This paper asks that you evaluate your water use. Using the material on water and food production, along with your personal water use habits, you will need to keep a water diary. This diary includes your food consumption, how often and how long you shower or take a bath, how long the water runs when you wash your hands and how often you wash your hands, how often you flush the toilet, and a description of the type of toilet used, and your personal observations of how water is used on the campus.

The analysis will involve using a water footprint calculator which will assess your water footprint based on your consumption of resources that use water for production, as well as a personal reflection on your water use practices. In addition, your paper should include at least three suggestions that would result in a lower individual water footprint, as well as a general discussion of how production or consumption might be changed to reduce water consumption.

Papers should cite at least two sources of information about water use and the water cycle presented in class, and, in addition, two additional sources that you find in the literature about water use and water availability. You must cite your sources in the text of the paper, as well as in a literature cited section. used, and your personal observations of how water is used on the campus.

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Journals are evaluated 3 times during the course and are assessed on the basis of reflection on the material presented in each class.⁴

Rubric

1. Do journal entries cover the main topics of each lecture?
2. Are the main points of each topic covered. For example, are the compartments of cycles listed?.
3. Do the journal entries make connections between topics presented in each lecture?
4. Do the journal entries include reflection about how each topic in a lecture is connected.
5. Do the journal entries include a synthesis of how topics in different lectures are connected.

Commented [ITSC11]: Actual examples of assessment activities are presented.

Commented [ITSC12]: The matrix makes sure that assessment methods specifically address learning outcomes

| Learning Outcome | Assessment Method | | | |
|--|-------------------|--------------------------------|-------------------------------------|----------------------|
| | Quiz ¹ | Short Answer Exam ² | Student Project Papers ³ | Journal ⁴ |
| Students will be able to describe the individual components, and the connections between components of the carbon, nitrogen and water cycles | X | X | | |
| Students will be able to discuss the impact of food production, consumption and security, and water pollution on the global nitrogen cycle. | | X | X | X |
| Students will be able to relate fossil fuel combustion, population growth, and lifestyle choices to the global carbon cycle | | X | X | X |
| Students will be able to assess the effects of human population growth, food production, human consumption and pollution on the water cycle | | X | X | X |
| Students will be able to illustrate how alterations to the carbon, nitrogen and water cycles affect the earth's ecosystems | X | X | | X |
| Students will be able to propose how to reduce their own impact on these biogeochemical cycles and on the earth's ecosystems | | | X | X |

Assessment:

| Assessment Tool | Points | Percent Final Grade |
|---------------------------------|--------|---------------------|
| Quizzes | 4@10 | 22% |
| Exams | 3@20 | 33% |
| Student Project Papers | | 33% |
| Water Footprint | 20 | |
| Carbon Footprint/Waste Analysis | 20 | |
| Nitrogen Analysis | 20 | |
| Journal | 20 | 11% |
| | 3 | |

Required/Essential Readings:

Miller, G. Tyler and Spoolman, Scott, *Environmental Science*, 14th Edition, Brooks Cole, 2012.

Other required readings will be posted on Moodle.

Appendix

Verbs That Are Commonly Used to Illustrate Intellectual Levels When Writing Learning Outcomes (Bloom's Taxonomy)

Verbs giving evidence of KNOWLEDGE

Define, describe, identify, label, name, outline, reproduce, recall, select, state, present, extract, organise, recount, write, recognise, measure, underline, repeat, relate, match.

Verbs giving evidence of COMPREHENSION

Interpret, translate, estimate, justify, comprehend, convert, clarify, defend, distinguish, explain, extend, generalise, exemplify, give examples of, infer, paraphrase, predict, rewrite, summarise, discuss, perform, report, present, restate, illustrate, indicate, find, select, represent, name, formulate, judge, contrast, translate, classify, express, compare.

Verbs giving evidence of APPLICATION OF KNOWLEDGE/UNDERSTANDING

Apply, solve, construct, demonstrate, change, compute, discover, manipulate, modify, operate, predict, prepare, produce, relate, show, use, give examples of, exemplify, draw (up), select, explain how, find, choose, assess, practice, operate, illustrate, verify.

Verbs giving examples of ANALYSIS

Recognise, distinguish between, evaluate, analyse breakdown, differentiate, illustrate how, infer, point out, relate, select, separate, divide/subdivide, compare, contrast, justify, resolve, devote, conclude, criticise, question, diagnose, categorise, point out, elucidate.

Verbs giving examples of SYNTHESIS

Propose, present, structure, integrate, formulate, teach, develop, combine, compile, compose, create, devise, design, explain, generate, modify, organise, plan, rearrange, reconstruct, relate, re-organise, revise, write, summarise, tell, account for, report, alter, argue, order, select, manage, generalise, derive, conclude, build up, engender, synthesise, put together, suggest, enlarge.

Verbs giving evidence of EVALUATION

Judge, appraise, assess, conclude, compare, contrast, describe how, criticise, discriminate, justify, defend, evaluate, rate, determine, choose, value, question.

