

## Washtenaw Community College Comprehensive Report

### ENV 101 Introduction to Environmental Science Effective Term: Fall 2023

#### Course Cover

**College:** Math, Science and Engineering Tech

**Division:** Math, Science and Engineering Tech

**Department:** Physical Sciences

**Discipline:** Environmental Science

**Course Number:** 101

**Org Number:** 12300

**Full Course Title:** Introduction to Environmental Science

**Transcript Title:** Intro to Environmental Science

**Is Consultation with other department(s) required:** No

**Publish in the Following:** College Catalog , Time Schedule , Web Page

**Reason for Submission:** Three Year Review / Assessment Report

**Change Information:**

**Consultation with all departments affected by this course is required.**

**Course title**

**Outcomes/Assessment**

**Objectives/Evaluation**

**Rationale:** We suggest a name change from "Environmental Science I: to "Introduction to Environmental Science" since the name "Environmental Science I" implies a part two, and there are no plans to run an Environmental Science II course.

**Proposed Start Semester:** Fall 2023

**Course Description:** In this course, students will be introduced to the physical processes that affect the environment, the impact of people on the environment and the physical resources in our environment. They will also explore the causes, consequences, and possible solutions to both local and global environmental issues. Emphasis will be placed on a holistic approach to environmental science and sustainability, using laboratory exercises, class discussions and projects to reinforce scientific principles. The title of this course was previously Environmental Science I.

#### Course Credit Hours

**Variable hours:** No

**Credits:** 4

**Lecture Hours: Instructor: 45 Student: 45**

**Lab: Instructor: 45 Student: 45**

**Clinical: Instructor: 0 Student: 0**

**Total Contact Hours: Instructor: 90 Student: 90**

**Repeatable for Credit:** NO

**Grading Methods:** Letter Grades

Audit

**Are lectures, labs, or clinicals offered as separate sections?:** NO (same sections)

#### College-Level Reading and Writing

College-level Reading & Writing

## **College-Level Math**

Level 2

### **Requisites**

#### **General Education**

##### **MACRAO**

MACRAO Science & Math

MACRAO Lab Science Course

##### **General Education**

EMU GenEd Diverse World

##### **General Education Area 4 - Natural Science**

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

##### **Michigan Transfer Agreement - MTA**

MTA Lab Science

### **Request Course Transfer**

#### **Proposed For:**

Eastern Michigan University

Ferris State University

Grand Valley State University

Jackson Community College

Kendall School of Design (Ferris)

Lawrence Tech

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

Central Michigan University

### **Student Learning Outcomes**

1. Recognize and identify introductory principles and concepts from the environmental sciences, including geology, biology, and chemistry, as well as the environmental issues and concerns associated with each.

#### **Assessment 1**

Assessment Tool: Outcome-related exam questions

Assessment Date: Fall 2025

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Multiple-choice questions will be scored using the answer key. Essay and short answer questions will be scored using a departmentally-developed rubric.

Standard of success to be used for this assessment: 70% of students will score 70% or higher.

Who will score and analyze the data: Departmental faculty.

2. Solve environmental problems using appropriate principles and concepts from the fields of natural, life, and social sciences.

#### **Assessment 1**

Assessment Tool: Outcome-related exam questions

Assessment Date: Fall 2025

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

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Standard of success to be used for this assessment: 70% of students will score 70% or higher.

Who will score and analyze the data: Departmental faculty.

### 3. Construct and interpret maps, charts, diagrams, and graphs.

#### **Assessment 1**

Assessment Tool: Outcome-related exam questions

Assessment Date: Fall 2025

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

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How the assessment will be scored: Multiple-choice questions will be scored using the answer key. Essay and short answer questions will be scored using a departmentally-developed rubric.

Standard of success to be used for this assessment: 70% of students will score 70% or higher.

Who will score and analyze the data: Departmental faculty.

### **Course Objectives**

1. Define the term environment and identify some important environmental concerns that we face today.
2. Define sustainability and sustainable development and discuss the implications of each.
3. Describe characteristics of open systems, including positive and negative feedback
4. Identify key concepts in chemistry; describe how atoms bond to make molecules; distinguish among acids, bases, and buffers; explain that matter is recycled but never disappears, so there is no "away" to throw things.
5. Define energy and identify major energy transfers in a living system.
6. Define or identify examples of living organisms at all levels of complexity from cells to species to the biosphere and explain the relationship of organisms in a food web.
7. Identify the major inputs and waste products in photosynthesis and cellular respiration.
8. Explain and identify key steps in the hydrologic cycle, carbon, nitrogen, and phosphorous cycle.
9. Define key terms relating to evolution, such as adaptation, mutation, genetic drift, isolation, speciation, and natural selection; and explain how natural selection causes evolution.
10. Define ecological niche, explain the factors that determine where a species can live; describe various species interactions; and identify the importance of keystone species.
11. Define species diversity, identify where diversity is greatest and describe how communities are distributed and how they change over time.
12. Interpret data on population growth in humans and explain the benefits and problems associated with population growth.
13. Interpret ecological footprint analysis data for different countries.
14. Identify characteristics of the major terrestrial, freshwater, and marine biomes.
15. Describe some of the economic benefits and the environmental problems associated with a few of the biomes.
16. Define biodiversity, identify benefits of biodiversity, and identify threats to biodiversity.
17. Describe some of the ways in which we can reduce threats to biodiversity and explain the purpose behind protecting endangered species.
18. Describe world food supplies and why chronic hunger or famine occurs as well as some solutions to address hunger.
19. Explain some major human nutritional requirements, as well as the consequences of deficiencies in those nutrients.
20. Identify the sources and effects of soil degradation.
21. Analyze some of the promises and perils of genetic engineering.

22. Explain what is needed for crop production; describe sustainable agriculture.
23. Identify some major infectious organisms and hazardous agents that cause environmental diseases that affect human beings.
24. Distinguish between toxic and hazardous chemicals, and between chronic and acute exposures and responses.
25. Compare the relative toxicity of some natural and synthetic compounds, and report on how such ratings are determined and what they mean.
26. Evaluate the major environmental risks we face and how risk assessment and risk acceptability are determined.
27. Summarize the structure and composition of the atmosphere and explain the significance of each layer to living things, including the ozone layer.
28. Describe the major categories and sources of air pollution and how air pollution damages human health, vegetation and building materials.
29. Judge how air quality around the world has improved or degraded and suggest what we might do about problem areas.
30. Describe the important sources of water and the major ways we use it.
31. Explain the causes and consequences of water shortages around the world and describe the merits of proposals to increase water supplies and manage demand.
32. List some water conservation methods students can apply in their own lives.
33. Define water pollution and describe the sources and effects of some major types.
34. Explain why access to sewage treatment and clean water are important to people in developing countries.
35. Describe some basic geologic principles, including how plate tectonic movements affect conditions for life on the earth.
36. Summarize economic mineralogy and strategic minerals and describe the environmental effects of mining and mineral processing.
37. Recognize the geologic hazards of earthquakes, volcanoes, floods, and erosion.
38. Summarize our current energy sources and explain briefly how our energy compares with that of other people in the world.
39. Analyze the major types and reserves of fossil fuels in the world and describe why we must keep most fossil fuels in the ground to avoid the worst impacts of climate change.
40. Explain how renewable energy sources, such as hydropower, wind, solar energy can supplant fossil fuels.
41. Identify the major components of the waste stream and describe how wastes have and are being disposed of in North America and around the world.
42. Explain the differences between dumps, sanitary landfills, and modern, secure landfills.
43. Summarize the benefits, problems, and potential of recycling and reusing wastes.
44. Analyze some alternatives for reducing the plastic waste we generate.
45. Explain what hazardous and toxic wastes are and how we dispose of them, as well as options to better manage these wastes through storage or destruction.
46. Use graphs to show relationships and learn vocabulary associated with graphs.
47. Design, complete and analyze a controlled experiment, such as the effect of soil conditions on the germination of seeds or the growth of plants.
48. Examine and graph world population data and generalize about population data from the different continents.
49. Map biomes onto a map of the world and describe how temperature, moisture and latitude affect these biomes.
50. Demonstrate the effect of melting land vs. sea ice on sea level rise using a simulated experiment.
51. Model the generation of air pollution and its effect on water bodies, both proximate and at a distance.
52. Describe and understand diverse solutions to address climate change.
53. Analyze data to determine if a direct or indirect causal relationship exists between human activity and various geologic hazards, including floods, droughts, landslides and global climatic changes.
54. Recognize American energy consumption and conservation methods by watching a video such as "Kilowatt Ours" or "Tomorrow".

55. List the components of a landfill and explain both what garbage is and how by-products of waste management are processed, including methane by-products and leachate as a result of watching a video on garbage.
56. Use graphs to identify key population biology concepts such as exponential and logistic population growth and carrying capacity.
57. Describe different ideas about the causes of human population growth and various responses to addressing the problem.
58. Describe the mechanism of Greenhouse Effect including the role of greenhouse gases.
59. Identify the four major greenhouse gases and their primary sources.
60. Describe some major impacts of anthropogenic climate change and some solutions to mitigate climate change.
61. Recognize major successes and challenges in addressing human population growth by watching a video such as "Don't Panic, Population".
62. Describe the major challenges with our food supply, by watching a video such as "10 Billion: What's on Your Plate".
63. Model energy transfers between trophic levels and biomagnification of toxins.
64. Analyze and perform statistical analysis on primary scientific data on the impact of fungicide on bumble bee populations.
65. Synthesize and describe relationships between different sustainable development goals.

### New Resources for Course

Various new laboratory equipment, computer maintenance and improved computer cart, additional open source and paid resources (videos) to update labs.

### Course Textbooks/Resources

#### Textbooks

Cunningham, W.P., Cunningham, M.. *Principles of Environmental Science Inquiry and Applications*, tenth ed. New York: McGraw Hill, 2011, ISBN: 0-07-338324-4.

#### Manuals

#### Periodicals

#### Software

### Equipment/Facilities

Level III classroom

Computer workstations/lab

ITV

TV/VCR

Data projector/computer

<u>Reviewer</u>	<u>Action</u>	<u>Date</u>
<b>Faculty Preparer:</b> <i>Smita Malpani</i>	<i>Faculty Preparer</i>	<i>Feb 25, 2023</i>
<b>Department Chair/Area Director:</b> <i>Suzanne Albach</i>	<i>Recommend Approval</i>	<i>Mar 13, 2023</i>
<b>Dean:</b> <i>Tracy Schwab</i>	<i>Recommend Approval</i>	<i>Mar 13, 2023</i>
<b>Curriculum Committee Chair:</b> <i>Randy Van Wagnen</i>	<i>Recommend Approval</i>	<i>Apr 07, 2023</i>
<b>Assessment Committee Chair:</b> <i>Shawn Deron</i>	<i>Recommend Approval</i>	<i>Apr 13, 2023</i>
<b>Vice President for Instruction:</b>		

*Victor Vega*

*Approve*

*Apr 17, 2023*

## Washtenaw Community College Comprehensive Report

### ENV 101 Environmental Science I Effective Term: Winter 2020

#### Course Cover

**Division:** Math, Science and Engineering Tech

**Department:** Physical Sciences

**Discipline:** Environmental Science

**Course Number:** 101

**Org Number:** 12300

**Full Course Title:** Environmental Science I

**Transcript Title:** Environmental Science I

**Is Consultation with other department(s) required:** No

**Publish in the Following:** College Catalog , Time Schedule , Web Page

**Reason for Submission:** Three Year Review / Assessment Report

**Change Information:**

**Consultation with all departments affected by this course is required.**

**Course description**

**Outcomes/Assessment**

**Objectives/Evaluation**

**Other:**

**Rationale:** Changes based on assessment.

**Proposed Start Semester:** Fall 2019

**Course Description:** In this introductory science course, students will be introduced to the physical processes that affect the environment, the impact of people on the environment and the physical resources in our environment. They will also explore the causes, consequences, and possible solutions to both local and global environmental issues. Emphasis will be placed on a holistic approach to environmental science and sustainability, using laboratory exercises, class discussions and projects to reinforce scientific principles.

#### Course Credit Hours

**Variable hours:** No

**Credits:** 4

**Lecture Hours: Instructor:** 45 **Student:** 45

**Lab: Instructor:** 45 **Student:** 45

**Clinical: Instructor:** 0 **Student:** 0

**Total Contact Hours: Instructor:** 90 **Student:** 90

**Repeatable for Credit:** NO

**Grading Methods:** Letter Grades

Audit

**Are lectures, labs, or clinicals offered as separate sections?:** NO (same sections)

#### College-Level Reading and Writing

College-level Reading & Writing

#### College-Level Math

Level 2

## **Requisites**

### **General Education**

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MACRAO Science & Math

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#### **General Education**

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#### **General Education Area 4 - Natural Science**

Assoc in Applied Sci - Area 4

Assoc in Science - Area 4

Assoc in Arts - Area 4

#### **Michigan Transfer Agreement - MTA**

MTA Lab Science

### **Request Course Transfer**

#### **Proposed For:**

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College for Creative Studies

Eastern Michigan University

Ferris State University

Grand Valley State University

Jackson Community College

Kendall School of Design (Ferris)

Lawrence Tech

Michigan State University

Oakland University

University of Detroit - Mercy

University of Michigan

Wayne State University

Western Michigan University

### **Student Learning Outcomes**

1. Recognize and identify introductory principles and concepts from the environmental sciences, including geology, biology and chemistry, as well as the environmental issues and concerns associated with each.

#### **Assessment 1**

Assessment Tool: Departmental Exams

Assessment Date: Winter 2022

Assessment Cycle: Every Three Years

Course section(s)/other population: All sections

Number students to be assessed: All students

How the assessment will be scored: Multiple choice questions will be scored using the answer key. Essay and short answer questions will be scored using a departmentally-developed rubric.

Standard of success to be used for this assessment: 70% of the students will score an average of 72.5% on the exams. An item analysis of outcome-related questions will be done to identify areas of strength and weakness.

Who will score and analyze the data: Appropriate environmental science faculty will assess the data.

2. Solve environmental problems using appropriate principles and concepts from the fields of natural, life and social sciences.

#### **Assessment 1**



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Assessment Date: Winter 2022

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### 3. Construct and interpret maps, charts, diagrams and graphs.

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2. Define sustainability and sustainable development and discuss the implications of each.
3. Describe characteristics of open systems, including positive and negative feedback
4. Identify key concepts in chemistry; describe how atoms bond to make molecules; distinguish among acids, bases, and buffers; explain that matter is recycled but never disappears, so there is no "away" to throw things.
5. Define energy and identify major energy transfers in a living system.
6. Define or identify examples of living organisms at all levels of complexity from cells to species to the biosphere and explain the relationship of organisms in a food web.
7. Identify the major inputs and waste products in photosynthesis and cellular respiration.
8. Explain and identify key steps in the hydrologic cycle, carbon, nitrogen, and phosphorous cycle.
9. Define key terms relating to evolution, such as adaptation, mutation, genetic drift, isolation, speciation, and natural selection; and explain how natural selection causes evolution.
10. Define ecological niche, explain the factors that determine where a species can live; describe various species interactions; and identify the importance of keystone species.
11. Define species diversity, identify where diversity is greatest and describe how communities are distributed and how they change over time.
12. Interpret data on population growth in humans and explain the benefits and problems associated with population growth.
13. Interpret ecological footprint analysis data for different countries.
14. Identify characteristics of the major terrestrial, freshwater and marine biomes.
15. Describe some of the economic benefits and the environmental problems associated with a few of the biomes.
16. Define biodiversity, identify benefits of biodiversity, and identify threats to biodiversity.
17. Describe some of the ways in which we can reduce threats to biodiversity and explain the purpose behind protecting endangered species.

18. Describe world food supplies and why chronic hunger or famine occurs.
19. Explain some major human nutritional requirements, as well as the consequences of deficiencies in those nutrients.
20. Identify the sources and effects of soil degradation.
21. Analyze some of the promises and perils of genetic engineering.
22. Explain what is needed for crop production; describe sustainable agriculture.
23. Identify some major infectious organisms and hazardous agents that cause environmental diseases that affect human beings.
24. Distinguish between toxic and hazardous chemicals, and between chronic and acute exposures and responses.
25. Compare the relative toxicity of some natural and synthetic compounds, and report on how such ratings are determined and what they mean.
26. Evaluate the major environmental risks we face and how risk assessment and risk acceptability are determined.
27. Summarize the structure and composition of the atmosphere and explain the significance of each layer to living things, including the ozone layer.
28. Explain how climate patterns determine weather.
29. Identify the causes of natural climate change and explain the hypothesis that human actions are altering the global climate.
30. Describe the major categories and sources of air pollution and how air pollution damages human health, vegetation and building materials.
31. Judge how air quality around the world has improved or degraded, and suggest what we might do about problem areas.
32. Describe the important sources of water and the major ways we use it.
33. Explain the causes and consequences of water shortages around the world and describe the merits of proposals to increase water supplies and manage demand.
34. List some water conservation methods students can apply in their own lives.
35. Define water pollution and describe the sources and effects of some major types.
36. Explain why access to sewage treatment and clean water are important to people in developing countries.
37. Identify ways to control water pollution, including technological and legal solutions.
38. Describe some basic geologic principles, including how plate tectonic movements affect conditions for life on the earth.
39. Summarize economic mineralogy and strategic minerals and describe the environmental effects of mining and mineral processing.
40. Recognize the geologic hazards of earthquakes, volcanoes, floods, and erosion.
41. Summarize our current energy sources, and explain briefly how our energy compares with that of other people in the world.
42. Analyze the major types and reserves of fossil fuels in the world, and describe why we must keep most fossil fuels in the ground to avoid the worst impacts of climate change.
43. Explain how alternative energy sources, such as hydropower, wind, solar energy and biomass can contribute to our energy supply.
44. Identify the major components of the waste stream, and describe how wastes have and are being disposed of in North America and around the world.
45. Explain the differences between dumps, sanitary landfills, and modern, secure landfills.
46. Summarize the benefits, problems, and potential of recycling and reusing wastes.
47. Analyze some alternatives for reducing the waste we generate, such as incinerators.
48. Explain what hazardous and toxic wastes are and how we dispose of them, as well as options to better manage these wastes through storage or destruction.
49. Use graphs to show relationships and learn vocabulary associated with graphs.
50. Design, complete and analyze a controlled experiment, such as the effect of soil conditions on the germination of seeds or the growth of plants.
51. Model the concept of the "tragedy of the commons" and apply the concept to real world environmental issues.

52. Examine and graph world population data and make generalizations about population data from the different continents.
53. Map biomes onto a map of the world and describe how temperature, moisture and latitude affect these biomes.
54. Demonstrate the effect of carbon dioxide on temperature and explain how it relates to climate change.
55. Model the generation of air pollution and its effect on water bodies, both proximate and at a distance.
56. Assess their own personal level of consumption and their personal impact on the environment, social equity and the economy.
57. Analyze data to determine if a direct or indirect causal relationship exists between human activity and various geologic hazards, including floods, droughts, landslides and global climatic changes.
58. Recognize American energy consumption and conservation methods by watching a video such as "Kilowatt Ours" or "Tomorrow".
59. Compile and analyze an audit of their personal energy consumption to develop a plan to maximize personal energy conservation.
60. List the components of a landfill and explain both what garbage is and how by-products of waste management are processed, including methane by-products and leachate as a result of watching a video on garbage.
61. Research and present one alternative energy source to the class, which may include biofuels, solar power and geothermal energy.
62. Use graphs to identify key population biology concepts such as exponential and logistic population growth and carrying capacity.
63. Describe different ideas about the causes of human population growth and various responses to addressing the problem.
64. Describe the mechanism of Greenhouse Effect including the role of greenhouse gases.
65. Identify the four major greenhouse gases and their primary sources.
66. Describe some major impacts of anthropogenic climate change and some solutions to mitigate climate change.
67. Analyze a scientific paper on an environmental topic.
68. Recognize how to search for primary scientific research in databases of academic literature.
69. Recognize major successes and challenges in addressing human population growth by watching a video such as "Don't Panic, Population".
70. Describe the major challenges with our food supply, by watching a video such as "Food, Inc." or "The Seed: The Untold Truth."
71. Model energy transfers between trophic levels and biomagnification of toxins.
72. Analyze and identify sustainable options through a simulation of various scenarios in different landscapes.
73. Research and present an environmental issue in Michigan and what solutions could be implemented given a budget of \$5 million.
74. Describe the impact of plastic disposal on oceans and marine wildlife.

### **New Resources for Course**

Various new laboratory equipment, 12 computers on a cart, appropriate videos and models related to environmental science are needed to start up and maintain this course.

### **Course Textbooks/Resources**

#### Textbooks

Cunningham, W.P., Cunningham, M.. *Principles of Environmental Science Inquiry and Applications*, eighth ed. New York: McGraw Hill, 2011, ISBN: 0-07-338324-4.

#### Manuals

#### Periodicals

#### Software

### **Equipment/Facilities**

Level III classroom

Computer workstations/lab  
 ITV  
 TV/VCR  
 Data projector/computer

<b><u>Reviewer</u></b>	<b><u>Action</u></b>	<b><u>Date</u></b>
<b>Faculty Preparer:</b> <i>Smita Malpani</i>	<i>Faculty Preparer</i>	<i>Apr 16, 2019</i>
<b>Department Chair/Area Director:</b> <i>Suzanne Albach</i>	<i>Recommend Approval</i>	<i>Apr 17, 2019</i>
<b>Dean:</b> <i>Kimberly Jones</i>	<i>Recommend Approval</i>	<i>May 07, 2019</i>
<b>Curriculum Committee Chair:</b> <i>Lisa Veasey</i>	<i>Recommend Approval</i>	<i>Jun 13, 2019</i>
<b>Assessment Committee Chair:</b> <i>Shawn Deron</i>	<i>Recommend Approval</i>	<i>Jun 25, 2019</i>
<b>Vice President for Instruction:</b> <i>Kimberly Hurns</i>	<i>Approve</i>	<i>Jun 30, 2019</i>