Environmental Science, BIOL 110  
Muskegon Community College  
Fall 2009

Instructor: Theresa Van Veelen  
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Phone: 231-777-0672  
Email: Theresa.vanveelen@muskegoncc.edu.

- When emailing, you must use your Muskegon Community College email address and put BIOL 104 in the subject area and subject of email. Don’t use the Blackboard discussion postings for emails.
- Expect emails to be answered between M – F (no weekends), 8am to 3pm but not during lab and lecture periods. Expect about a two day response time (exempting weekends).

Office Hours: M W 7:30am-noon, 2-3pm; F 7:30-8am OR by appointment

Course Description:
An introductory laboratory course for all students. A study of local natural communities and human impacts on the environment. Through service learning, students will apply the scientific process by collecting, analyzing, and then presenting local ecosystem data to interested community members. Ecosystem monitoring at local sites may possibly extend beyond scheduled lab times and field trips may include a boat trip, a brownfield tour, and a renewable energy building tour. (4 credits, 6 contact hours, 3lecture/3lab)

Lecture:  
F 8-11am  
Rm 241

Lab:  
F 11:30am-2:30pm  
Rm 245

Required Texts:
- Packaged together:
      (Individual ISBN 0-07-338320-1)
  - E-book versions of the above can also be purchased by going to www.coursesmart.com, checking the circle for students, and entering the ISBN number in the search field, for example 0073383201.
- Package of 5” X 8” index (for graded detailed reading notes)

IMPORTANT
- Students must concurrently register for a laboratory. The lecture course grade incorporates laboratory points.
- Students are required to attend all laboratory sessions.
- If a lab is not attended, ten points for each lab time absent will be deducted from the lab grade (except with valid excuse and instructor has been previously contacted or the day).
- Ten points will be deducted from any assignment grade for each day that it is late.
- Prior to attending the laboratory, read the lab manual including worksheet pages that pertain to the week’s topic so that procedures/activities are understood.
- Lab worksheets should be filled out neatly and completely otherwise points may be deducted.
- Lab questions may be discussed with your lab group but absolutely no copying of others’ work will be allowed. You must write your own responses unless instructed to do otherwise.
- Many labs will be conducted outside so dress accordingly for the weather.
Attendance:  

Students are required to attend all laboratory sessions. Attendance is very important for learning. Each student is responsible for the material presented, exams, class participation points, and laboratory reports on the day that they are due or given. It is the sole responsibility of the student to make arrangements prior to a planned absence to makeup the missed work. In the event of an unexpected absence and without satisfactory explanation from the student, the missed work will not be accepted for any grades.

Studying:  

About 2-3 hours of studying time for each hour in class is recommended. Reading the text BEFORE a lecture is helpful in understanding the lecture and writing detailed notes. The end of each chapter contains a summary, questions and web sites for additional learning aids. Some students have also found that making notecards, recording lectures, studying with a group, and quizzing yourself are good preparation techniques for exams.

Assistance  

+ Biology Computers with learning programs (room 249).
+ Exam review sessions (outside of regular class time) upon request.
+ If you have special learning needs, please inform your instructor and contact Janice Alexander at #309.

Grading:

- Three lecture exams (50% of grade), totally 300 pts.
- Laboratory reports, quizzes, presentation, and other activities (50% of grade), totally 300 pts.
- Course TOTAL in possible points = are 600.
- Blackboard will be used in this course to post all current points and any supplemental learning items such as lectures, audios, etc.
- No WP or WF will be given after the last EXAM.
- If you wish to withdraw, see MCC catalog for details.
- All assignments/exams will be returned to you for viewing within two class periods from the exam time. All exams must be returned immediately to the instructor, who will keep them for one year.

Academic Integrity Policy

Cheating or plagiarism will not be tolerated and may lead to a failing grade. Cheating is using or attempting to use, give, and obtain materials or information including computer material pertaining to a quiz, examination, written paper or other work that a student is expected to do alone. Plagiarism is the use of another’s words or ideas without acknowledgement. Papers/tests will be immediately taken from the student and the instructor will notify the student on what action the instructor will take. See your student handbook for more information. All papers must be submitted to Safe Assign on the Blackboard class site.
Campus Wide Student Assessment:

Muskegon Community College is fully accredited by the Higher Learning Commission of the North Central Association of Colleges and Schools. Accreditation helps ensure students that they are receiving a quality education and can transfer to other colleges and universities with ease and confidence. MCC is committed to an essential part of the accreditation process: assessing student learning. You may be asked to participate in assessing student academic achievement this semester by doing two things:

1. Evaluate your class and your instructor by completing a Student Opinion Survey, usually given toward the end of the semester.

2. In some of your classes, you will find that one hour of the class time may be devoted to completing a test of your general knowledge. Your performance on this test will not affect your grade in this course or your status in the College. However, the College asks that you take the test seriously and do your very best since the information gained from the test results is a key component of assessing student learning.

Overall Outline of Assigned Work for Grades

<table>
<thead>
<tr>
<th>Assignment Name</th>
<th>Explanation</th>
<th>Points</th>
<th>Due When</th>
<th>Submit to Safe Assign?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Reading Notes (13 weeks)</td>
<td>On index cards, submit at least one card per week with detailed reading/studying notes</td>
<td>5 pts each week</td>
<td>First five minutes of each Friday except Sept. 4. Always hand in the current reading assignment.</td>
<td>No</td>
</tr>
<tr>
<td>Weekly quiz in lecture (13 weeks)</td>
<td>Questions will be from the current reading and the past week’s lecture and lab.</td>
<td>5 pts each week</td>
<td>First five minutes of each Friday except for Sept. 4</td>
<td>No</td>
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<tr>
<td>Lab assignments OR case studies (14 weeks)</td>
<td>The previous week’s lab or case study worksheets.</td>
<td>5 pts each week</td>
<td>At the beginning of lab time each Friday.</td>
<td>No</td>
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<tr>
<td>Environmental Assessment research and report</td>
<td>This is the main project of the course and is a collaborative effort to evaluate the assigned ecosystem.</td>
<td>100 pts</td>
<td>Dec. Day to be determined</td>
<td>YES</td>
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<tr>
<td>Exams</td>
<td>3 of them</td>
<td>100 pts each</td>
<td>See below</td>
<td>No</td>
</tr>
<tr>
<td>Total possible points in course</td>
<td></td>
<td>600 pts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecture Date</td>
<td>Week</td>
<td>Topic</td>
<td>Chapter Text Readings</td>
<td>Course Objectives</td>
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<td>--------------</td>
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<td>-----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Sept. 4</td>
<td>1</td>
<td>Introduction, Scientific Method, Ecological monitoring, Hydrological cycle, Marine &amp; fresh ecosystems, riparian areas, marsh monitoring</td>
<td>4,15</td>
<td>1-19</td>
</tr>
<tr>
<td>Sept. 11</td>
<td>2</td>
<td>Energy &amp; food webs, Energy sources, Fuel</td>
<td>5,8,9,10</td>
<td>26-31, 58-62</td>
</tr>
<tr>
<td>Sept. 18</td>
<td>3</td>
<td>Ecosystems, Local Watersheds and AOC <strong>(guest speaker, pending)</strong>, Water Resources, issues, and pollution,</td>
<td>1</td>
<td>20-25, 75-79</td>
</tr>
<tr>
<td>Sept. 25</td>
<td>4</td>
<td>Biogeochemical cycles, Global warming, atmospheric pollution, ozone depletion, Review for Exam 1</td>
<td>5,16</td>
<td>32-34, 69-74</td>
</tr>
<tr>
<td>Oct. 2</td>
<td>5</td>
<td><strong>EXAM 1 (100pts, all material to date)</strong>, Biomes, Environmental Geology</td>
<td>6</td>
<td>46, 52-57</td>
</tr>
<tr>
<td>Oct. 9</td>
<td>6</td>
<td>Populations, communities, biodiversity</td>
<td>7,11</td>
<td>35-45</td>
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<tr>
<td>Oct. 16</td>
<td>7</td>
<td>Adaptations, selection pressures, predator/prey interactions, etc.</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Oct. 23</td>
<td>8</td>
<td>Human populations, exotic &amp; invasive species, Management of Ecosystems</td>
<td>7</td>
<td>47-51</td>
</tr>
<tr>
<td>Oct. 30</td>
<td>9</td>
<td>Soil, Food and agriculture, Forestry</td>
<td>13</td>
<td>63-68</td>
</tr>
<tr>
<td>Nov. 6</td>
<td>10</td>
<td><strong>EXAM 2 (100pts, all material from previous exam)</strong>, Environmental Health &amp; Toxicology, Public health, pest control, toxicity, Statistics Info</td>
<td>14,16</td>
<td>80-86</td>
</tr>
<tr>
<td>Nov. 13</td>
<td>11</td>
<td>Solid and Hazardous waste, Recycling, Brownfields</td>
<td>17,18</td>
<td>87-91</td>
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<tr>
<td>Nov. 20</td>
<td>12</td>
<td>Sustainability with a guest speaker (8am, Chris Bedford, confirmed 8/17/09), Land Use, urban sprawl, review</td>
<td>12,19</td>
<td>92-95</td>
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<tr>
<td>Nov. 27</td>
<td>13</td>
<td>NO CLASS. Happy Thanksgiving. Work on the environmental assessment report</td>
<td></td>
<td></td>
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<tr>
<td>Dec. 4</td>
<td>14</td>
<td>Civic Activism, Tragedy of the Commons Debate, Work on environmental assessment</td>
<td></td>
<td>2, 3</td>
</tr>
<tr>
<td>Dec. 11</td>
<td>15</td>
<td><strong>Exam 3 review. Finalize and practice Environmental Assessment Report and Public presentation for next week (100 pts)</strong></td>
<td></td>
<td></td>
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<tr>
<td>Dec 15-18 TBD</td>
<td>16</td>
<td><strong>EXAM 3 (100pts, mostly material from exam 2 with a few comprehensive questions)</strong>.</td>
<td></td>
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<tr>
<td>Lab Date</td>
<td>Week</td>
<td>Topic</td>
<td>Lab Exercises in Enger &amp; Smith or Handouts to be given</td>
<td></td>
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<tr>
<td>Sept. 4</td>
<td>1</td>
<td>Lab safety, Scientific Method case study,</td>
<td>Handout, Ex. 1</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Library visit: 1:30pm Sample of environmental impact report,</td>
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<td></td>
<td></td>
<td>Environmental report discussion and responsibilities</td>
<td></td>
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<tr>
<td>Sept. 11</td>
<td>2</td>
<td>Microscope Use, Aquatic sampling procedures, Field Monitoring: Four Mile Creek</td>
<td>Handout, Ex. 4, 14 Report form</td>
<td></td>
</tr>
<tr>
<td>Sept. 18</td>
<td>3</td>
<td>Field Monitoring: Four Mile Creek</td>
<td>Report form</td>
<td></td>
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<tr>
<td>Sept. 25</td>
<td>4</td>
<td>Field trip: Boat trip on Jackson, Annis Water Resource Institute (AWRI), Review for Exam 1</td>
<td>Ex. 12</td>
<td></td>
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<tr>
<td>Oct. 2</td>
<td>5</td>
<td>Field Monitoring: Four Mile Creek Field trip: Field monitoring, Ruddiman Creek</td>
<td>Report form</td>
<td></td>
</tr>
<tr>
<td>Oct. 9</td>
<td>6</td>
<td>Field monitoring: Four Mile Creek Field trip: Field monitoring, Ruddiman Creek</td>
<td>Report form</td>
<td></td>
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<tr>
<td>Oct. 16</td>
<td>7</td>
<td>Upland Forest lab and soil sampling, Field Monitoring: Four Mile Creek</td>
<td>Handout, Ex. 2, 5, 16 Report form</td>
<td></td>
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<tr>
<td>Oct. 23</td>
<td>8</td>
<td>Populations</td>
<td>Ex. 3, 9, 10?</td>
<td></td>
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<tr>
<td>Oct. 30</td>
<td>9</td>
<td>Field Monitoring: Four Mile Creek</td>
<td>Ex. 7 Report form</td>
<td></td>
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<td></td>
<td></td>
<td>Campus facility survey</td>
<td></td>
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<tr>
<td>Nov. 6</td>
<td>10</td>
<td>Field Monitoring: Four Mile Creek Field trip: Muskegon Wastewater treatment plant, confirmed 8/14/09 (1-2pm)</td>
<td>Ex., Handout</td>
<td></td>
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<tr>
<td>Nov. 13</td>
<td>11</td>
<td>Data analysis, graph making, Field trip: Tour at MAREC, alternative energy. Confirmed 8/13/09 (1-2pm), tour guide: George</td>
<td>Ex.17, 20 Report form</td>
<td></td>
</tr>
<tr>
<td>Nov. 20</td>
<td>12</td>
<td>Continue discussion of research, Compile data from Previous BIOL 104 classes</td>
<td>Handout on graphs and stats</td>
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<tr>
<td>Nov. 27</td>
<td>13</td>
<td>No Class – Happy Thanksgiving</td>
<td></td>
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<tr>
<td>Dec. 4</td>
<td>14</td>
<td>Data Analysis, Finalize graphs and report</td>
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<tr>
<td>Dec. 11</td>
<td>15</td>
<td>Practice Presentation, final revisions.</td>
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<tr>
<td>Dec. 14-18</td>
<td>16</td>
<td><strong>Presentation week at local meeting. Date TBD</strong></td>
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</table>
Muskegon Community College

BIOL 110, ENVIRONMENTAL SCIENCE OBJECTIVES:
The objectives, included in the Laboratory Manual, serve as a basis for the lectures, laboratories, and exams. The student is responsible for an objective, whether it is covered in the laboratory only, lecture only, reading only, or a combination of these. Tests will be derived from these objectives, labs, lectures, and the textbook readings. Use the objectives as study guides for the exams. Many of the specific objectives are modeled after the textbook.

General Objectives:
1. Understand the nature of science, ecology, environmental science, and the scientific process/method.
2. Apply scientific process by collecting, analyzing, and presenting local ecosystem data to our community.
3. Explain ecological concepts such as food webs, populations, communities, and ecosystems.
4. Explore local and Great Lake environmental history particularly of Muskegon County and understand how current societal pressures may affect local ecosystems.
5. Discuss environmental stewardship and sustainable practices.

Specific Objectives:

Introduction to Environmental Science and Scientific Process
1. Define science, ecology, and environmental science.
2. Explain scientific process and construct a hypothetical experiment.
3. Differentiate between hypothesis and theory.
4. Be capable of differentiating between science and non-science information in current news events.
5. Explain statistics, data, and graphs that are utilized in current news events.
6. Define sustainability.

Service Learning Assignment
7. Work with your assigned group in researching monitoring methods and assigning responsibilities and goals.
8. Attend the presentation about conducting research in our library and with databases.
9. Assess progress of your individual work and other’s individual work toward group goals.
10. Analyze gathered data with the help of your instructor and then develop simple statistics and graphs.
11. Understand and utilize basic statistical calculations in laboratory reports and field research: average, standard error, etc.
12. Actively participate in writing and presenting your data to local community citizens.

Monitoring Riparian Ecosystems
13. Define riparian areas and their importance to ecosystems.
14. Explain the hydrological cycle and how areas are affected by runoff.
15. Understand how the Marsh Monitoring Program works.
16. Identify the vocal calls of these frogs: tree frog, American toad, and bullfrog.
17. Identify these riparian plants: cattails, duckweed, wild rice, sedges, horsetail, burreed, smartweed, water milfoil.
18. Identify common macro – invertebrates within the monitoring sites.
19. Explain and demonstrate the field methods utilized to monitor frogs, riparian plants and macro – invertebrates.

Environmental Science and Policy
20. Summarize how environmental policy is established in our region.
21. Discuss local, state, and Great Lake issues.
22. Explain Areas of Concerns, International Joint Commission, and other environmental councils.
23. Understand the importance of some major environmental laws such as Clean Water Act and Superfund Amendments.
24. Explain the importance of citizen participation and action.
25. Give a general overview of our local environmental history.

**Energy and Food Webs**

26. Define energy and explain how it flows from one trophic level to another and the energy loss that occurs from level to level.
27. Discuss photosynthesis and cellular respiration processes as related to living organisms and food chains.
28. Explain primary productivity and give some examples of limiting factors for primary productivity.
29. Explain the ecological significance of species, populations, communities, and ecosystems.
30. Discuss the difference between these ecological pyramids of numbers, biomass, and energy and why they are used.
31. Give some examples of food chains that are four trophic levels.

**Biogeochemical Cycles**

32. Explain the importance of decomposers to food webs and the biogeochemical cycles.
33. In detail, diagram and discuss the nitrogen cycle, the carbon cycle, and the phosphorus cycle.
34. Explain how humans have altered the nitrogen cycle, the carbon cycle, and the phosphorus cycle.

**Populations, Biodiversity, and Natural Selection**

35. Explain how environmental factors affect species, populations, and communities.
36. Discuss genetic variations among all living organisms and its importance in natural selection.
37. Define genetic adaptations.
38. Explain how natural selection is “survival of the fit enough” as opposed to “survival of the fittest”.
39. List and explain some selecting factors on populations such as predation, herbivory, and etc.
40. Define carrying capacity of an ecosystem and its relation to populations.
41. Explain population growth and factors that can limit its growth.
42. Understand how life expectancy, mortality, and natality affect populations; use our human society as an example.
43. Define biodiversity and its importance to our society.
44. Give three exotic species that are causing havoc to our local ecosystems and explain how they have become such problems.
45. Identify regions of high biodiversity.
46. Recognize characteristics and locations of these major biomes: rainforest, temperate forest, tundra, grasslands/savannah, shrubland, and desert.

**Management of Ecosystems**

47. Explain how humans have altered the biomes and ecosystems by overgrazing, clear-cutting, road building, construction, and draining.
48. Discuss the tension between conservation of ecosystems, economic development, and landowner “rights”.
49. State the legislative origin of the national parks and wilderness areas.
50. Identify the national parks and wilderness areas within the Midwest.
51. Discuss how value of these ecosystems should be addressed to relay their importance to the general public.

**Environmental Geology**

52. Give a basic explanation of plate-tectonics.
53. Explain how the geologic movements and weather events, such as earthquakes, erosion, and floods, alter ecosystems.
54. Describe the rock cycle and the formation of the three major rocks.
55. Explain soil formation and name the different horizons.
56. Understand the importance of living organisms in creating and maintaining fertile soil.
57. Discuss anthropogenic effects, such as mining and waste disposal that alter soil structures and ecosystems.

**Energy**

58. Explain our society’s current energy sources.
59. Compare United States’ energy usage to other parts of the world.
60. Discuss the advantages and disadvantages of fossil fuel usage and compared to other energy sources.
61. Describe other energy sources: nuclear, hydropower, wind, solar, biomass, geothermal.
62. Explain some ways in which citizens and homeowners can reduce energy usage.

**Food Production**

63. Discuss world food supplies for humans.
64. Explain some human nutritional requirements and deficiencies related to lack of food nutrients.
65. Describe famine and chronic under-nutrition.
66. Compare the advantages and disadvantages of genetic engineering of plant crops.
67. Explain some limiting factors of food production.
68. Discuss the need and potential of low-energy, sustainable agriculture.

**Our Air**

69. Explain these terms and their effect on weather: atmosphere, jet streams, ocean currents.
70. Discuss natural climatic changes vs. global warming.
71. Understand the natural fluctuations of ozone and ozone depletion.
72. State what causes ozone depletion.
73. Describe our local air quality.
74. State how air pollution damages human health, vegetation and buildings.

**Water**

75. Explain our uses of water and how we affect the water around us.
76. Discuss the causes and consequences of water shortages around the world.
77. Understand the basis of water laws and why they were established.
78. Explain some types of sewage treatment.
79. Discuss some ways to provide clean drinking water.

**Environmental Health**

80. Identify some major organisms and hazardous agents that cause environmental diseases/illnesses.
81. State some emerging human and ecological diseases.
82. Understand our local fish advisories and how the toxins are biomagnified.
83. Explain how toxins migrate and persist in the environment and enter the food web.
84. Differentiate between toxic and hazardous chemicals.
85. Differentiate between chronic and acute exposures.
86. Explain how environmental risk assessments are completed.

**Waste**

87. Describe the waste stream in North America.
88. Discuss the historical changes in how waste was disposed.
89. Summarize the advantages and disadvantages of recycling.
90. Analyze some ways of waste reduction.
91. Understand how hazardous waste is disposed of in our country.

**Sustainability**
92. Explain what urban sprawl is and the rate at which it is occurring.
93. Discuss the economic advantages and disadvantages for businesses and citizens to practice sustainability.
94. Explain Garritt Hardin’s concept of “Tragedy of the Commons”.
95. Ponder your role in a sustainable society.