Ecampus Syllabus

Course Name: Case Studies in Humanitarian Engineering, Science and Technology

Course Number: HEST 412/512

Term Offered: Spring 2017

Credits: **3**

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Teaching Assistant name and contact info: NA

Course Description

This course introduces students to basic concepts in humanitarian engineering, science and technology. Applications to real world issues with global implications at the interface of humanity and nature are addressed from a systems perspective using a case study approach. The course is a core course for Humanitarian Engineering Science and Technology students. However, the course welcomes students from other disciplines.

Each week students will highlight key issues associated with a relevant topic and engage with each other through online discussion. Students will be asked to share information about humanitarian issues of local interest by completing a term project with deliverables due throughout the term.

Baccalaureate Core

This course may be used to fulfill the Baccalaureate Core Synthesis category for Science, Technology and Society because students engage in a multi-disciplinary study of the interaction of science and technology with society. Students gain understanding of the political and economic dimensions of scientific or technological change, the nature of the scientific enterprise, and the complexity of major revolutions in science and technology.

Communication

Please post all course-related questions in the General Discussion Forum so that the whole class may benefit from our conversation. Please email your instructor for matters of a personal nature. The instructor will reply to course-related questions and email within 24-48 hours.

Technical Assistance

If you experience computer difficulties, need help downloading a browser or plug-in, assistance logging into the course, or if you experience any errors or problems while in your online course, contact the OSU Help Desk for assistance. You can call (541) 737-3474, email osuhelpdesk@oregonstate.edu or visit the OSU Computer Helpdesk online.

Learning Resources

Weekly required readings and background material are provided each week [see class schedule on following pages for specific weekly reading assignments]. Streaming media and optional articles from various sources will be posted as support material when applicable. Copies of all required articles and other material are posted on Canvas. You are encouraged to review the support material to gain additional perspectives related to the weekly assignment.

Canvas

This course will be delivered via Canvas where you will interact with your classmates and with your instructor. Within the course Canvas site you will access the learning materials, such as the syllabus, class discussions, assignments, and projects. To preview how an online course works, visit the Ecampus Course Demo. For technical assistance, please visit Ecampus Technical Help.

Measurable Course-Specific Student Learning Outcomes

Bacc Core Learning Outcomes for Science, Technology, and Society

1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines
2. Analyze the role of science and technology in shaping diverse fields of study over time.
3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

Graduate Learning Outcomes for Humanitarian Engineering, Science and Technology

1. Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
2. Learn to apply systems thinking to the basic concepts of technological, ecological, and social sciences that form the underpinnings of humanitarian engineering, science and technology.
3. Learn how to effectively address the interdisciplinary nature of global humanitarian issues.
4. Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

Additional case study specific outcomes are listed as applicable.

Evaluation of Student Performance

Individual student performance will be determined by grading each student's products: (1) the quality of the critiques of modules submitted in the form of weekly case study assignments; (2) the quality and creativity of the term project in the form of assigned deliverables; and (3) the quality, frequency, and timeliness of participation on the Canvas Discussion Board.

Overall assessment is based on a scale of 1000 points.

(1) Module assignments (350 points)

Over the 10-week term, each student is required to complete 7 briefing assignments or learning exercises relevant to the weekly topic (a topic consists of both assigned articles and backgrounder) and submit the assignment in the specified format by midnight on **Monday** of the following (see class schedule on the following pages). Late submissions will be accepted, but penalized one point per day.

Module assignments (briefing reports and/or exercises) account for 35 percent of the class grade (7 module assignments @ 50 points per assignment = 350 points).

(2) Discussion Board assignments (200 points)

Over the 10-week term, each student will substantively and regularly participate on the Canvas Discussion Board on a weekly basis. Each week (**Monday**) I will post a discussion topic on the Discussion Board and student participation is required. Regular participation by individual students is defined minimally as at least three (3) posts per week (primary post plus two or more classmate responses). Each student's contribution to the weekly on-line discussions will be evaluated in terms of content, originality, frequency, and timeliness. Discussion board posts should be completed by the following **Monday.**

Discussion board participation accounts for 20 percent of the class grade (10 discussion board assignments @ 20 points per assignment = 200 points).

(3) Term Projects (450 points)

Students will submit a term project presentation no later than **Friday** of Week 10 and a term project paper no later than **Friday** of Week 11. All term project deliverables are listed as follows (and described in detail in a separate document):

1. **Project selection posted on discussion board by Friday of Week 1 and feedback for two other students on their projects by Monday of Week 2 (50 points)**
2. **Written project proposal and concept map (50 points) due Monday of Week 3**
3. **Stakeholder poster presentation (100 points) due Monday of Week 7**
4. **Term project presentation due Friday of Week 10 (100 points)**
5. **Evaluation of two peers/students on their presentations due Monday of Week 11 (50 points)**
6. **Term project paper (100 points) due Friday of Week 11**

Graduate students will also be expected to complete an additional term project assignment worth 200 points, for a total of 1200 points. The project is described in the document Termprojectmoduletemplate_grad. Graduate students will create a case study module based on their term project and employ a modeling tool to arrive at potential solutions and address specific questions.

There will be no examinations.

Grading

A	94-100%
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	69 and below

Course Content

Module	Topic	Reading Assignments	Learning Activities	Due Date
1	Introductions and E-course navigation	Course background information Optional readings	Discussion board introductions Term project: selection and discussion board feedback	Monday of Week 2
2	World without Humans	Background Materials Background Reading assignments	Online discussion board Q&A Concept mapping case study using C-MAP Term project: Concept maps and proposals due	Monday of Week 3
3	Energy Technology and Public Health	Background Materials Background Reading assignments	Online discussion board Q&A Hydraulic Fracturing: Risk Assessment using R	Monday of Week 4
4	Technology Adoption for Public Health	Background Materials Background Reading assignments	Online discussion board Q&A Arsenic in Bangladesh briefing report	Monday of Week 5
5	Implications of Climate Change	Background Materials Background Reading assignments	Online discussion board Q&A Predictive modeling case study using Daisyworld	Monday of Week 6
6	Building Engineering Partnerships through Stakeholder Engagement	Background Materials Background Reading assignments	Online discussion board Q&A Term project: Stakeholder engagement posters due	Monday of Week 7
7	Equity and Resource Allocation	Background Materials Background Reading assignments	Online discussion board Q&A Bottle water case study / briefing report	Monday of Week 8
8	Mapping Spatial Vulnerability	Background Materials Background Reading assignments	Online discussion board Q&A Watershed assessment case study using Google Earth	Monday of Week 9
9	Cultural norms and nutrient cycles	Background Materials Background Reading assignments	Online discussion board Q&A Nitrogen footprint case study using N-print / briefing report	Monday of Week 10
10	Term Projects		Term project presentations due Online discussion board Q&A Term project presentation grading due Term project reports due	Friday of Week 10 Monday of Week 11 Friday of Week 11

Course Schedule and Content

Week 1: Introductions and E-course navigation
Term Project: Selection and Discussion

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
- Get to know your classmates, learn about their interests and how to communicate effectively via online discussion boards.
- Learn to navigate the Canvas online classroom.

Introduction:
Welcome to Case Studies in Humanitarian Engineering, Science and Technology! Thank you for your commitment to online learning at Oregon State University. This first week, you will be spending time getting familiar with online course navigation in the Canvas environment. Please take a look at the course syllabus, rubrics document, and guideline documents (briefing report guidelines, term project guidelines, and discussion board guidelines) located in the Introduction module folder to get a feel for the flow of the course and course expectations over the next ten weeks. Except for the first week, you will have weekly assignments usually in the form of a briefing report synopsis of the topic covered in the current module. You will also have a discussion board question or series of questions on the current topic of interest. Each module offers an introduction to timely topics and evaluation methods of local or global interest.

Over the course of the term, starting with the first week, you will have term project deliverables due at various intervals. Your term project topic will be selected this week and shared with the class via the discussion board. The first and subsequent term project deliverables are described in depth in the Term Project Guidelines document. The term project topic selected should have interdisciplinary aspects, which will be highlighted in the poster project and final document and presentation. Please be sure to choose a topic of personal and local interest to your region. This will greatly enhance sharing and extended learning in this class. Wishing you all an excellent online learning experience!

Biography:
My name is Carolyn Fonyo and it's a pleasure to serve as your HEST 412/512 course facilitator for the next ten weeks. I have been active in the engineering and sciences fields for a few decades. I've worked as a scientist and engineer for industry, the government, private consulting, and universities in various capacities with the main emphasis on natural resources management. I apply systems thinking and energy analysis to create sustainable and humanitarian solutions based on fundamental ecological, social, economic, and technical principles and interconnections. It is my hope to share this systems perspective with you throughout this term. Please contact me with questions and concerns any time throughout the term. I will do my best to respond in a timely manner. I will also be available for Skype meetings on Fridays from 2-4 pm PST. You can find me listed on Skype as carolynfonyo. Please email me at carolyn.fonyo@oregonstate.edu to request an appointment no later than Wednesday of the same week.

Background Material (1):
Video attached:
Introduction to HEST 412/512

Optional Background Readings (2):
1. Sustainability: A Comprehensive Foundation:
http://cnx.org/contents/1741effd-9cda-4b2b-a91e-003e6f587263@43.5/Sustainability:_A_Comprehensiv

2. Changing the Way We View Humanity and the Rest of Nature:
http://www.thesolutionsjournal.com/node/1010

Discussion Board Questions (20 points):
Introductions
The introductions discussion forum is where students can get to know each other at the start of class. Please introduce yourself to your classmates:
1. Tell us about your interest in humanitarian engineering
2. Tell us about your educational background and where you are located
3. Tell us if you've ever been a student in an online class
4. Tell us what you expect will be the biggest difference or challenge for you when moving from face-to-face to online education
5. Tell us a fun fact about yourself

BONUS -- If you're feeling adventurous, rather than typing your initial post, if you have a webcam try the media recording option. Click on the filmstrip icon in the text editor to record yourself. Be patient -- it might take a moment for Canvas to recognize your webcam.

Term Project Deliverable 1: Term Project Topic Selection and Discussion (50 points)
Once you have selected a topic, the first task is to share your selection via the discussion board during the first week of class no later than **Friday of Week 1** and respond to at least two other students about their topics no later than **Monday of Week 2**.
In a couple of paragraphs, please describe your topic and why you have selected it as well as the focus of your term project in a paragraph or two. Please be sure to give useful feedback to your classmates – Is the topic clear? Is it of interest? Provide suggestions to improve the focus if needed.

Week 2: World without Humans
Concept Mapping Case Study using C-MAP
Term Project: Proposals and Concept Maps

Learning Outcomes:
- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad2: Learn to apply systems thinking to the basic concepts of biological, physical,

ecological, and social sciences that form the underpinnings of humanitarian engineering, science and technology.

- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues.

- Grad4: Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

Introduction:
Nature provides value to humans in terms of the services it delivers. One might assert that natural systems and ecosystems also have intrinsic value regardless of human use or presence. The information shared in this module gives a snapshot of life on earth post humans. How might one expect the earth to evolve if humans were no longer present? Would ecosystem services still be provided if there were no humans to receive them? These are a few questions for you to ponder while working on your assignment and discussion board posts this week. You will use the concept mapping tool, which helps one organize and visualize interconnections within a system, to develop an overview of your term project when you submit your proposals next week.

Background Materials (3):
Video: What if Humans Disappeared?:
https://www.youtube.com/watch?v=guh7i7tHeZk#t=13
Videos: The World without Us:
http://www.worldwithoutus.com/multimedia.html
Video: How to Create a Concept Map:
https://www.youtube.com/watch?v=nu46uDbTZvc#t=34

Background Readings (2):
1. The World without Us flow chart:
http://www.worldwithoutus.com/did_you_know.html
2. Concept Mapping:
http://cmap.ihmc.us/docs/theory-of-concept-maps

Case Study Assignment (50 points):
Using concept mapping as a tool, choose an socio-ecological system of local interest and diagram the major pathways you would expect with and without humans. Highlight the pathways that would change. These "before and after" diagrams need not be a great complexity. The general purpose of this assignment is to familiarize you with the concept mapping tool you will also use for your term project proposal deliverable.

Discussion Board Questions (20 points):
Does the concept of "value" make sense without humans? In other, words, does nature have an intrinsic value if humans are not around to provide measurement?

Term Project Deliverable 2: Term Project Proposal and Concept Map (50 points)
Incorporate the feedback you received from your classmates and build your selected topic into a project proposal. Provide a backdrop for the topic, i.e. why it is a timely issue and how you will focus your project. For example, this may be part of your ongoing research that you would like to share with the

class. Or you may have a hobby or particular interest you would like to explore further. The parameters are broad and you have a lot of flexibility regarding your topic selection. It would be preferable to highlight an issue that is local to your region so that others can increase their global understanding. Term project proposals should be two to three pages of text in length. Graphics and visuals may add to the minimum length as needed. Term project proposals and concept maps are due on **Monday of Week 3.**

Week 3: Energy Technology and Public Health: Hydrofracking
Risk Assessment using R

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues using risk assessment as a tool.
- Grad4: Articulate original thinking and solve case studies in the field of humanitarian engineering, science and technology.

Introduction:
Hydraulic fracturing is a process used in nine out of 10 natural gas wells in the United States, where millions of gallons of water, sand and chemicals are pumped underground to break apart the rock and release the gas. Fracking is also practiced in China, Australia, New Zealand, parts of Europe and Africa as well as Canada. Hydraulic fracturing produces fractures in the rock formation that stimulate the flow of natural gas or oil, increasing the volumes that can be recovered. Wells may be drilled vertically hundreds to thousands of feet below the land surface and may include horizontal or directional sections extending thousands of feet.
Fractures are created by pumping large quantities of fluids at high pressure down a wellbore and into the target rock formation. Hydraulic fracturing fluid commonly consists of water, proppant and chemical additives that open and enlarge fractures within the rock formation. These fractures can extend several hundred feet away from the wellbore. The proppants - sand, ceramic pellets or other small incompressible particles - hold open the newly created fractures.
Once the injection process is completed, the internal pressure of the rock formation causes fluid to return to the surface through the wellbore. This fluid is known as both "flowback" and "produced water" and may contain the injected chemicals plus naturally occurring materials such as brines, metals, radionuclides, and hydrocarbons. The flowback and produced water is typically stored on site in tanks or pits before treatment, disposal or recycling. In many cases, it is injected underground for disposal. In areas where that is not an option, it may be treated and reused or processed by a wastewater treatment facility and then discharged to surface water.
The number of chemical additives used in a typical fracture treatment depends on the conditions of the specific well being fractured. A typical fracture treatment will use very low concentrations of between 3 and 12 additive chemicals, depending on the characteristics of the water and the shale formation being fractured. Each component serves a specific, engineered purpose. For example, the predominant fluids

currently being used for fracture treatments in the gas shale plays are water-based fracturing fluids mixed with friction-reducing additives (called slickwater). The addition of friction reducers allows fracturing fluids and sand, or other solid materials called proppants, to be pumped to the target zone at a higher rate and reduced pressure than if water alone were used. In addition to friction reducers, other additives include: biocides to prevent microorganism growth and to reduce biofouling of the fractures; oxygen scavengers and other stabilizers to prevent corrosion of metal pipes; and acids that are used to remove drilling mud damage within the near-wellbore area.
Fluids are used to create the fractures in the formation and to carry a propping agent (typically silica sand) which is deposited in the induced fractures to keep them from closing up.
Scientists are concerned that the chemicals used in fracturing may pose a threat either underground or when waste fluids are handled and sometimes spilled on the surface. Risk assessment is a tool commonly used by the USEPA (Environmental Protection Agency) and other scientists to characterize the exposure, effect and risk of hazards identified to cause harm to human health.

Background Materials (4):

1. *Fracking R: Risk Assessment Case Study Overview*

Powerpoint attached

2. *Global Fracking:*

https://paloma.sav.uqam.ca/p5n40kuhht1/

3. *Oil Industry Perspective: What the Frack is Going On?*

http://www.youtube.com/watch?v=VY34PQUiwOQ

4. *Anti-frack Perspective:*

http://www.youtube.com/watch?v=2LPV8uujQyc

Background Readings (5):

1. Boudet, H., et al., 2013, "Fracking" controversy and communication: Using national survey data to understand public perceptions of hydraulic fracturing. *Energy Policy*, http://dx.doi.org/10.1016/j.enpol.2013.10.017i

2. Cooley, H. and Donnelly, K., 2014, Hydrofracturing and Water Resources – What we know and what we need to know: *World's Water*, volume 8, pp. 63- 77, Island Press.

3. Stephens, D.B., 2015, Analysis of the Groundwater Monitoring Controversy at the Pavillion, Wyoming Natural Gas Field: *Groundwater,* Volume 53, Issue 1, pages 29–37.

4. Ecological Risk Assessment Guidelines, pdf attached

5. Newsweek, Fracking Could Increase Risk of Cancer, New Study Finds: http://www.newsweek.com/fracking-could-increase-risk-cancer-new-study-finds-332113

Case Study Assignment (50 points):

Identification of contaminant pathway and dose-response model

For this assignment, you will be creating your own environmental risk assessment (ERA) model. The goals of this assignment are to become familiar with the ERA framework, do some of your own research to parameterize an ERA model, and think quantitatively about environmental issues. The Powerpoint presentation shows you an example of a simple dose-response model of benzene in drinking water. You will be using this framework to create your own model describing an environmental contaminant of your choice.

1. Review the model illustrated in the Powerpoint presentation – specifically, focus on the general concepts of a dose-response model. Keep in mind this is highly simplified for our purposes. Keeping this framework in mind, choose a process that potentially involves human exposure to an environmental contaminant. The presentation example used benzene contamination of drinking water as a result of hydraulic fracturing. Choose your own – the more interesting the better! There is no shortage of environmental contaminant pathways in our modern world. Of importance is to provide some sort of real documentation of the pathway. You will need to find quantitative data on dosages and exposures. You will also need to define a population that is exposed to your chosen contaminant.

So now that you have successfully identified your environmental contaminant and its associated exposure pathway…

2. Explore the USEPA IRIS database. EPA's IRIS (Integrated Risk Information System) is a program that compiles information on human health effects from exposure to environmental contaminants. This program is searchable in multiple ways, and has a ton of great information. Don't be intimidated by it – take the opportunity to get a handle on how this stuff is dealt with. Remember that the EPA is the nation's environmental regulatory agency, and as such, is charged with providing a wealth of public information on human health effects of environmental contaminants. Search for your chosen contaminant in the database. Here you will find data on cancer potencies, absorption factors, etc. Gather the data relevant to your contaminant and pathway. Keep in mind the equations we used for the dose-response model. You will need values for all the variables in these equations. Some will be found in the IRIS database, others will be from your initial research, while others will be from…

3. EPA's Exposure Factors Handbook! This is a pretty mind blowing document, providing data on various human exposure pathways. If you ever laid awake wondering how many apples the average 59 year old non-Hispanic white male eats per year, this is the place to look. If your literature search does not give you quantitative information on exposure rates, you can calculate our own using the information in this handbook.

4. Using your dataset, calculate the total lifetime dose, lifetime average daily dose, and individual risk of your population. Be explicit about any assumptions you are making for your calculations (e.g. your population drinks 3L of water per person per day).

R Model segment

For this portion of the lab, you will be entering your data into R to create a stochastic model of your population's health risk from the chosen environmental contaminant. I know and understand many people's extreme aversion to coding (and math…), but don't panic if you have never used it before – you will have to do minimal coding! If you don't already have access to R and RStudio, follow the download instructions here: http://www.rstudio.com/resources/training/online-learning/

Here is a great tutorial on how to use R Studio if you need more information:
http://www.computerworld.com/article/2497143/business-intelligence-beginner-s-guide-to-r-introduction.html

Once you have R Studio up and running, next step is to run the model using your parameters. Output will include vectors of total lifetime dose, lifetime average daily dose, and individual risk of your population. In addition, the model calculates a population risk. This is simply the individual risk multiplied by the population size. Make plots of these stats, and calculate summary statistics (mean, median, standard deviation, etc.) as you feel appropriate.

Please provide a concise write-up that includes some background information on your contaminant pathway, the data you chose to use in the model, calculations for the dose-response model, figures generated from the R model, as well as a discussion about your model output. What does the output mean? What was the point of doing the R model? How is it different than the simple dose-response linear models used in the first part of the lab? Provide citations for your chosen model parameters, as well as those references used for background info.

Please keep in mind that there is no single "right" answer to this lab. I am looking for you to identify a topic of interest to you, and go about quantitatively investigating it using the provided framework. Along the way, you will be forced to make decisions and assumptions in order to parameterize your model. It is important to be able to justify these using some sort of existing data – and to cite this data. Remember that this lab is designed to get you to think about the model building process, and not necessarily about the answer. Feel free to contact me with any questions.

Discussion Board Questions (20 points):
What role(s) does the professional environmental scientist have in the rational discourse of unconventional oil and gas development through hydrofracking? When considering options for your posting on the discussion board, consider (1) personal and political biases, and (2) dispute prevention and conflict resolution.

Week 4: Technology Adoption for Public Health: Arsenic in Bangladesh
Case Study Briefing report

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc2: Analyze the role of science and technology in shaping diverse fields of study over time.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
- Grad4: Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

Introduction:
In the 1970s, public health efforts to reduce the morbidity and mortality of waterborne disease in Bangladesh focused on providing groundwater as a safe drinking water source. This resulted in the "Tubewell Revolution" and in a very short time period, the entire population of Bangladesh switched from drinking surface water to groundwater. At the time, this was heralded as a public health triumph but twenty years later, it came to light that the groundwater in this region is heavily contaminated with naturally occurring arsenic and has led to the world's largest mass poisoning event. In this lecture, we will i) discuss the interplay of factors that led to the current arsenic crisis, ii) the role of epidemiology in setting drinking water regulatory limits for arsenic, and iii) challenges in providing "safe water" in Bangladesh. Dr Molly Kile is an assistant professor in the College of Public Health and Human Sciences at Oregon State University (http://health.oregonstate.edu/people/kile-molly). She is an environmental epidemiologist whose research focuses on understanding how exposure to chemicals in the environment influences human health with a particular focus on maternal-child health. She has been involved in research on the health effects of arsenic in Bangladesh for the past ten years and has studies that look at the effects of arsenic on skin cancer, type 2 diabetes, reproductive health and child neurodevelopment.

Background Material:
Video: ON the Frontlines of Public Health:
http://synergies.oregonstate.edu/2013/health-effects-of-arsenic-exposure-from-drinking-contaminated-water/

Background Readings (4):
1. Mead (2005) Arsenic: In Search of an Antidote to a Global Poison. *Env Health Perspective.*113(6): A377-386.
2. UNICEF. Bangladesh National Drinking Water Quality Survey of 2009. Focus on pages 1-9, 159-160. (Available free online at: http://www.unicef.org/bangladesh/BNDWQS_2009_web.pdf)
3. Water Supply Options:
http://phys4.harvard.edu/~wilson/arsenic/conferences/Feroze_Ahmed/Sec_3.htm
4. US EPA Human Health Risk Assessment page: http://www.epa.gov/risk/health-risk.htm provides additional details on the process of conducting chemical risk assessments.

Case Study Assignment (50 points):
Create a Briefing Report on the arsenic crisis in Bangladesh, summarizing the main factors that led to the crisis and recommendations for future remediation. See "Briefing Report Guidelines" document for instructions.

Discussion Board Questions (20 points):
In this module, we have examined the case of technology adoption in a developing nation to enhance the delivery of potable drinking water and reduce health risks. However, as is often the case, local customs and beliefs create barriers to adoption and unanticipated consequences, or wicked problems, which require creative solutions. What would you do in order to reduce the possibility of such unanticipated consequences and improve the potential to adopt new practices?"

Week 5: Global Implications of Climate Change
Predictive Modeling Case Study using Daisyworld

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc2: Analyze the role of science and technology in shaping diverse fields of study over time.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues using predictive modeling as a tool.
- Grad4: Articulate original thinking and solve case studies in the field of humanitarian engineering, science and technology.

Introduction:
Global climate change is one of the most pressing and controversial issues of our times. One thing is for certain: the climate will change with or without the effect of humans. However, anthropogenic activities have greatly accelerated the "natural" rate of change and tipped the homeostasis of global material and energy cycles, perhaps irrevocably. Whether or not change is reversible is still to be determined, and a multitude of scientists around the globe are working diligently to try to determine cause and effect of various alternative solutions. This week we will be looking at global climate change issues, with an emphasis on the global energy budget and how anthropogenic forcing is changing this budget, using a simple simulation model referred to as DaisyWorld. Please take a look at the background slides and the short video overview on the Gaia hypothesis as well as the background readings to gain a little more familiarity on this rather large and well-studied topic before proceeding with the DaisyWorld case study and discussion board assignments.

Background Materials (3):
1. *The Global Energy Budget, Carbon Cycle, and Climate Change*
PDF presentation attached

2. *James Lovelock Explains the Gaia Hypothesis:*
https://www.youtube.com/watch?v=44yiTg7cOVI

3. *Geochemical Carbon Cycle and Global Climatic Stability:*
http://www.snowballearth.org/week8.html

Background Readings (3):
1. *Gaia Hypothesis:*
http://www.environment.gen.tr/gaia/70-gaia-hypothesis.html

2. *Gaia Hypothesis:*
http://en.wikipedia.org/wiki/Gaia_hypothesis

3. *The Historical Ecology of Global Climate Change:*
http://www.environment.gen.tr/climate-change/666-the-historical-ecology-of-global-climate-change.html

Case Study Assignment (50 points):
Your case study is focused on the Gaia hypothesis and modeling how changes in planetary albedo and incident radiation affect physical and biological characteristics of Earth. To do this, you will be working with an online model called DaisyWorld. You can find this model at the website below:

http://gingerbooth.com/flash/daisyball/

Please answer the following questions clearly and concisely. Feel free to take screenshots of the model in order to answer questions. You can place your cursor on the plots to read point values. You may also need to do some reading outside of the website in order to fully answer the questions. There are many excellent online resources on these topics that you should utilize – use Google and your good judgment.

1. Using your knowledge of planetary albedo, how do you think albedo differed from today during the Ice Ages? How would this have affected surface temperatures on the Earth? Large volcanic events have been known to lower global surface temperatures. Why is this?

2. Research past atmospheric CO2 levels during glacial and interglacial periods. What pattern do you find? How does this relate to the global energy budget and greenhouse effect?

3. Using the DaisyWorld Classic model, Run DaisyWorld with the three scenarios: 2 - black and white, 1 - black only, and 1 - white only. Describe what you see in each scenario. Notice for what range of luminosity the daisies manage to control the planet temperature in each scenario. How do these ranges differ between the scenarios? Why do you think this is? Why can a single color of daisy control the planet temperature?

4. Run the DaisyWorld Classic model with 6, 10, and 16 colors. What do you observe in the behavior of the daisy color composition? How does adding more colors affect the surface temperature?

5. By clicking the "Advanced" button, you can control model parameters. You can also use a different algorithm to more realistically model global albedo using the DaisyBall 3D logic. Create a scenario of your own, list the parameters which you used, and describe the model output.

Discussion Board Questions (20 points):
The Gaia hypothesis asserts that Earth is a living organism with the ability to regulate its own environment. Do you agree or disagree with this hypothesis and why? Please cite at least two references when making your argument for or against the Gaia hypothesis.

Week 6: Building Engineering Partnerships through Stakeholder Engagement
Term Project: Stakeholder Engagement Posters

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.

- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.

- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology.

- Grad4: Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

- Identify the role of stakeholders in the multidisciplinary decision making process.

- Demonstrate the ability to clearly organize information around a multidisciplinary issue.

Introduction:
Humanitarian Engineering is intricately woven within the public policy arena and oftentimes decisions are made based upon stakeholder consensus rather than scientific or engineering evidence alone. It is important for engineers to be attuned to the varied interest groups with a vested stake in the issue at hand and to work with policy makers to foster stakeholder involvement from the onset of the decision making process.
The assignments this module are designed to provide you with a better understanding of the stakeholder engagement process and the role of stakeholders in humanitarian engineering decision-making.

Background Materials (3):
What is Stakeholder Engagement?
https://www.youtube.com/watch?v=VHGTsEwbOJY

Stakeholder Engagement Poster Guidelines (document attached)

Example posters (document attached)

Background Readings (1):
Stakeholder Engagement A Good Practice Handbook for Companies Doing Business in Emerging Markets:
http://www.scribd.com/doc/16903354/Stakeholder-Engagement-A-Good-Practice-Handbook-for-Companies-Doing-Business-in-Emerging-Markets-May-2007#fullscreen

Term Project Deliverable 3: Stakeholder Engagement poster (100 points) (due no later than Monday of Week 7):

1) Please review the background material, the Stakeholder poster guidelines document, and the assigned reading before you begin your stakeholder poster assignment. The document provides guidelines for creating an effective poster presentation and the readings set the context for the role of stakeholders in the policy making arena.
2) Use the local humanitarian engineering topic of interest that you selected for your term project assignment as the basis for your poster presentation.

3) Using PowerPoint, construct a concise poster which describes the humanitarian engineering issue of concern, identifies the major stakeholders involved, and delineates their positions and interests in the issue of concern. Example posters are provided in the Week 6 file folder (file: Allposters2013).

Metrics: Posters will be graded based upon the following criteria (100 points)

1) Organization and flow (30 points)
2) Stakeholder representation, i.e. are positions stated clearly? (30 points)
3) Graphics (30 points)
4) Bibliography (10 points)

Discussion Board Questions (20 points) (no later than Monday of Week 7):

1) Post a brief overview of the stakeholder engagement issue being addressed to the discussion board (5 points)
2) Upload your poster to the discussion board, select a specific role as a stakeholder and describe your role and position on the issue at hand (5 points)
3) Query two students on the discussion board regarding their stakeholder positions (5 points)
4) Respond to at least two questions from students from the stakeholder viewpoint (5 points)

Week 7: Equity and Resource Allocation: Bottled Water

Case Study Questionnaire or Briefing Report

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues.

Introduction:

Bottled water is big business around the globe. Tap water comes directly from pipes, whereas bottled water may be likened to mining, which also requires resource extraction and processing. When you consider the secondary resources that are expended in order to bottle drinking water, the energy and environmental costs are huge. There are multiple socioeconomic as well as human and environmental dimensions to the bottled water controversy, which will be examined in depth in the current module. Dr. Todd Jarvis serves as Interim Director of the Institute of Water and Watersheds at Oregon State University. Dr. Jarvis has nearly 30 years of experience as a hydrogeologist specializing in groundwater development and source water protection with emphasis in fractured rock and karst terrains. With professional licenses as a Certified Engineering Geologist, Certified Water Rights Examiner, and Certified Mediator, his interests include transboundary aquifers, water conflict resolution, and education in water

science and policy. Dr. Jarvis is also a member of the faculty of the OSU Water Resources Graduate Program in Water Resources Engineering, Water Resources Science and Water Resources Policy and Management, and serves on the Oregon State Board of Geologists Examiners as an appointee by Governor Kitzhaber.

Background Materials (4):
Look Beneath the Surface:
https://www.youtube.com/watch?v=XdwC03n2whQ

Cascade Locks Town Hall meeting:
https://media.oregonstate.edu/media/public+participation+example/0_wv57dv82

Bottled Water Documentary:
FLOW: For the Love of Water
https://vimeo.com/99141271

Anti-Bottled Water Perspective:
https://www.youtube.com/watch?v=Se12y9hSOM0

Background Readings (4):
1. Bottled Water in Oregon - http://water.oregonstate.edu/sites/default/files/bottled_water_v5.pdf
2. Gleick, P. and Cooley, H. 2012, Bottled Water and Energy: *World's Water*, volume 7, pp. 157- 164, Island Press.
3. Gleick, P. 2006, Bottled Water: An Update: *World's Water*, volume 5, pp. 169- 174, Island Press.
4. http://www.oregonlive.com/environment/index.ssf/2015/01/bottled_water_wars_nestles_lat.html

Case Study Assignment (50 points):
Go shopping for Bottled Water (**if it is not possible to purchase bottled water in your area, then please complete a briefing report instead**)

Go to the bottled water section of your favorite store.

1. What store did you go to and how many brands did they have?

2. Fill in a chart like the one below for each brand by converting the shelf price to the price per gallon.

BRAND	**TYPE (e.g. Spring, distilled, mineral)**	**ORIGIN**	**CONTAINER (e.g. Glass, plastic, Aluminum**	**SIZE**	**PRICE**	**PRICE/GAL**
Ice Mountain	*Spring*	*Greenwich, CT*	*Plastic*	*Gallon*	*.99*	*$**0.99**/gal*

3. Why is there such a disparity in price? Does price seem to be correlated with any of the variables in your chart?

4. How much is gasoline selling for in your area? Which is more expensive per gallon, gasoline or bottled water? Does this make sense?

5. How many of your brands were in plastic bottle? Glass? Which is more easily recycled?

6. Search the web and answer the following questions: Are there any risks contaminants from plastic bottles? If yes, what are they? Having trouble? Try this link:
http://www.pbs.org/frontlineworld/stories/bolivia/waterbottle.html

7. Do you drink bottled water? Why or why not? Which brand do you like? Why?

8. Visit the website of your favorite brand of bottled water. Can you find a listing of the water chemistry? If so, print out and add to this assignment. If not, why do you think you cannot find the listing?

Discussion Board Questions (20 points):
After viewing the Cascades Locks public meeting video and FLOW, what are the socio-economic issues beyond "just the water" when it comes to the controversy over bottled water? Can you locate any information rebutting the anti-bottled water rhetoric? What are their arguments? Do they "hold water"?

Week 8: Mapping Spatial Vulnerability: Watershed Analysis
Spatial Assessment Case Study using Google Earth

Learning Outcomes:

- Bacc2: Analyze the role of science and technology in shaping diverse fields of study over time.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues.
- Learn how to test and evaluate alternative assessment tools in the field of humanitarian engineering, science and technology.

- Learn how to effectively manage humanitarian engineering, science and technology issues from a spatial perspective.

Introduction:
With the introduction and development of sophisticated Geographic Information Systems (GIS) over the past few decades, environmental decision-making from a spatial perspective has become increasingly popular and widely used. Models have ranged from simplistic to elaborate at various levels of spatial and temporal scales. Watershed assessment for both quality and quantity has been a primary focus for spatial analysis around the globe and you will have firsthand experience this week with a simple spatial watershed assessment. This will give you practice with data layers and databases available for public use within an open source system that is available free of charge, Google Earth. As more and more scientists and engineers share their results, a huge repository of spatial data is being build for shared use. The possibilities are endless and collaboration is key. You will explore an open source GIS program called Envision that was developed at Oregon State University by John Bolte, professor of Biological and Ecological Engineering. You will also explore Data Basin, another online spatial tool developed by another BEE professor, Dominique Bachelet, and a team of scientists. Enjoy the explorations and the case study this week and please feel free to ask any pertinent questions that arise.

Background Materials (4):
Envision model:
1. *Envision Tutorial Part 1: Developing Alternative Futures Models using Envision*
   http://envision.bioe.orst.edu/Documents/Tutorials/ENVISION-Tutorial-Part1.pdf
2. *Envision Tutorial Part 2:*
   http://envision.bioe.orst.edu/Documents/Tutorials/ENVISION-Tutorial-Part2.pdf

Data Basin model:
3. *Navigating the Data Basin Platform: A Guided Tour*
   https://www.youtube.com/watch?t=968&v=bgQnhTXGHCA
4. *Powered by Data Basin: Supporting the LCCs with Spatial Data, Analytical Tools, and Social Networks*
   https://www.youtube.com/watch?v=8IKSUlCsGtM

Background Readings (4):
1. *Modeling Biocomplexity - Actors, Landscapes and Alternative Futures*
   http://envision.bioe.orst.edu/Documents/ModelingBiocomplexity_Published.pdf
2. *Envision – A Quick Summary*
   See attached document: Envision-QuickSummary.docx
3. *Conserving Biodiversity: Practical Guidance about Climate Change Adaptation Approaches in Support of Landuse Planning*
   https://d2k78bk4kdhbpr.cloudfront.net/media/publications/files/Schmitz_et_al._2015.pdf
4. *Using GIS for Exposure Assessment in Environmental Epidemiology Studies*
   See attached document: GIS for Exposure Assessment in Env Epi.pdf

Case Study Assignment (50 points):
See attached overview slides: *Spatial Analysis in Google Earth*
See attached document: *Google Earth assignment.docx*

Discussion Board Questions (20 points):
After reviewing the Envision and Data Basin backgrounders and readings, and completing the Google Earth

case study assignment, you now have some familiarity with open source spatial data management tools, if you were not familiar with these tools already. Based on your assessment of these tools, provide a summary table highlighting the benefits, shortcomings and best uses of the three alternative modeling approaches presented. Do you prefer a particular spatial modeling tool/approach? If so, which one do you prefer and why? Don't limit your choice to the tools presented if you prefer another alternative spatial modeling tool. How do you think that temporal variability may best be captured in a spatial model? What are the main points from this week's readings and assignment that you might share with a policymaker in charge of selecting an approach to managing water quality in a highly developed watershed?

Week 9: Cultural Norms and Nutrient Cycling
Nitrogen Footprint Case Study using N-print

Learning Outcomes:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support
- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology.
- Grad4: Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

Introduction:
Small quantities of nitrogen are essential for living things, but too much nitrogen from non-point sources such as land use and agriculture is harmful to ecosystems, animals, and humans. Connecting these nitrogen sources to their impacts, and quantifying them in ways that people can understand helps to address major problems like air quality, and problems we see in waterways such as eutrophication and coastal hypoxia. Also, by looking at the social and economical impacts of nitrogen pollution, we can help people to recognize how it might be affecting the benefits we all get from healthy ecosystems, what we call "ecosystem services," such as clean air and safe drinking water.
Jana Compton is a research ecologist focusing on biogeochemistry at the Western Ecology Division of U.S. EPA's Office of Research and Development in Corvallis. Jana received her MS and PhD in forest ecosystems and biogeochemistry at the University of Washington. Her research at EPA focuses on element cycling and biogeochemistry in order to better understand and manage the effects of human actions on water quality and terrestrial and aquatic ecosystems. She currently leads a national project on integrated management of reactive nitrogen in EPA's Sustainable and Healthy Communities research program.

Background Materials (2):
1. Video attached:
Just Enough of a Good Thing: Nitrogen and Ecosystem Services

2. Video: Your Invoice:
https://vimeo.com/16961590

Background Readings (2):
1. Compton, et. al. Ecosystem services altered by human changes in the nitrogen cycle: a new perspective for US decision making. Ecology Letters, (2011) 14: 804–815.

2. Costanza, et. al. The value of the world's ecosystem services and natural capital. 1997. Nature 387 (253-260).

Case Study Assignment (50 points):
Based on the background material and readings in this module, create a Briefing Report that describes to decision-makers the value of the ecosystem services provided by nitrogen cycling. How do human activities affect the services provided by nature? What types of management options could be implemented to maintain the flow of ecosystem services?

Discussion Board Questions (20 points):
Estimate and describe your nitrogen footprint using the following link:
http://www.n-print.org/sites/n-print.org/files/footprint_java/index.html#/home
How does your footprint compare to the average in your region? Globally? How would you reduce your footprint?

Week 10: Term Projects
Term Project Final Presentation, Discussion, and Evaluations
Term Project Final Report

Learning Outcomes

Your term project for HEST 412/512 is designed with the following learning outcomes in mind:

- Bacc1: Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
- Bacc3: Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.
- Grad1: Learn to evaluate and assess contemporary issues in humanitarian engineering, science and technology.
- Grad2: Learn to apply systems thinking to the basic concepts of biological, physical, ecological, and social sciences that form the underpinnings of humanitarian engineering, science and technology.
- Grad3: Learn how to effectively address the interdisciplinary nature of humanitarian engineering, science and technology issues.
- Grad4: Articulate original thinking and create effective briefings and presentations in the field of humanitarian engineering, science and technology.

Introduction

The term project is a way to share humanitarian topics of timely local interest. The ecourse format promotes sharing and expansion of local knowledge to various corners of the globe, thereby broadening the perspectives of participants. This allows for interactive participation among classmates, regardless of location.

When choosing your topic, you might ask yourself a few of the following questions:

- What attracted you to the study of humanitarian engineering?
- Was there a specific issue or concern that caught your attention?
- What do you perceive as the main challenges or barriers to entry in your region for implementing humanitarian engineering projects?
- How does the cultural, environmental, economic, and/or political setting influence decision-making in your geographical area?

Term Project Deliverables

Deliverable 1 Term Project Topic Selection and Discussion (50 points)

Once you have selected a topic, the first task is to share your selection via the discussion board during the first week of class no later than **Friday of Week 1** and respond to at least two other students about their topics no later than **Monday of Week 2**.

In a couple of paragraphs, please describe your topic and why you have selected it as well as the focus of your term project in a paragraph or two. Please be sure to give useful feedback to your classmates – Is the topic clear? Is it of interest? Provide suggestions to improve the focus if needed.

Deliverable 2 Term Project Proposal and Concept Map (50 points)

Incorporate the feedback you received from your classmates and build your selected topic into a project proposal. Provide a backdrop for the topic, i.e. why it is a timely issue and how you will focus your project. For example, this may be part of your ongoing research that you would like to share with the class. Or you may have a hobby or particular interest you would like to explore further. The parameters are broad and you have a lot of flexibility regarding your topic selection. It would be preferable to highlight an issue that is local to your region so that others can increase their global understanding. Term project proposals should be two to three pages of text in length. Graphics and visuals may add to the minimum length as needed. Term project proposals and concept maps are due on **Monday of Week 3.**

Deliverable 3 Stakeholder Engagement Poster (100 points)

Assignment details are provided in the Stakeholder Engagement module document and folder for Week 6. Posters are due on **Monday of Week 7.**

Deliverables 4 and 5 Term Project Presentation and Grading (150 points)

The final project presentation offers another way to deliver your message in addition to your report. It is a way to explore presentation options: standard PowerPoint or alternatives such as Prezi with audio; video with options such as a TED talk format or news report format; video and / or multimedia. All are acceptable options and others you are familiar with. Be creative! Explore new avenues to present your findings and to help you get more comfortable showcasing your work and/or interests. Presentations should take 8-10 minutes total. Guidelines for grading your fellow peers are given in Table 2 below. Final term project presentations are due **Friday of Week 10** and grading of two peer/student presentations are due **Monday of Week 11**.

Deliverable 6 Term Project Report (100 points)

The written project report should provide a synopsis of the environmental topic that the student has chosen to investigate. The report should include a good background and history of the humanitarian engineering, science and technology issue under investigation as well as the socio-political setting. It should also include a discussion on the stakeholders / special groups of interest, their viewpoints and suggestions for common ground solutions. Discuss the physical and geographic extent of the issue at hand. Is it unique to place or is this a more general issue experienced in other parts of the world? Discuss potential solutions and next steps to be taken. The term project report should be a minimum of 1250 words plus references that develop and sustain a critical perspective using evidence as support and a multidisciplinary approach, and not exceed 20 pages including graphics. The main purpose is to learn how to effectively address the interdisciplinary nature of humanitarian engineering and to think about effective ways to make change. Grading guidelines for term project reports are given in Table 2 below. Final term project reports are due **Friday of Week 11**.

Graduate students will also be expected to complete an additional term project assignment worth 200 points, for a total of 1200 points. The project is described in the document Termprojectmoduletemplate_grad. Graduate students will create a case study module based on their term project and employ a modeling tool to arrive at potential solutions and address specific questions.

Discussion Board Questions (20 points):
Post your term project presentations and engage your fellow peers in a lively discussion about their presentations: Why did you choose your project topic? What are the main barriers in your region to implementing humanitarian engineering projects? How might you improve the technology adoption process? Did you have any big surprises while working on your project? Other questions of interest?

Table 1. Term Project Deliverables Summary (450 points total)

Deliverable	Due date	Points
1 Topic Selection and Discussion	Monday of Week 1	50
2 Project Proposal and Concept Map	Monday of Week 3	50
3 Stakeholder Poster	Monday of Week 7	100
4 Project Presentation	Friday of Week 10	100
5 Peer Evaluation and Grading	Monday of Week 11	50
6 Project Report	Friday of Week 11	100

Table 2. Grading Scheme for Term Project Reports and Presentations

	D	C	B	A	Grade	Comments
Organization						
Flow of presentation **20**	Audience cannot understand presentation because there is no sequence of information.	Audience has difficulty following presentation because student jumps around	Student presents information in logical sequence which audience can follow	Student presents information in logical, interesting sequence which audience can follow		
Graphics **20**	Student uses superfluous graphics or no graphics	Student occasionally uses graphics that rarely support text and presentation	Student's graphics relate to text and presentation	Student's graphics explain and reinforce screen text and presentation		
Mechanics **20**	Presentation had four or more spelling errors or grammatical errors	Presentation had three misspellings and/or grammatical errors.	Presentation had no more than two misspellings or grammatical errors.	Presentation had no misspellings or grammatical errors		
Content						
Effectiveness **20**	Student did not convince audience of their position	Student made a few convincing points	Student made several convincing arguments for his/her position	Student convinced the audience of the importance of /her position		
Substance **20**	The points made were not well supported	The student showed minimal support for points	Most information was well supported by data or anecdotal information	Student made good, well substantiated points throughout the presentation		
				Total Points:		

Overall Comments:

Advice for improvement:

Course Policies

Discussion Participation

Students are expected to participate in all graded discussions. While there is great flexibility in online courses, this is not a self-paced course. You will need to participate in our discussions on at least two different days each week, with all posts due by the following Monday.

Incompletes

Incomplete (I) grades will be granted in emergency cases (usually only for a death in the family, major illness or injury, or birth of your child), and if the student has turned in 80% of the points possible (in other words, usually everything but the final paper). If you are having any difficulty that might prevent you completing the coursework, please don't wait until the end of the term; let me know right away.

Guidelines for a Productive and Effective Online Classroom
Students are expected to conduct themselves in the course (e.g., on discussion boards, email) in compliance with the university's regulations regarding civility.

Civility is an essential ingredient for academic discourse. All communications for this course should be conducted constructively, civilly, and respectfully. Differences in beliefs, opinions, and approaches are to be expected. In all you say and do for this course, be professional. Please bring any communications you believe to be in violation of this class policy to the attention of your instructor.

Active interaction with peers and your instructor is essential to success in this online course, paying particular attention to the following:

- Unless indicated otherwise, please complete the readings and view other instructional materials for each week before participating in the discussion board.
- Read your posts carefully before submitting them.
- Be respectful of others and their opinions, valuing diversity in backgrounds, abilities, and experiences.
- Challenging the ideas held by others is an integral aspect of critical thinking and the academic process. Please word your responses carefully, and recognize that others are expected to challenge your ideas. A positive atmosphere of healthy debate is encouraged.

Statement Regarding Students with Disabilities
Accommodations are collaborative efforts between students, faculty, and Disability Access Services (DAS). Students with accommodations approved through DAS are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through DAS should contact DAS immediately at 541-737-4098.

Accessibility of Course Materials
All materials used in this course are accessible. If you require accommodations please contact Disability Access Services (DAS).

Additionally, Canvas, the learning management system through which this course is offered, provides a vendor statement certifying how the platform is accessible to students with disabilities.

Expectations for Student Conduct
Student conduct is governed by the university's policies, as explained in the Student Conduct Code.

Academic Integrity

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit Student Conduct and Community Standards, or contact the office of Student Conduct and Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.
b) It includes:
    i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.
    ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
    iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).
    iv) TAMPERING - altering or interfering with evaluation instruments or documents.
    v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.
c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

Conduct in this Online Classroom

Students are expected to conduct themselves in the course (e.g., on discussion boards, email postings) in compliance with the university's regulations regarding civility.

Tutoring

NetTutor is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Students connect to live tutors from any computer that has Internet access. NetTutor provides a virtual whiteboard that allows tutors and students to work on problems in a real time environment. They also have an online writing lab where tutors critique and return essays within 24 to 48

hours. Access NetTutor from within your Canvas class by clicking on the NetTutor button in your course menu.

OSU Student Evaluation of Teaching

Course evaluation results are extremely important and are used to help me improve this course and the learning experience of future students. Results from the 19 multiple choice questions are tabulated anonymously and go directly to instructors and department heads. Student comments on the open-ended questions are compiled and confidentially forwarded to each instructor, per OSU procedures. The online Student Evaluation of Teaching form will be available toward the end of each term, and you will be sent instructions via ONID by the Office of Academic Programs, Assessment, and Accreditation. You will log in to "Student Online Services" to respond to the online questionnaire. The results on the form are anonymous and are not tabulated until after grades are posted.