**ENVS 195: Sustainability Science**

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University of Vermont, Fall 2011, 3 credits, Tuesdays and Thursdays, 2:30– 3:45pm

Office Hours: By appointment – please call Sue Bean at 656-4055 to arrange for an appointment

*Overview:*

This course will consider the emerging discipline of sustainability systems research from an integrative natural and social science perspective. We will start off with a study of carrying capacity in ecological systems and move on to theories of ecological resilience, adaptation and restoration. Engineering-oriented approaches to sustainability such as industrial symbiosis, life cycle analysis and product-take-back will also be considered. The course is predicated in natural science methods but considers social and humanistic intersections of natural processes as well.

*Readings:*

Bell, Simon and Stephen Morse, *Sustainability Indicators; Measuring the Immeasureable* (Earthscan, 2008), ISBN: 978-1844072996

Several readings will be available via E-reserve for you to access through the UVM library web site (you will need to click through the course reading list on the library e-reserve web site and access these readings as pdf files which will be accessible with your UVM username and password).

*Assignments and Grade:*

1. Mid-term Exam – 25%
2. Group project on sustainability – 30%
3. Final Exam – 35%
4. Class participation 10% (evaluated through class discussion engagement)

The exams will all be multiple choice

Group project: You will work in groups of 5 each and receive a grade which will be collective. However, to avoid free-rider problems, I will ask for a break-up of assigned tasks undertaken by each member of the group and make any adjustments based on the output for that task in the group project.

Project: Choose a consumer product of that is widely used and which has some potential alternatives for use and prepare a general sustainability assessment for the product and at least one of its alternatives. Where possible research existing literature on life cycle analysis and other measures of sustainability as well as the development impact of choosing one product versus the other. Prepare a report which should include the following:

1. Introduction and rationale for choosing the product for this assignment
2. A material assessment of the product and its alternatives (this can be presented as a table for the product and its alternative). List the raw materials which go into making the product and where possible a list of where they come from
3. An evaluation of the environmental and social impacts related to this material assessment with a particular focus on potential for recycling or other factors which may impact its sustainability of use.
4. A discussion of corporate practices and any other relevant information related to the social and political aspects of the product and its prevalence.
5. Your recommendations for consumers and policy-makers regarding product choice based on this preliminary sustainability assessment.

**Schedule**

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| Date | Topic | Reading |
| August 30 | Introduction and course objectives | No readings |
| September 1 | Scale and sustainability | Film: “The Human Footprint” National Geographic 2010 release  Reading: William Clark and Nancy Dickson, “Sustainability Science: the Emerging Research Program,” National Academies, 2003:  Article linked below;  <http://www.pnas.org/content/100/14/8059.full> |
| September 6 | History of SS | Goerner et al. “The New Science of Sustainability.” 2008 (Triangle Center for Complex Systems, Chapel Hill NC).  Williams , George “Gaia, Nature worship and Biocentric Fallacies.” The Quarterly Review of Biology, December 1992. |
| September 8 | Footprints | Film viewing: National Geographic Special |
| September 13 | Metrics of Sustainability on Campus | Guest lecture by Gioia Thompson |
| September 15 |  | No Class – Makeup class on Sept 19th evening |
| September 19:  7pm to 8:15pm | Measuring Sustainability 1 | Bell and Morse, Chapter 1 and 2 |
| September 20 | Measuring Sustainability | Bell and Morse , Ch. 4 and 5  Fiala, “Measuring sustainability and why ecological footprints are bad economics,” *Ecological Economics*, 67, 2008 |
| September 22 | Fisheries | Worm, Boris et al. “Rebuilding Global Fisheries,” *Science* July 31, 2009. |
| September 27 | Forests | Turner et al, “The emergence of land change science for global  environmental change and sustainability,” *PNAS,* December 2007.  Linked at:  <http://www.pnas.org/content/104/52/20666.full.pdf+html> |
| September 29 | Farm | Rasmussen etal., “Long-Term Agroecosystem Experiments: Assessing Agricultural Sustainability and Global Change,” Science 30 October 1998. |
| October 4 | Adaptation and Sustainability | Guest Lecture by Amy Seidel |
| October 6 | Health and Sustainability | Rapport, “Sustainability Science: An Eco-health perspective,” *Sustainability Science,* No. 2, 2007 |
| October 11 | Biogeochemical Cycles | Schidlowski, Manfred, “Quantitative Evolution of Global Biomass” in Schneider et al eds, Scientists on Gaia, MIT Press, 1990.    Linton, Jamie, “Is the hydrological cycle sustainable?” Annals of the Association of American Geographers, September 2008 |
| October 13 | Engineering sustainability and  biotechnology | Capra, “The Hidden Connections” Chapter on Biotechnology, Doubleday, 2007.  Gaziulusoy, “A conceptual systemic framework… for sustainable technology development,” *Civil Engineering and Environmental Systems,* December 2008. |
| October 18 | Theories of systems ecology | Waring, “New evolutionary foundations: Theoretical requirements for a science of sustainability,” *Ecological Economics*, 69, 2010.  Ness et al, “Structuring Problems in Sustainability Science,” *Geoforum,* May 2010. |
| October 20 |  | Midterm Exam in Class |
| October 25 | Sustainability Assessments (SA) | Readings on Blackboard Course Materials |
| October 27 | Methods for SA | Readings on Blackboard Course Materials |
| November 1 | Methods for SA | Bell and Morse, Chapter 6 |
| November 3 | Business and Ethics of Sustainability | Edwards, Andres, “The Sustainability Revolution.” New Society, 2009.  Allenby, “Macro-ethical systems and sustainability science,” *Sustainability Science*, 1, 2006 |

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| November 8 | Engineering sustainability and  biotechnology | Capra, “The Hidden Connections” Chapter on Biotechnology, Doubleday, 2007.  Gaziulusoy, “A conceptual systemic framework… for sustainable technology development,” *Civil Engineering and Environmental Systems,* December 2008. |
| November 10 | Corporate examples | Corporations and Ecological Sustainability  <http://classes.uleth.ca/200703/mgt3031e/Shrivastava%20-%20Sustainability.pdf>  Browse the WBCSD web site: <http://www.wbcsd.org/> |
| November 15 | Material science and SS | Gordon et al, “Metal stocks and sustainability,” *PNAS*, January, 2006:  PNAS: Metal stocks and sustainability |
| November 17 | Cities and sustainability | Bell and Morse, Chapter 3  Cities, neighborhoods sustainability:  <http://www.cirano.qc.ca/pdf/publication/2009s-02.pdf> |
| November 22 | Thanksgiving – no class | Ness et al, “Structuring Problems in Sustainability Science,” *Geoforum,* May 2010. |
| November 24 | Thanksgiving - no class | Waring, “New evolutionary foundations: Theoretical requirements for a science of sustainability,” *Ecological Economics*, 69, 2010. |
| November 29 | Future of Sustainability Science | Beachy, Roger, “Science and Sustainability: The Emerging Consensus,” *Bioscience*, June 2010  Bell and Morse, Chapter 7 |
| December 1 | Project presentations | Read each other’s project submissions |
| December 6 | Project presentations | Read each other’s project submissions |
| December 12th | Final Exam | Time: 1:30 to 3:30 am in Stafford 101 |