

SUST 301/ENST 311 Practicum in Sustainability: Reducing Dickinson's Carbon Footprint, Fall 2012 Syllabus

Instructor: Neil Leary, Center for Sustainability Education, Dickinson College
Office: Kaufman Hall, Room 195
Office tel. no.: 245-1954
E-mail: learyn@dickinson.edu
Office Hours: MW, 10:30 – 11:20 and by appointment

Class Meetings: W 9:30-10:20 and lab on F 1:30 – 5:00 in Kaufman 178

Course Description: Dickinson College and more than 600 other colleges and universities have made a commitment to advance sustainability in higher education by reducing emissions of greenhouse gases that contribute to global climate change. Students in the course will work as a team to evaluate the climate action plans of Dickinson and other institutions, evaluate additional measures that could be taken to meet Dickinson's target of zero net emissions by 2020, develop recommendations for action, and present their recommendations to the Dickinson community and senior officers of the college. To place their analyses and recommendations in context, students will be introduced to climate change science and policy and will explore the implications of climate change for environmental, social and economic sustainability. Students will gain practical skills for climate action planning and team work. They will also build literacy about sustainability and climate change.

Service Learning/Community-Based Research: SUST 301 is a Service Learning course that features a community-based research (CBR) project in which students work together as a consulting team to assist Dickinson College in meeting its climate neutrality commitment. Community-based research is a form of research that is collaborative between a community and a team of researchers and serves a need of the community. For our CBR project, the community that we will serve is the Dickinson College community, collaborating primarily with the Office of Campus Operations. The need that we will fill is the collection, analysis, and communication of information to help support decision-making by College officers about greenhouse gas (GHG) emission reduction strategies. Your participation as a student researcher in this authentic problem-solving project will help you attain course learning goals.

Learning Goals: Students who successfully complete the course will be able to:

1. Assess and explain connections between campus operations, climate change and sustainability;
2. Critically analyze climate action plans of colleges and other institutions;
3. Evaluate options for reducing greenhouse gas emissions and advancing sustainability goals using environmental, financial and other criteria;
4. Work effectively as a member of a team to develop recommendations for climate change action and sustainability that are supported by credible evidence, good analysis, and well reasoned arguments; and
5. Communicate recommendations effectively to community members and decision makers.

Books and Other Readings: Required reading assignments are noted on the course schedule and should be completed prior to the class for which they appear. Readings will be posted on Moodle, except for selections from the required books. In many cases additional materials are listed as 'further reading'. These are not required, but are good sources for students looking for deeper understanding.

Two books are required for the course and are available from the college bookstore:

- A. Rappaport and S. H. Creighton, 2007. *Degrees that Matter, Climate Change and the University*. MIT Press, Cambridge MA. (Abbreviated as R&C in course schedule).
- A. Lovins and the Rocky Mountain Institute, 2011. *Reinventing Fire, Bold Business Solutions for the New Energy Era*. Chelsea Green Publishing Co., White River Junction, VT.

You may also find the following resources useful for the course and/or your course project:

- W. Simpson, 2009. *Cool Campus! A How-To Guide for College and University Climate Action Planning*. Association for the Advancement of Sustainability in Higher Education. PDF of the guidebook and wiki version of the guide can be accessed at <http://www.aashe.org/wiki/climate-planning-guide>.
- *Energy Star Building Upgrade Manual*, 2008. U.S. Environmental Protection Agency, Office of Air and Radiation, Washington, DC. The manual outlines a process for developing a comprehensive energy-management strategy for reducing energy use in existing buildings and provides information on energy-efficient technologies. You can download the manual at: http://www.energystar.gov/index.cfm?c=business.bus_upgrade_manual.
- National Renewable Energy Laboratory (2012). *Renewable Electricity Futures Study*. Hand, M.M. et al. Golden, CO, NREL. An analysis of the extent to which renewable energy supply can meet US electricity demand over the next several decades. Can be downloaded from http://www.nrel.gov/analysis/re_futures/.
- American College and University Presidents Climate Commitment, <http://www.presidentsclimatecommitment.org/>.
- Reducing Dickinson’s Carbon Footprint, A Review of Dickinson College’s Climate Action Plan and Recommendations for Attaining Zero Net Greenhouse Gas Emissions (2011). Report of the Spring 2011 SUST 301 course. You should read the executive summary plus any chapters that are relevant to your research project. Available on Moodle.

Student Responsibilities and Grading

Your responsibilities in this class are to participate actively in the learning process, put forth the effort necessary to attain the course learning goals, complete assigned work on time, contribute to creating an environment of learning, perform your fair share of work on collaborative tasks, and adhere to a high standard of academic honesty.

Performance in the course will be graded based on the following:

Participation	10%
Short assignments	20%
Exams I & II	20%
Research project	50%

Further details are provided below. Rubrics for evaluating and grading student performance will be available on Moodle. Consult them regularly so that you are aware of expectations and the criteria by which assignments will be graded.

Participation: Students will be graded on attendance and active participation in class meetings and other events as may be assigned during the semester. Most class meetings will be run in a seminar format. Come to class prepared to discuss the readings and pose questions to your peers. Expect to be called on to respond to a question, even when you have not volunteered. Class meetings will be as good, or as bad, as we collectively make them.

Short assignments & lab assignments: There will be a number of short assignments during the semester, which are noted in the course schedule. It is possible that additional short assignments may be added during the semester. Assignments are due before the start of class of the day for which they appear in the course schedule (except lab assignments, which are to be completed during Friday lab sessions). Assignments submitted 1 class meeting late will be accepted but docked one letter grade; assignments submitted after that will not be accepted.

Mid-term exams: The first mid-term exam will be given on Friday, October 19. A second mid-term exam will be given on Friday, November 30. The exams will cover readings, lectures, class discussions and labs of the first and second parts of the semester. There will not be a final exam.

Research project: Students will work together as a consulting team to assist Dickinson College in meeting its climate neutrality commitment by researching and analyzing options for reducing Dickinson's GHG emissions, developing recommendations, and presenting them to the Dickinson community and officers of the College. The project will include both individual and collaborative work. Working with Campus Operations, we will identify research topics of interest to the College. Each member of the team will be assigned a research topic and will prepare and submit a research plan, a progress report, a draft report, and a final report. Each member will present her/his findings and recommendations. In addition, the consulting team will discuss and agree priority recommendations, and will collectively present the priority recommendations as a team. The individual and team presentations will be made at a forum at the end of the semester that will include members of the President's Commission on Environmental Sustainability (PCES) and be open to the entire Dickinson community. Further details are provided in a document titled Community-Based Research Project available on Moodle. Due dates for each component of the project are given in the schedule at the end of this syllabus (dates are subject to change).

Academic code of conduct: Students will be held accountable to the academic code of conduct as described in Dickinson's 2012-2013 Community Standards. Suspected violation of these standards will be resolved through the formal disciplinary procedures of the college. The following guidance on plagiarism and how to avoid it are excerpted from the Community Standards. The full community standards document can be downloaded from <http://www.dickinson.edu/student-life/resources/dean-of-students/content/Resources-for-Students/>.

"Plagiarism: To plagiarize is to use without proper citation or acknowledgment the words, ideas, or work of another. Plagiarism is a form of cheating that refers to several types of unacknowledged borrowing."

"Students can avoid plagiarism by following some very simple advice. Always provide clear and accurate citations for the sources that inform your work. This is an admonition that goes to the heart of your academic responsibility. Remember that almost all quotations and statistics require citations. Specific facts and ideas borrowed from others, even if expressed in your own words, also require citations. Summaries of an author's argument require citations. It is true that matters of general knowledge do not usually require citations, but when in doubt, students should provide footnotes for them. It is also true that students who rely on parents, friends or others for specific contributions to their work should acknowledge this indebtedness in a citation. And finally, please understand that paraphrasing means to summarize in your own words. The surest way to avoid plagiarism when summarizing is to write with sources and notes closed. If you cannot explain what an author argued from memory, then you probably do not understand it well enough to paraphrase."

Academic accommodations: Dickinson College makes reasonable academic accommodations for students with documented disabilities. I am available to discuss the implementation of those accommodations. Students requesting accommodations must first register with Disability Services to verify their eligibility. After documentation review, Marni Jones, Director of Learning Skills and Disability Services, will provide eligible students with accommodation letters for their professors. Students must

obtain a new letter every semester and meet with each relevant professor prior to any accommodations being implemented. These meetings should occur during the first three weeks of the semester (except for unusual circumstances), and at least one week before any testing accommodations. Disability Services is located in Biddle House. Address inquiries to Stephanie Anderberg at 717-245-1734 or email disabilityservices@dickinson.edu. For more information, see the Disability Services website: www.dickinson.edu/disabilityservices.

Schedule of Lectures, Labs, Readings and Assignments

Week 1

Aug 29 Plan of the Semester

Overview of the course, expectations and community-based research project.

Required reading (read **before** our first class meeting):

- Course syllabus
- Course Project Description
- American College and University Presidents Climate Commitment (ACUPCC), 2 pages.

Aug 31 Campus Greenhouse Gas Inventories

Why and how colleges create inventories of their greenhouse gas emissions. We will work with the Clean Air – Cool Planet calculator, a tool used by Dickinson College and many other schools for calculating campus greenhouse gas emissions.

Required reading:

- Rappaport & Creighton, ch 3, The campus inventory and climate goals, pp. 33-49.
- Dickinson's 2011 GHG Inventory
- Clean Air – Cool Planet Calculator Users Guide, pp. 1-18 and appendix 1, pp. 30-37.
- 'Introduction' and 'Spreadsheet Map' sheets of the Clean Air – Cool Planet Calculator. You will need to download the Clean Air – Cool Planet Calculator from www.cleanair-coolplanet.org. Open the calculator, which is an Excel spreadsheet, and find the tabs along the bottom labeled 'Introduction' and 'Spreadsheet Map'. Read the introduction and explore the map to become familiar with the calculator before class.

Assignment:

- GHG Inventory Lab: In class lab assignment using the Clean Air – Cool Planet Calculator.

Week 2

Sep 5 Scoping Our Community Based Research Project

We will meet with employees of the Office of Campus Operations to discuss Dickinson's Climate Action Plan, progress to date, and how our course project can help Dickinson meet its commitment to climate neutrality.

Required reading:

- Lovins, ch 1, Defossilizing fuels, pp. 1-13.
- Rappaport & Creighton, ch 1, A time for action, pp. 1-12.
- Rappaport & Creighton, ch 4, Climate actors and climate advocacy, pp. 51-74.
- Rappaport & Creighton, ch 5, Strategy and tactics for climate action, pp. 75-108.

Sep 7 Climate Action Planning on College Campuses

Introduction to climate action planning processes and strategies at colleges and universities and follow up to discussion with Campus Operations.

Required reading:

- Dickinson's Climate Action Plan
- Executive Summary, Reducing Dickinson's Carbon Footprint, 2011. Report of the Spring 2011 SUST 301 Course. Pp. 1-15.

Week 3

Sep 12 Evaluating Dickinson's Climate Action Plan

We will apply what we have learned about climate action planning to evaluate Dickinson's plan.

* Sign-up during class to pick two colleges for an assignment that is due on September 19. See September 19 for details of the assignment.

Required reading:

- Eastern Research Group, Inc., 2010. "Climate Action Planning: A Review of Best Practices." pp. 1-42.
- Rappaport & Creighton, ch 9, Planning and policies for climate change, pp. 213-242.

Assignment:

- Evaluation of Dickinson's CAP: Write an evaluation of the strengths and weaknesses of Dickinson's Climate Action Plan using the template provided on Moodle. Submit your evaluation before the start of class.

Further reading:

- Simpson, ch 2, Creating the institutional structure for your climate action plan, pp. 16-24.
- Simpson, ch 7, Setting GHG emission targets and measuring progress, pp. 102-108.

Sep 14 Town-Gown Sustainability Partnerships ([Travel to F&M in Lancaster](#))

NOTE: We will travel to Franklin & Marshall College to attend a symposium on Town-Gown sustainability partnerships, departing Kaufman Hall at **12:15 pm** and returning at approximately **6 pm**.

At the symposium we will learn how colleges and communities are partnering to advance sustainability goals. Following the symposium we will meet with F&M staff and students to learn about their climate action plan. Information about the symposium:

<http://www.pagreencolleges.org/events?eventId=479568&EventViewMode=EventDetails>.

Required reading:

- Climate Action Plan of Franklin & Marshall College. F&M's CAP can be accessed from the ACUPCC website: <http://rs.acupcc.org/>.

Assignment:

- Analysis of F&M CAP: Write an analysis of F&M's Climate Action Plan using the template provided on Moodle. Submit your analysis before class.
- Questions for F&M: Write two questions about F&M's CAP that you would like to learn answers to during our visit to F&M. Submit your questions before the trip – and bring a copy with you!

Week 4

Sep 19 Comparison and Analysis of Climate Action Plans

We will read, evaluate and discuss Climate Action Plans of other schools that have signed the ACUPCC. Plans can be accessed from the ACUPCC website: <http://rs.acupcc.org/>.

Required reading:

- Climate Action Plans of the two colleges that you signed up to review.

Assignments:

- CAP Analyses: Write analyses of two Climate Action Plans using the template provided on Moodle. Submit your analyses before class. Be prepared to discuss them in class.
- Project Research Plan: Submit a research plan for your project. See Course Project document for instructions. Share your research plan with relevant Dickinson employees and external experts.

Sep 21 Reducing Energy Use of New and Existing Buildings

Overview of energy use by buildings in the US, design of high performance buildings, retrofits of existing buildings to reduce energy use, and strategies for reducing building energy use at college campuses.

Required readings:

- Lovins, ch 3, Buildings: Designs for better living, pp. 77-121.
- Rappaport & Creighton, ch 6, Buildings and climate change action, pp. 109-143.
- Rappaport & Creighton, ch 7, Tackling emissions at the source: climate actions in buildings and central facilities, pp. 145-175.

Campus tour:

- Tour Rector Science Complex and central energy plant with Campus Operations staff.

Week 5

Sep 26 Reducing Energy Use in Industry

Overview of energy use by industry and strategies for reducing industrial energy use.

Required reading:

- Lovins, ch 4, Industry: remaking how we make things.

Sep 28 Project Analysis

Analysis of GHG reduction projects using financial and other criteria.

Required reading:

- Simpson, ch 6, Project evaluation and ranking, pp. 95-101.
- Investment Analysis, ch 3 in USEPA, Energy Star Building Upgrade Manual, pp. 1-12.
- Clean Air Cool Planet Calculator Users Guide, pp. 19-28.

Assignment:

- In class lab assignment on project analysis.

Week 6

Oct 3 Electricity from Renewable Energy Sources

Overview of electricity use in the US and options for supplying electricity from renewable sources.

Required readings:

- Lovins, ch 5, Electricity: repowering prosperity

Further reading:

- National Renewable Energy Laboratory (2012). Executive summary of *Renewable Electricity Futures Study*.

Oct 5 - 7 Case Studies in Climate Neutrality: Green Mountain College & Middlebury College

We will travel to Vermont to visit Green Mountain College (GMC) and Middlebury College, departing Dickinson at 6 am on Friday, Oct 5 and returning by evening of Sunday Oct 7. GMC is the 2nd college in the US to become climate neutral, achieved in part through a new combined heat & power (CHP) plant that uses wood chips to provide the campus with heat and electricity. On Friday afternoon will tour GMC's CHP plant, college farm and other facilities, meet with their climate action planning team and students, and learn about GMC's sustainability initiatives. On Saturday we will visit to Middlebury College to meet with their sustainability director, tour Middlebury's campus, and learn about their climate action plan.

Required readings:

- GMC's Climate Action Plan. Can be accessed from the ACUPCC website: <http://rs.acupcc.org/>.
- BERC, 2008. Report Review and Wood Fuel Supply Study for Green Mountain College Campus.

Week 7

Oct 10 Transportation

Overview of energy use for transportation in the US, options for reducing national transportation energy use, and strategies for reducing commuting emissions at Dickinson.

Required readings:

- Lovins, ch 2, Transportation: fitter vehicles, smarter use, pp. 15-75.
- Rappaport & Creighton, ch 8, Action beyond facilities, pp. 177-212

Oct 12 Solar Energy

A workshop on solar energy at Dickinson College Farm with Matt Steiman.

Required readings:

- Russel, 2004. Solar Electric Systems Simplified.
- SEI ch 2, electrical circuits, pp. 10-14.
- SEI ch 4, electrical loads, pp. 40-45.

Assignments:

- In class lab assignment on solar energy.

Week 8

Oct 17 Personal Action & Behavior Change

Role of behavior change and personal action in reducing carbon emissions.

Required reading:

- Rappaport & Creighton, ch 10, Personal action initiatives, pp. 243-269.
- Dietz et al, 'Household actions can provide a behavioral wedge to rapidly reduce U.S. carbon emissions.' *Proceedings of the National Academy of Sciences* 106, no. 44:18452-18456.

Further reading:

- Center for Research on Environmental Decisions (2009). *The Psychology of Climate Change Communication*. Columbia University, New York.
- Maniates, 2001. "Individualization: plant a tree, buy a bike, save the world?" *Global Environmental Politics* 1 (3):31-52.

Oct 19 **Exam I**

Week 9

Oct 24 No class. Work on research projects.

Oct 26 No class. Work on research projects.

Week 10

Oct 31 No class – **but project progress reports are due.**

Assignment:

- Project Progress Report: Submit a written progress report for your project before start of class. See Course Project document for instructions.

Nov 2 Climate Change Science & GHG Sources and Trends

An introduction to the causes and consequences of global climate change. Is the climate changing? What are the causes? How do we know? How might climate change in the future? What are the likely consequences? We will also do a lab on global and national GHG emissions.

Required reading:

- National Research Council, 2012, *Climate Change, Evidence, Impacts and Choices*. Washington, DC.
- COP15 Brochure, World Resources Institute, 2009. *Climate Analysis Indicators Tool (CAIT)*.
- CAIT Introduction. See lab assignment on how to access.

Assignment:

- GHG Sources and Trends: In class lab assignment using Climate Analysis Indicators Tool of the World Resources Institute (WRI/CAIT) to analyze global, regional and national GHG emissions. Access lab assignment from Moodle, login to WRI/CAIT and read introductory material **BEFORE** class.

Further reading:

- Intergovernmental Panel on Climate Change, 2007, Working Group I Summary for Policymakers, http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html.
- Intergovernmental Panel on Climate Change, 2007, Working Group II Summary for Policymakers, http://www.ipcc.ch/publications_and_data/ar4/wg2/en/contents.html.
- Hansen, Sato and Ruedy, 2012. "Perception of climate change." *Proceedings of the National Academies of Science*.

- *The Copenhagen Diagnosis*, 2009. Allison et al. University of New South Wales, pp. 9-16 and 42-53.
- Baumert, Herzog and Pershing, 2007. *Navigating the Numbers, Greenhouse Gas Data and International Climate Policy*. World Resources Institute, Washington, DC, pp 1-33.
- NASA: Climate Change, Vital Signs of the Planet: <http://climate.nasa.gov/>.
- Climate Communication, Science & Outreach, <http://climatecommunication.org/>.

Week 11

Nov 7 Energy Futures

Examination of different energy futures, and the steps needed to attain a low carbon future.

Required readings:

- Lovins, ch 6, Many choices, one future, pp. 227-251.
- Chu and Majumdar, 2012. "Opportunities and challenges for a sustainable energy future." *Nature*, vol. 488, 16 August 2012, pp. 294-303.

Further reading:

- National Renewable Energy Laboratory (2012). Executive summary of *Renewable Electricity Futures Study*.

Nov 8 **World Climate, 6:00-9:30 pm (Special Class Session)**

HUB Social Hall. Pizza and drinks provided.

We will simulate the annual UN climate change negotiations with a role-playing exercise developed by MIT and Climate Interactive. Students will represent blocs of nation states and negotiate an international climate change agreement. A simple climate model will be used to estimate the effects of preliminary and final agreements on global mean surface temperature and sea level. We will be joined by students from two other courses.

Required reading:

- Background briefing document for the bloc of countries that you will represent.

Nov 9 Sustainability & Ecological Footprints

What is sustainability? Can it be measured? How? What are the purposes of sustainability measures? What are their limitations?

Required reading:

- Wackernagel & Rees (1996). "Footprints and Sustainability" in *Our Ecological Footprint*, pp. 31-60.

Further reading:

- Kates, Parris, and Leiserowitz (2005). "What is sustainable development?" *Environment: Science and Policy for Sustainable Development* 47, no. 3:8-21.

Assignment:

- Ecological Footprint Lab:

Week 12

Nov 14 Climate and Sustainable Development

We will explore connections between climate change and sustainable development.

Required reading:

- Winkler et al, Sustainable Development Policies and Measures: Starting from Development to Tackle Climate Change, pp. 61-87.
- Agrawala et al, 2005. Climate Change and Natural Resource Management: Key Themes from Case Studies, chapter 4 in *Bridge Over Troubled Waters*, Linking Climate Change and Development. OECD. Pp 85-123. http://www.keepeek.com/Digital-Asset-Management/oecd/environment/bridge-over-troubled-waters-linking-climate-change-and-development/climate-change-and-natural-resource-management_9789264012769-6-en.

Nov 16 Dickinson's Climate Action Plan – Next Steps

The Stone House Group is an energy consulting firm that has been contracted by Dickinson College to conduct energy audits for 4 of our buildings, analyze options for reducing their energy use, and provide recommendations. Darren Cassel of Stone House Group will walk us through two of the buildings to show us areas where energy can be saved. After the walk-through, we will return to our classroom where Darren will present preliminary results of the Stone House Group's financial analysis of energy conservation options.

Required readings:

- Rappaport & Creighton, ch 12, Degrees that matter, pp. 301-315.

Assignments:

- Draft Research Report is due: Submit a draft report for your project before the start of class. See CBR Project document for instructions.

Week 13

Nov 21 No class, Thanksgiving break

Nov 23 No class, Thanksgiving break

Week 14

Nov 28 Exam II

Project Presentations – Preliminary

Each member of the class will give a quick 3-minute presentation of preliminary recommendations for Dickinson's climate action plan that are based on his/her research project.

Assignment:

- Presentation of Preliminary Recommendations: Prepare a powerpoint presentation with up to 3 recommendations for Dickinson's climate action plan that are based on your research project. Each recommendation must be accompanied by a clear justification. You are permitted no more than 3 slides. Submit the powerpoint before the start of class. You will have 3 minutes to give your presentation in class.

Nov 30 Work on Team Presentation

Work on team presentation to be made to the President's Commission on Environmental Sustainability (PCES) of key recommendations and justifications. A general outline and main points should be completed by the end of the session, and tasks assigned to each student for completion of final presentation.

Week 15

Dec 5 Rehearsal of Team Presentation

Dec 7 Team and Individual Presentations

We will meet in TOME 115.

Members of PCES and the Dickinson community will be invited to attend a presentation of the class's findings and recommendations. There will be two parts to the presentation, (i) a presentation of priority recommendations of the consulting team, and (ii) presentations of students' individual projects. The first part will be 45 minutes, and will be divided roughly equally between formal presentation and questions/discussion. During the second part, students will present their individual projects and recommendations for 10 minutes each.

Each student should personally invite all college personnel and external experts who provided suggestions, guidance or information for her/his individual research project.

Course evaluation forms will be distributed for students to complete in the last 30 minutes of the class period.

Assignment:

- Powerpoints: submit powerpoints of individual and team presentation before start of class.
- Contribution to team presentation: Write a 1-paragraph description of your contribution to the team presentation, to be shared with all members of the team.

Final paper due Saturday, December 15, 2:00 pm. There is no final exam for the course.