

FYS: COUNTING ON SUSTAINABLE ENERGY: DOES IT ADD UP?

SYLLABUS: SPRING 2013

Professor: Dr. Sarah K Mason
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Office Hours: TBA

Course Meetings: TBA

Course Webpage: Sakai

Textbook: David JC MacKay, *Sustainable Energy - without the hot air*.

1. COURSE SUMMARY AND GOALS

In this course we will explore and compare the environmental costs and benefits of different forms of energy production, energy consumption, and other aspects of environmental sustainability. We will attempt to attach numbers and computations to these processes and use real data to analyze the values and costs of things like recycling, hybrid cars, and alternative energy sources.

2. ACTIVITIES (20% OF FINAL GRADE)

Each day you will be expected to come to class having read the assigned material and having completed the class activities assigned during the previous class period. The activities will be worth 20% of your final grade and will be graded for completion only.

3. HOMEWORK ASSIGNMENTS (40% OF FINAL GRADE)

The weekly homework assignments will be relatively short (3-5 pages in length) papers which will typically include a computational aspect as well as a qualitative aspect. They will be worth 40% of your final grade. Rubrics for the grading of these assignments will be posted on Sakai.

4. CLASS PARTICIPATION (10% OF FINAL GRADE)

This class is a discussion-based class, so your participation in class discussions is extremely important. You are expected to attend class, come prepared, and contribute to the class discussion. Although there is not a formal attendance policy, significant absences or tardiness will impact your participation grade.

5. EARTH DAY PROJECT (20% OF FINAL GRADE)

You will work together with several classmates to create an interactive presentation in conjunction with Earth Day. This project includes an individual written component on a specific topic and is worth 20% of your final grade. Details will be posted on Sakai.

6. PERSONAL BALANCE SHEET (10% OF FINAL GRADE)

You will create a personal balance sheet in which you compute a detailed estimate of the amount of energy you use on an annual basis. You will then compute an estimate for the amount of energy Wake Forest University could produce on campus (per student) from sustainable sources and determine whether or not your lifestyle could potentially be supported through sustainable energy sources. You will write a paper about your findings, including any potential caveats your estimate might have and your response to these findings.

7. GRADING AND POLICIES

Item	Percentage of final grade
Activities	20%
Assignments	40%
Class participation	10%
Earth Day Project	20%
Personal Balance Sheet	10%

Grading rubrics for all assignments will be posted on Sakai at least two weeks in advance of the due date. Grades will also be posted on Sakai.

Everything you submit should be your own work. You may discuss readings, projects, and papers with other students, but unless the assignment is a group assignment the work you submit should represent your own ideas and understanding and should be written in your own words. You should not copy any portion of any assignment from any source. Plagiarism of any kind will not be tolerated and will be treated as a violation of the Honor Code.

8. GETTING HELP

Please contact the Learning Assistance Center (336-758-5929) within the first two weeks of the semester if you have a disability that may require an accommodation for taking this course. If a medical condition or personal situation occurs that requires accommodation in this course, please consult with Academic Affairs for assistance in determining the appropriate accommodations.

9. UNITS: CONSUMPTION

The following is a rough outline of the main activities and assignments that will be included in this course. All of the activities and assignments are in addition to readings and class discussions, which will of course be integrated into every class meeting. Most of the activities and assignments listed below are new for Spring 2013, so the ones used in Spring 2012 are indicated clearly.

9.1. **Transportation.** (The first activity in this unit was used during Spring 2012. The assignments and the other activity are new.)

- **Activity:** Compute your personal energy consumption from driving, air travel, and public transportation.

Assignment: Survey Wake Forest students, faculty, and staff who commute to campus by car to collect data on how far they commute and why they choose to commute by car. Use your findings to create a proposal for how WFU could improve

the transportation alternative options (shuttle service, zip cars, carpool incentives, etc) to encourage more people to make use of these alternatives.

- **Activity:** Volunteer with the Winston-Salem Bike Co-Op. Write about your experience and the sustainable aspects of the Bike Co-Op.

9.2. **Electricity.** (The activity and assignment are updated versions of assignments from Spring 2012, and the inclusion of the “Kill-A-Watt” meters is new.)

- **Activity:** Use the “Kill-A-Watt” meter to measure the power consumed by your gadgets and appliances for one week. Also estimate the energy you use for activities such as heating your dorm room and doing laundry.

Assignment: Analyze your consumption and use the WFU building dashboard to compare your consumption to the average consumption per person in your dorm. What might account for any differences? What are some easy changes you could make to reduce your consumption? Compute the impact that could be made in your dorm if all residents made this change. Did any of your findings surprise you?

9.3. **Waste.** (Both assignments are entirely new for Spring 2013, and were specifically inspired by the “Sustainability across the curriculum” workshop.)

- **Activity:** Collect all of your trash for one week, to be sorted and weighed in class.

Assignment: Compute the number of years it will take for your trash to decompose and write a reaction paper, being sure to address the following questions:

- (1) Were you surprised by the amount of trash you accrued or the amount of time it would take to decompose?
- (2) Do you think your habits are typical of a Wake Forest student? Of the average American?
- (3) Are there changes you will make as a result of this assignment?

- **Activity:** Visit the Hanes Mill Road Landfill.

Assignment: Analyze a map of the Forsyth County landfill capacity and use this to estimate the number of years remaining. Construct several scenarios which will increase the amount of time left.

9.4. **Water.** (This was a part of the Spring 2012 course that worked very well.)

- **Activity:** Time your showers, clothes washing, toilet flushing, hand washing time.

Assignment: Determine the amount of water used for these activities by testing shower heads and sink faucets, compute the total amount of water used, and write up your results in a paper, being sure to address the following questions:

- (1) Were you surprised by the amount of water you use?
- (2) Do you think your habits are typical of a Wake Forest student? Of the average American?
- (3) Are there changes you will make as a result of this assignment?

9.5. **Food.** (Some of the volunteer activities listed in this unit were part of the Spring 2012 course, but not integrated directly into this assignment.)

- **Activity:** Watch a documentary (such as Food, Inc) about American corporate farming practices.
- **Assignment:** Volunteer at either Campus Kitchen, a community garden, a local food bank, or visit a local farm. Write a reaction paper about your experience, being sure to discuss connections to sustainability.

10. UNITS: PRODUCTION

10.1. **Solar.** (The first activity and assignment in the solar energy unit was used during the Spring 2012 version of this course but the second is new.)

- **Activity:** Visit “The Barn” with Volt Energy Associate Alison Wright.

Assignment: Calculate an estimate for how much energy the Barn’s solar panels should produce in a year, and compare your estimate to the information from Wake’s “Building Dashboard”. Then compute how much energy a larger system could produce and analyze the economics of such a system: how long would it take for such a system to pay for itself? Include a discussion on the pros and cons of solar power.

- **Activity:** Build a model solar PV system from a kit and measure how much energy it produces per hour.

10.2. **Wind.** (This is a variation on the way this unit was presented in Spring 2012.)

- **Activity:** Class visit from Wind Farm Project Manager.
- **Assignment:** Analyze the wind speeds in Winston Salem and write a proposal for a wind turbine on Wake’s campus or a careful and detailed explanation of why a wind turbine here does not make sense. Include a discussion on the pros and cons of wind power.
- **Activity:** Build a model wind turbine generator from a kit and measure how much energy it produces per hour.

10.3. **Hydroelectric.** (The model hydroelectric power generator is new for Spring 2013, but the other activity and the assignment were used in the Spring 2012 version of this course.)

- **Activity:** Debate about the Alcoa controversy.
- **Activity:** Build a model hydroelectric power generator from a kit and measure how much energy it produces per hour.

Assignment: Investigate Duke Power’s hydroelectric sources and determine what percentage of our power is from hydroelectric sources. Compute an estimate of how much power we could produce in North Carolina and write a paper about this and the pros and cons of hydroelectric power.

10.4. **Geothermal.** (The Logan Heating and Cooling presentation is new for Spring 2013 but the rest was used during the Spring 2012 version of this course.)

- **Activity:** Presentation/demonstration by Logan Heating and Cooling, a local geothermal air conditioning company.

Assignment: Investigate the economics of geothermal power and determine whether or not it would be worthwhile for Wake Forest University to pursue this type of air conditioning on campus. Include a discussion about the pros and cons of geothermal power.

- **Activity:** Learn about Iceland’s geothermal power.

10.5. **Wave/tidal power.** (In Spring 2012, we did not create models of the various wave and tidal power sources.)

- **Activity:** Build models of Salter Duck, Sea Snake, and Oscillating Water Column. Compute an estimate of the amount of energy North Carolina could produce using tidal and wave power.

- **Activity:** Class presentations on different types of wave/tidal power.

Assignment: Research your assigned type, write a paper on it, and present your findings to the class.

10.6. **Biofuels/Hydrogen Fuel Cells.** (This unit is new for Spring 2013 and will only be included if time permits.)

- **Activity:** Build a hydrogen fuel cell from a kit.

Assignment: Determine the amount of energy you would save if you traded your car for a hydrogen fuel cell car. Also calculate the long-term financial costs/savings of this change. Research the pros and cons of hydrogen fuel cells and decide whether or not you believe this is an alternative energy source worth pursuing aggressively. Be sure to back up your claims with concrete evidence and computations.

- **Activity:** Debate about hydrogen fuel cells.