

ENE491 Life cycle assessment of energy technologies Spring 2016

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Location MW 9:10-10:00 AM 202 Urban Plan & Land Arch Bldg
and time: MW 10:20-11:10 AM 3560 Engineering Building

Office Hours: Wednesday 11:30 - 12:30 EB3575 and by appointment

Course Description

Life-cycle assessment (LCA) is a well-established methodology commonly used to evaluate the environmental impact of a product throughout all the stages of its life, from cradle-to-grave. The focus of this class will be toward the use of LCA for energy technologies, where it can provide a systematic method to evaluate tradeoffs between various energy options and guide energy choices. LCA will be used to compare renewable energy technologies with fossil-based and nuclear energy technologies. In addition to the most common process LCA methodology, other methods such as input-output, economic and social LCA will be introduced.

Format

The lectures will address the environmental impact of energy technologies and life cycle assessment methodology while computer laboratory will be used to learn energy-modeling tools for various energy options and life cycle assessment.

At the completion of the course the student should have a thorough understanding of LCA methodology and its use to evaluate the environmental impact of energy options.

Textbook

- The required textbook for the LCA portion of the class is available for free at: www.lcatextbook.com Specific information on chapter used in this class will be provided.

There will be extensive course material on PowerPoint slides and other supplementary materials (which will be made available to students through course web access i.e., D2L).

Other references will be provided as the course progress.

Policy

- Attendance at regular scheduled class meetings is expected as well as participation in class discussions.
- In the event of an unplanned absence by the professor, class will be cancelled after 15 minutes
- Academic honesty is expected. Any violation of Michigan State University policy as described in the Student Handbook will not be tolerated and may result in a failing grade. For additional information visit the web page of the office of the ombudsman at MSU: <http://www.msu.edu/unit/ombud/>. Therefore, unless authorized by your instructor, you are expected to complete all course assignments, including homework, tests and exams, without assistance from any source. You are expected to develop original work for this course; therefore, you may not submit course work you completed for another course to satisfy the requirements for this course.

- Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. If you have a documented disability and verification from the Resource Center for Persons with Disabilities (RCPD), and wish to discuss academic accommodations, please contact your instructor as soon as possible. It is the student's responsibility to provide documentation of disability to RCPD and meet with an RCPD specialist to request special accommodation *before* classes start. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to the instructor at the start of the term and/or two weeks prior to the accommodation date (test, project, etc). Requests received after this date may not be honored. RCPD is located in 120 Bessey Hall, near the center of the Michigan State University campus, on the southwest corner of Farm Lane and Auditorium Road. RCPD may be contacted by phone at (517) 884-7273 (884-RCPD), or via their website www.rcpd.msu.edu.
- To make up course work missed to participate in a required activity for another course or a university-sanctioned event, a student must provide the instructor with adequate advanced notice and a written authorization from the faculty member of the other course or from a university administrator.

Assessment Criteria

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| 1. Homework (approximately 10) | 50% |
| 2. Midterm (take-home) | 15% |
| 3. Project | 30% |
| • Develop the framework necessary to conduct a full-scale LCA related to energy problem | |
| • Complete the data collection and quantitative analysis for the LCA to be included in a manuscript style paper | |
| 3.1. Proposal | 5 % |
| 3.2. Final document | 20% |
| 3.3. Final Presentation | 5% |
| 4. Attendance and participation | 5% |
| • In class participation during class discussion | |

Grading Scale:

≥90% = 4.0; ≥85 and <90% = 3.5; ≥80 and <85% = 3.0; ≥75 and <80% = 2.5; ≥70 and <75% = 2.0; ≥65 and <70% = 1.5; ≥60 and <65% = 1.0; and <60% = 0.0.

Assignments

Homework will be assigned weekly. Homework content will include problem solving, reading assignments, written critiques of readings, etc. In addition to formal assignments, students are asked to pay attention to current topics in energy. Late homework will receive an automatic 10% deduction for every day overdue. The lowest homework grade will be dropped.

Tentative Course Outline (Subject to Change)

Week	Date	Topic
1	Jan 11-13	Introduction to LCA
2	Jan 20	Goal definition and system boundaries <i>(No class on Jan 18)</i>
3	Jan 25 -27	Life cycle inventory (Data collection and data quality)
4	Feb 1-3	Impact Assessment
5	Feb 8-10	Energy Resources / Consumption
6	Feb 15-17	Environmental and economic drivers for Sustainable Energy Take home (Feb 17 -22)
7	Feb 22-24	Fossil fuels
8	Feb 29-March 2	Nuclear - Project Proposal (March 2)
	March 7-9	Spring break
9	March 14-16	Biomass - LCA co-products and allocation
10	March 21-23	Solar and wind
11	March 28-30	Hydroelectric and Geothermal
12	April 4-6	Energy storage and distribution
13	April 11-13	Tidal and other sustainable energy technology
14	April 18-20	Input-output and social LCA
15	April 25-27	Final presentations and final report (April 27)
16	May 2-6	No classes and exam