

A Practical Introduction to Life Cycle Assessment

EVPP 692 (1 Credit)

EVPP 991 (2 Credits)

Fall 2025



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Classroom: Nguyen Engineering Building, Room 1110.

Class Meetings: Wednesdays, 4:30 PM to 6:20 PM.

Office Hours: By appointment.

Course Description and Goals

This seminar will introduce students to the Life Cycle Assessment (LCA) methodology, which has emerged in recent years as the tool of choice to assess the environmental impacts associated with the entire life cycle of a particular product or service. In this context, the life cycle includes the acquisition of raw materials, production, use, and post-use phases for the product or service. The assessment process involves gathering and measuring all environmental inputs and outputs associated with the product's life cycle, such as energy used, raw materials consumed, and emissions released into the air, water, and land.

The LCA analyst role is expected to see remarkable growth and create thousands of job opportunities across the U.S. by 2030. The high demand for more sustainable brands could make this projection even larger.

Course Learning Outcomes

By the end of this course, students should be able to:

- demonstrate an understanding of LCA as a tool for evaluating the environmental impact of a product or service.
- explain notions in LCA-terminology such as 'functional unit', 'system boundaries', 'End-of-Life', 'allocation', 'system expansion', etc.
- demonstrate a basic mastery of the openLCA software and inventory databases such as ecoinvent and LCA Commons.
- develop simple case studies comparing the relative environmental performance of a related set of products or services.

Learning Management System:

This course will be hosted on Canvas (<https://info.canvas.gmu.edu/>). Please ensure you are familiar with accessing and navigating this platform. Resources and support are available at: <https://lms.gmu.edu/getting-started-students/> to help you get started.

Course Content, Instructional Methods and Evaluation of Student Performance

The Class Schedule shown below is tentative but it serves as a guide of the topics to be covered throughout the semester. Most lectures are based on training materials developed by GreenDelta, an engineering and consultancy firm specializing in the development of software and databases for LCAs and sustainability. In 2006, GreenDelta developed the concept of openLCA as a freely available (open-source) software for life cycle assessments. Students are therefore required to download the latest version of openLCA from <https://www.openlca.org/download/>. Further instructions for operating the software will be provided in class.

Students are also required to conduct a total of eight exercises throughout the semester, which are to be completed during the class sessions. Grades for students enrolled in EVPP 692 will be based on the successful completion of the exercises. Students enrolled in EVPP 991 are also required to develop and present an LCA case study based on the concepts learned in class (further details will be provided as the semester progresses). For these students, the exercises and the case study will each account for 50% of the course grade.

TENTATIVE CLASS SCHEDULE: Subject to changes.

Date	Topic	Exercise
Aug 27	Introduction to Life Cycle Assessment.	1: Get openLCA running.
Sept 3	Introduction to openLCA. LCA data import & elements in the database. Creating flows and processes.	2: Create a new database. 3a: Import a dataset. 3b: Import a database. 3c: Import impact assessment methods. 4: Flow information 5a: Battery production phase – Process creation.
Sept 10	Product systems creation and calculation. Results analysis and interpretation.	5b: Production phase of the battery – Modeling and calculation. 5c: Production phase of the battery – LCIA. 5d: Use phase of the battery – Create process.
Sept 17	Results analysis and interpretation (continued). Comparative LCA studies – Creation of projects. Data export. Sensitivity analysis – Working with parameters.	5e: Use phase of the battery – LCIA. 5f: Production + use phases – LCIA. 5g: e-car vs. diesel powered car. 5h: Battery production phase – Process creation with parameters 5i: e-car in different regions. 5j: Sensitivity analysis with parameters.
Sept 24	Modeling the End-of-Life. Allocation.	6a: Waste modelling (process producing waste). 6b: Waste treatment modelling (process treating waste). 6c: Comparison EoL modelling approaches. 7a: Physical allocation. 7b: Economic allocation. 7c: Causal allocation. 7d: Comparing allocation methods.
Oct 1	System Expansion.	8a: System expansion. 8b: System expansion vs. allocation – Model graphs. 8c: System expansion vs. allocation – Analysis. 8d: System expansion.

Date	Topic	Exercise
Oct 8	System Expansion (Continued). Uncertainty Analysis.	8d: System expansion (continued – additional exercise with Excel).
Oct 15	Class Practice: LCA of PC Bottles	
Oct 22	Class Practice: LCA of PC Bottles (continued) Class Practice: Kelp Farming Model by Ayala et al. (2023)	
Oct 29	Class Practice: Kelp Farming Model by Ayala et al. (2023) – Continued Case studies for student presentations are assigned. Introduce Federal LCA Commons	
Nov 5	No Classes This Week – Students work on their case studies.	
Nov 12	Class Practice: LCA model for the U.S. kelp aquaculture industry (using Federal LCA Commons)	
Nov 19	Presentation of case studies by EVPP 991 students.	
Nov 26	No Classes: THANKSGIVING BREAK	



Common Policies Affecting All Courses at George Mason University

Updated August 2025

These four policies affect students in all courses at George Mason University. This Course Policy Addendum must be made available to students in all courses (see [Catalog Policy AP.2.5](#)).

Additional policies affecting this course, and additional resources or guidance regarding these policies, may be provided to students by the instructor.

Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is outlined in the university's [academic standards procedures](#). Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

Student responsibility: Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit the [Disability Services website](#) for detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu. Phone: (703) 993-2474.

Student responsibility: Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

FERPA and Use of GMU Email Addresses for Course Communication

The [Family Educational Rights and Privacy Act \(FERPA\)](#) governs the disclosure of [education records for eligible students](#) and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

Student responsibility: Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

Title IX Resources and Required Reporting

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see [University Policy 1202](#): Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence. Questions regarding Title IX can be directed to the Title IX Coordinator via email to TitleIX@gmu.edu, by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

Student opportunity: If you prefer to speak to someone *confidentially*, please contact one of Mason's confidential employees in [Student Support and Advocacy \(SSAC\)](#), [Counseling and Psychological Services \(CAPS\)](#), [Student Health Services \(SHS\)](#), and/or the [Office of the University Ombudsperson](#).