EXPANDED COURSE DESCRIPTION
MECHANICAL ENGINEERING
Lassonde School of Engineering
Mechanical Engineering
LE / MECH 4504 3.0 SECTION M
LIFE-CYCLE ANALYSIS AND SUSTAINABILITY
FALL 2019 / WINTER 2020

COURSE CALENDAR DESCRIPTION

This course discusses the notion of "triple bottom-line" or triple-E (energy, environment, economics), life Cycle inventory, computational structure of LC inventory, case studies and execution of a mini- LCA, as well as strengths, weaknesses and appropriate uses of LCA. Prerequisites: ES/ENVS 2150 3.00 or LE/ESSE 2210 3.00. Corequisite: LE/MECH 4401 3.00.

INSTRUCTOR(S)

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<tr>
<th>Name</th>
<th>Section / Format / Term</th>
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<tbody>
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ADDITIONAL INFORMATION

TOPICS AND CONCEPTS

Sustainability from the “Triple Bottom Line” View Point
The importance of environmental, economic and societal factors and stakeholder engagement in making sustainable decisions. The importance of aligning corporate codes of conduct with sustainable decision making from the “triple bottom line” perspective. Measuring and reporting your progress, creating a culture of sustainability

Introduction, Environmental Life Cycle Assessment (LCA): Background and Perspective
Basic concepts, historical roots of LCA, environmental life cycle concept, an overview of the LCA method-past, present, and future.

Life Cycle Inventory (LCI) Modeling
Introduction, study goal, scope, methodology issues, evolution of LCA practice and associated issues.

Life Cycle Impact Assessment (LCIA)
Life cycle impact assessment (ISO14040-44 requirements), Principles and framework of LCIA.

Sourcing Life Cycle Inventory Data
Types of LCI data, private, public, and dedicated LCI databases.

Software for Life Cycle Assessment
LCA software (e.g. GaBi Solutions), professional life cycle assessment, sample case studies.

Life Cycle Assessment in Product Innovation
The importance of research and development (R&D), idea generation and assessment, concept development, business planning and execution, design for environmental compliance.

How to Approach the Assessment?
Assessment methods, comparison of assessment methods, guidance for assessment.

Life Cycle Sustainability Analysis (LCSA)
Life cycle assessment and sustainability questions, a framework for life cycle sustainability analysis

*Life Cycle Knowledge Informs Greener Products*

Situation analysis, diagnostics and interpretation, main strengths and weaknesses of LCA. Applications of LCA to a variety of systems (offshore wind, bio-fuels, electric vehicles, etc.) in varying industries and locations.

**LIST OF LEARNING OUTCOMES AND EXAMPLES OF COURSE LEARNING OBJECTIVES**

Upon successful completion of this course the student will be able to:

- Identify the key terms in life-cycle assessment and triple bottom-line used in the analysis and management of technological systems
- Construct a mini life-cycle assessment of a product or a technological system
- Apply LCA software to model a product life cycle assessment
- Explain the assessment parameters that describe the impacts on society, environment, and resources
- Appraise the impacts the three aspects of sustainability (economic, environmental and societal) could have on decision making

**GRADED ASSESSMENT**

**Proposed Grading Scheme:**

- Regular Assignments - 15%
- Mini LCA Project - 20%
- Presentation – 5%
- Quizzes - 20%
- Final Exam -40%

**ADDITIONAL INFORMATION**

**Required Textbook:** A course pack that consists of selected chapters in the following textbooks:

- Freely available on-line: <www.lcatextbook.com>
  ISBN: 9781118330371 (ePub), 9781118333174 (ePDF)
- The International Reference Life Cycle Data System (ILCD) Handbook

**ACADEMIC INTEGRITY LINKS**

- Senate Policy on Academic Honesty - http://secretariat-policies.info.yorku.ca/policies/academic-honesty-senate-policy-on/
- Academic Integrity - http://lassonde.yorku.ca/academic-integrity

**STUDENT LINKS**

- Student Rights and Responsibilities - http://oscr.students.uit.yorku.ca/student-conduct
- Religious Observance - https://w2prod.sis.yorku.ca/Apps/WebObjects/cdm.woa/wa/regobs
- Student Accessibility Services (SAS) - https://accessibility.students.yorku.ca/
• York University’s Policies on Sexual Violence - http://secretariat-policies.info.yorku.ca/policies/sexual-violence-policy-on/
• York University’s Policies on Gender/LGBTQ*/Positive Space - http://rights.info.yorku.ca/lgbtq/

LAND ACKNOWLEDGEMENT
• We acknowledge our presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the New Credit First Nation. This territory is subject of the Dish With One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.
• The Indigenous Framework for York University: A Guide to Action can be found here: http://indigenous.info.yorku.ca/
• Meaning of a land acknowledgement: http://healthydebate.ca/opinions/indigenous-land-acknowledgements

Many courses utilize Moodle, York University’s course website system. If your course is using Moodle, click here to access it.
Moodle @ York University