

Course guide

390456 - LCA - Life-Cycle Assessment of Products and Processes

Last modified: 30/05/2022

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Optional subject).
BACHELOR'S DEGREE IN LANDSCAPE ARCHITECTURE (Syllabus 2019). (Optional subject).

Academic year: 2022 **ECTS Credits:** 6.0 **Languages:** English

LECTURER

Coordinating lecturer: Asunción Antón Vallejo

Others:

PRIOR SKILLS

English level: higher intermediate (B2, FCE) or advanced (C1, CAE)

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE-BC-17. Decision taking by assessment of available resources in multidisciplinary work-teams.

CE-BC-2. Fundamentals of computer use and programming, operating systems, data bases, software for engineering applications.

General:

CG-3L3. (ENG) TERCERA LENGUA NIVELL 3: defensar en públic en anglès un treball elaborat per escrit en aquesta llengua relacionat amb l'àrea d'estudi

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

CG-3L2. (ENG) TERCERA LENGUA, NIVELL 2: redactar un text en anglès relacionat amb l'àrea d'estudi i ser capaç de formular i respondre qüestions, tant per escrit com oralment, sobre el mateix

CG-3L1. (ENG) TERCERA LENGUA NIVELL 1: comprendre un text en anglès relacionat amb l'àrea d'estudi i ser capaç de respondre qüestions relacionades amb el mateix

TEACHING METHODOLOGY

During the first part of the course, lectures will provide background information and the fundamentals of the subject (LCA).

Invited speakers will share their expertise on two specific topics: Carbon footprint and Water footprint.

Students will be organised in groups of 2-4 people for the coursework (LCA project).

The second part of the course will be focussed on the coursework that each group will undertake with the software SimaPro (1 month license).

At the end of the course each group will present the LCA project to the rest, and hand in the LCA report.

Finally, a test will be used to ensure that knowledge on the subject has been successfully achieved.

LEARNING OBJECTIVES OF THE SUBJECT

- To describe the fundamentals of LCA, including its four main phases and LCA report content
- To carry out a LCA project by:
 - o Compiling an inventory of relevant energy and material inputs and environmental releases
 - o Evaluating the potential impacts associated with identified inputs and releases
 - o Interpreting the results
 - o Writing the LCA report according to ISO Standards
- To Identify the potential and limitations of LCA in practice
- To apply LCA results to support decision making

STUDY LOAD

Type	Hours	Percentage
Hours large group	60,0	40.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Life Cycle Assessment

Description:

- Introduction and overview
- Goal and scope
- Goal definition
- Scope definition
- Functional Unit
- System boundaries
- Allocation
- Data quality requirement
- Comparison of different systems
- Life Cycle Inventory
- Inventory analysis
- Data collection and processing
- Impact assessment
- Classification
- Characterization
- Normalization
- Weighting
- Methods
- Interpretation
- Sensitivity analysis
- ISO
- LCA Report

Specific objectives:

- To describe the fundamentals of LCA, including its four main phases and LCA report content

Related activities:

- Coursework: inventory
- Initial coursework presentation

Related competencies :

CG-3L2. (ENG) TERCERA LENGUA, NIVELL 2: redactar un text en anglès relacionat amb l'àrea d'estudi i ser capaç de formular i respondre qüestions, tant per escrit com oralment, sobre el mateix

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

Full-or-part-time: 27h

Theory classes: 17h

Laboratory classes: 10h

2. Single issue indicators

Description:

- Carbon footprint
- Water footprint

Specific objectives:

- To describe the fundamentals of LCA, including its four main phases and LCA report content
- To Identify the potential and limitations of LCA in practice

Related activities:

- Invited speaker presentation

Related competencies :

CG-3L1. (ENG) TERCERA LENGUA NIVELL 1: comprendre un text en anglès relacionat amb l'àrea d'estudi i ser capaç de respondre qüestions relacionades amb el mateix

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

Full-or-part-time: 3h

Theory classes: 3h

3. SimaPro

Description:

- Overview and software interface description
- Database and Methods (Libraries)
- Create Processes
- Create assembly
- Waste scenario
- Impact analysis and results (table and charts)
- Allocation
- Sensitivity analysis and parameters

Specific objectives:

- To carry out a LCA project by:
 - o Compiling an inventory of relevant energy and material inputs and environmental releases
 - o Evaluating the potential impacts associated with identified inputs and releases
 - o Interpreting the results
 - o Writing the LCA report according to ISO Standards
- To Identify the potential and limitations of LCA in practice
- To apply LCA results to support decision making

Related activities:

- Coursework: LCA project
- Final coursework presentation

Related competencies :

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

CG-3L3. (ENG) TERCERA LENGUA NIVELL 3: defensar en públic en anglès un treball elaborat per escrit en aquesta llengua relacionat amb l'àrea d'estudi

CE-BC-17. Decision taking by assessment of available resources in multidisciplinary work-teams.

CE-BC-2. Fundamentals of computer use and programming, operating systems, data bases, software for engineering applications.

Full-or-part-time: 24h

Theory classes: 14h

Laboratory classes: 10h



4. Social and economic life cycle assessment

Description:

- Social Life Cycle
- Life Cycle Costing

Specific objectives:

- To describe the fundamentals of LCA, including its four main phases and LCA report content
- To Identify the potential and limitations of LCA in practice

Related competencies :

CG-3L1. (ENG) TERCERA LENGUA NIVELL 1: comprendre un text en anglès relacionat amb l'àrea d'estudi i ser capaç de respondre qüestions relacionades amb el mateix

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

Full-or-part-time: 3h

Theory classes: 3h

5. Ecodesign and Ecolabel

Description:

- Ecodesign
- Ecolabel

Related competencies :

CG-3L1. (ENG) TERCERA LENGUA NIVELL 1: comprendre un text en anglès relacionat amb l'àrea d'estudi i ser capaç de respondre qüestions relacionades amb el mateix

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

Full-or-part-time: 3h

Theory classes: 3h

ACTIVITIES

Initial oral presentation

Description:

Oral presentation of the coursework first stage (inventory) in groups of 2-4 people.

Specific objectives:

- To carry out a LCA project by:
 - o Compiling an inventory of relevant energy and material inputs and environmental releases

Delivery:

- Coursework: inventory

Related competencies :

CG-3L2. (ENG) TERCERA LENGUA, NIVELL 2: redactar un text en anglès relacionat amb l'àrea d'estudi i ser capaç de formular i respondre qüestions, tant per escrit com oralment, sobre el mateix

CE-BC-17. Decision taking by assessment of available resources in multidisciplinary work-teams.

Full-or-part-time: 3h

Theory classes: 3h



Final oral presentation

Description:

Oral presentation of the coursework (LCA project) in groups of 2-4 people.

Specific objectives:

- To carry out a LCA project by:
 - o Compiling an inventory of relevant energy and material inputs and environmental releases
 - o Evaluating the potential impacts associated with identified inputs and releases
 - o Interpreting the results
 - o Writing the LCA report according to ISO Standards

Delivery:

- Coursework: LCA project

Related competencies :

CG-SCS. SUSTAINABILITY AND SOCIAL COMMITMENT

CG-3L3. (ENG) TERCERA LENGUA NIVELL 3: defensar en públic en anglès un treball elaborat per escrit en aquesta llengua relacionat amb l'àrea d'estudi

CE-BC-17. Decision taking by assessment of available resources in multidisciplinary work-teams.

CE-BC-2. Fundamentals of computer use and programming, operating systems, data bases, software for engineering applications.

Full-or-part-time: 3h

Theory classes: 3h

GRADING SYSTEM

- Test: 40%
- Group coursework: 60%, divided into:
 - o Initial oral presentation: 10%
 - o Final oral presentation: 15%
 - o Dissertation: 35%

BIBLIOGRAPHY

Basic:

- Xarxa Temàtica Catalana d'ACV. Llibre didàctic d'anàlisi del cicle de vida (ACV) [on line]. 1. Barcelona, 2002 [Consultation: 16/07/2022]. Available on:

https://mediambient.gencat.cat/web/.content/home/ambits_dactuacio/empresa_i_produccio_sostenible/estrategia_ecodisseny/ecodisseny/eines/eines_avalucio/llibre_acv.pdf.

- European Commission-Joint Research Centre - Institute for Environment and Sustainability. International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance [on line]. 1. Luxembourg: Publications Office of the European Union, 2010 [Consultation: 16/04/2020]. Available on: <http://eplca.jrc.ec.europa.eu/uploads/ILCD-Handbook-General-guide-for-LCA-DETAILED-GUIDANCE-12March2010-ISBN-fin-v1.0-EN.pdf>.

- Mark Goedkoop, Michiel Oele, Jorrit Leijting, Tommie Ponsioen, Ellen Meijer. Introduction to LCA with SimaPro [on line]. 2013 [Consultation: 16/04/2020]. Available on: <https://www.pre-sustainability.com/download/SimaPro8IntroductionToLCA.pdf>.

Complementary:

- "Environmental management Water footprint Principles, requirements and guidelines". International Organization for Standardization [on line]. 2014. ISO 14046:2014 [Consultation: 16/04/2020]. Available on: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=43263.

- "Environmental management -- Life cycle assessment -- Principles and framework". International Organization for Standardization [on line]. 2006. ISO 14040:2006 [Consultation: 16/04/2020]. Available on: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=37456.

- "Environmental management systems Guidelines for incorporating ecodesign.". International Organization for Standardization [on line]. 2011. ISO 14006:2011 [Consultation: 16/04/2020]. Available on: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=43241.

- "Greenhouse gases Carbon footprint of



products Requirements and guidelines for quantification and communication". International Organization for Standardization [on line]. 2013. ISO/TS 14067:2013 [Consultation: 16/04/2020]. Available on: http://www.iso.org/iso/home/search.htm?qt=ISO+14067&published=on&active_tab=standards&sort_by=rel.- "Environmental management -- Life cycle assessment -- Requirements and guidelines". International Organization for Standardization [on line]. 2006. ISO 14044:2006 [Consultation: 16/04/2020]. Available on: http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=38498.

RESOURCES

Hyperlink:

- SimaPro Demo. <http://www.pre-sustainability.com/simapro-demo>