

Course Memo  
**LIFE CYCLE ASSESSMENT**

**Credits: 7.5 hp**  
**Course code: AG2800**  
**Year: 2016**

**Welcome to the course in Life Cycle Assessment!**

This course memo contains important information about the course.

**Please take your time to read it carefully!**

**Then read parts of it again before every lecture, computer lab, supervision meeting, or seminar.**

## **Contents**

---

<b>ADMINISTRATIVE INFORMATION.....</b>	<b>3</b>
<b>COURSE AIM, CONTENT, AND WORK LOAD .....</b>	<b>4</b>
<b>SUBMISSION DEADLINES.....</b>	<b>6</b>
<b>COURSE REGISTRATION .....</b>	<b>7</b>
<b>STUDENTS WITH DISABILITIES (FUNKA).....</b>	<b>7</b>
<b>LECTURES (L1 – L9).....</b>	<b>8</b>
<b>COMPUTER EXERCISES (C1 – C6).....</b>	<b>11</b>
<b>WRITTEN EXAM .....</b>	<b>12</b>
<b>PROJECTS AND PROJECT REPORTS .....</b>	<b>13</b>
<b>PRE-SEMINAR.....</b>	<b>15</b>
<b>FINAL SEMINAR AND REPORT SUBMISSION.....</b>	<b>17</b>
<b>CRITICAL REVIEW OF PROJECTS .....</b>	<b>18</b>
<b>CO-OPERATION AND EQUAL CONTRIBUTION IN PROJECTS .....</b>	<b>19</b>
<b>EXAMINATION AND GRADING .....</b>	<b>20</b>
<b>HOW TO USE CANVAS.....</b>	<b>24</b>
<b>LITERATURE.....</b>	<b>24</b>

## ADMINISTRATIVE INFORMATION

Any questions related to course organisation, lectures, seminars etc., should primarily be directed to the coordinator.

**Coordinator** Carolina Liljentröm, [carlil@kth.se](mailto:carlil@kth.se)

**Lecturers and project supervisors** Anna Björklund, [annab@abe.kth.se](mailto:annab@abe.kth.se)  
Göran Finnveden, [goran.finnveden@abe.kth.se](mailto:goran.finnveden@abe.kth.se)  
Miguel Brandão [miguel.brandao@abe.kth.se](mailto:miguel.brandao@abe.kth.se)  
Carolina Liljentröm, [carlil@kth.se](mailto:carlil@kth.se)  
Xenofon Chrysovalantis Lemperos [lemperos@kth.se](mailto:lemperos@kth.se)  
James Joyce [pjjoyce@kth.se](mailto:pjjoyce@kth.se)  
Elisabeth Ekener [elisabeth.ekener@abe.kth.se](mailto:elisabeth.ekener@abe.kth.se)

**Course responsible and examiner** Anna Björklund, [annab@abe.kth.se](mailto:annab@abe.kth.se)

**Teaching unit:** Division of Environmental Strategies Research-fms, Dept. of Sustainable development, Environmental science and Engineering.

**Visiting address:** Drottning Kristinas väg 30 (3<sup>rd</sup> floor)

**Web-site:** <https://www.seed.abe.kth.se/om/avd/fms>

## **COURSE AIM, CONTENT, AND WORK LOAD**

### ***Learning outcomes***

The overall aim of this course is to develop your skills of systems thinking in environmental issues, related to your own area of expertise. This course will give you a basic analyst's competence in Life Cycle Assessment (LCA).

After completing the course, you should be able to:

- Explain the overall purpose and principles of LCA.
- Discuss possible applications and limitations of LCA.
- Describe the content and explain the purpose of the analytical steps of LCA.
- Carry out a complete LCA of a product or service system, including:
  - identify and delimit the system,
  - specify and handle allocation problems,
  - identify and use relevant data from LCA databases,
  - collect and use data from other sources,
  - choose characterisation method based on coverage and relevance to the intended application,
  - implement and use a computer model of the system in the LCA software SimaPro,
  - analyse, explain, and interpret model results.
- Write a report of the performed LCA, applying the reporting guidelines and terminology as defined in the ISO standard for LCA.
- Make a critical review of another LCA.

### ***Course main content***

The course includes lectures, computer exercises and a group project.

Lectures will cover the following areas:

- LCA in relation to other environmental systems analysis tools.
- Methodology for the different phases of an LCA (goal definition and scoping, inventory analysis, impact assessment and interpretation).
- Methodology for simplified LCA.
- LCA software tools and databases.
- Critical review of an LCA study.
- Application areas of LCA and limitations.

Groups of 4 students perform LCA using the software SimaPro. Projects are presented in a report and at a seminar. Each group will also make a critical review of the LCA of another group.

### ***Time/work load***

From experience, we know that some students realise towards the end of the course that they did not plan to allocate enough time to course work. A 7.5 credit course corresponds to 5 weeks of full time work. You should expect to spend roughly the following amount of time in the course:

#### Scheduled

- Lectures: 18 h
- Computer labs: 12 h
- Supervision meetings: 4 h

#### Own studies, estimated time

- Reading course literature: 1 week
- Completing home exam: 5 h
- Project work: 2.5 weeks
- Critical review and final revision of report: 0.5 week

## **SUBMISSION DEADLINES**

Dates for lectures, computer labs and seminars are listed in the schedule in KTH Social.

In addition, the following important dates apply.

### Home exam

- **Friday, November 18 (at 12.00):** Home exam posted in Canvas.
- **Tuesday, November 22 (at 19.00):** Deadline submission of home exam in Canvas.

### Pre-seminar

- **Monday, November 28 (at 19.00):** Deadline for submission of summary and reflection from pre-seminar in Canvas.

### Final seminar

- **Friday, December 16 (at 17.00):** Deadline submission of reports before the final seminar in Canvas. NOTE: This version of the report will be graded.
- **Wednesday, January 11 (at 19.00):** Deadline submission of critical review in Canvas
- **Monday, January 16 (at 19.00):** Deadline submission of final revised report in Canvas.

## **COURSE REGISTRATION**

Please register on-line for the course through the personal menu at the top of the kth.se website. You will immediately see in your personal menu when you have registered successfully. If you encounter any problems when registering, please contact your program coordinator. The course coordinator does not handle course registrations.

Students must register for the course. If you are not registered, you are not allowed to attend the course, your grades will not be reported, and you will not be eligible to study allowance from CSN. Registration is possible only after you have applied and been admitted to the course.

Program students who have not applied when the course starts must contact their student counselor or program coordinator. This is your own responsibility and it cannot be arranged by the course coordinator.

## **STUDENTS WITH DISABILITIES (FUNKA)**

If you have a disability, you may receive support from Funka.

<https://www.kth.se/en/student/studentliv/funktionsnedsattning>

We recommend you inform the teacher regarding any need you may have. Funka does not automatically inform the teacher.

## LECTURES (L1 – L9)

The lectures give theoretical coverage of LCA methodology. This is important for you to work efficiently in your projects. To get you started at an early stage, most lectures are given at the beginning of the course.

In the following, it is indicated what parts of the course literature relates to the topic of each lecture. Use this as a help to read ahead and to find the right literature when working on your projects. You are encouraged to do the exercises in the course book.

### L1 - What is LCA? & Practical issues

**Lecturer:** Anna Björklund

**Content:** The lecture introduces key features of LCA. The purpose is to give you an overview of course content and a possibility to start reflecting over how LCA can be used in various fields of industry and society. Throughout the remainder of lectures, LCA methodology will be covered in depth.

We will also go through practical issues and course design in this lecture.

#### **Literature for L1:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Preface and Chapter 1.
- PRé Consultants (2013) [SimaPro Introduction to LCA](#). Chapter 1.

### L2 – Forming project groups & Goal definition and scoping

**Lecturer:** Anna Björklund

**Content 1st hour:** How to set up and design a LCA study. Understanding this phase (Goal definition and scoping) of LCA is important for you to make an adequate and meaningful formulation for the topic of your project. This is necessary as background for the first project supervision meeting (PS1).

**Content 2nd hour:** We will brain storm about project ideas and form project groups (4 members per group). Please prepare before Lecture 2 by thinking of topics that you would like to work with in your projects. Some food for thought is found in the document “[Suggested topics for LCA projects in AG2800](#)” (found in Canvas).

<p><b>NOTE:</b> If you miss this lecture, you need to contact the course coordinator ASAP in order to make sure that you join a project group!!! Project groups start working already during the first week of the course.</p>
--

#### **Literature for L2:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 2.
- PRé Consultants (2013) [SimaPro Introduction to LCA](#). Chapter 2.
- “[Suggested topics for LCA projects in AG2800](#)” (found in Canvas)

### **L3 –Goal definition and scoping continued. The Ecoinvent database (3 hrs)**

**Content hours 1-2:** Goal definition and scoping continued (2h). **Lecturer:** Anna Björklund

**Content hour 3:** About the Ecoinvent database v3 (1h): Exercises handed out in the lab.  
**Lecturer:** James Joyce

#### **Literature for L3:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 2.
- PRÉ Consultants (2013) [SimaPro Introduction to LCA](#). Chapter 2.

### **L4 - Inventory analysis**

**Lecturer:** Anna Björklund

**Content:** Constructing a flow model and collecting data of the technical system. Understanding this phase of LCA is important for you to make a detailed description of the technical system of your project, and to help you start collecting relevant data. This is necessary as background for the second project supervision meeting (PS2).

#### **Literature for L4:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 3.
- PRÉ Consultants (2013) [SimaPro Introduction to LCA](#), chapter 3.
- Finnveden, G., Hauschild, M., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D., and Suh, S. (2009) Recent developments in Life Cycle Assessment. *Journal of Environmental Management* 91, 1–21.

### **L5 – Impact assessment**

**Lecturer:** Göran Finnveden

**Content:** Describing the principles and methods available for impact assessment in LCA. Understanding this phase is important when you start interpreting the results of your project. This is necessary as background for the third project supervision meeting (PS3).

#### **Literature for L5:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 4.
- PRÉ Consultants (2013) [SimaPro Introduction to LCA](#). Chapter 4.1 - 4.4.
- Finnveden, G., Hauschild, M., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D., and Suh, S. (2009) Recent developments in Life Cycle Assessment. *Journal of Environmental Management* 91, 1–21.
- Hauschild, M., Goedkoop, M., Guinée, J., Heijungs, R., Huijbregts, M., Jolliet, O., Margni, M., De Schryver, A., Humbert, S., Laurent, A., Sala, S., and Pant, R. (2013) Identifying best existing practice for characterization modeling in life cycle impact assessment. *International Journal of Life Cycle Assessment*, 18:683–697.

## **L6 – Weighting, normalisation and interpretation**

**Lecturer:** Göran Finnveden

**Content:** Methods for further aggregation of impact assessment results, as an aid to interpret the impact assessment results. This is necessary as background for the fourth supervision meeting (PS4).

### **Literature for L6:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 5.
- PRé Consultants (2008) [\*SimaPro Introduction to LCA\*](#). Chapter 4.5 – 4.6.
- Hellweg, S. and i Canals, L. M. (2014) Emerging approaches, challenges and opportunities in life cycle assessment. *Science*, 344, 1109-1113.

## **Lecture 7 – Biogenic carbon cycles and Uncertainty in LCA**

**Lecturer:** Miguel Brandão

**Content:** On the modeling of biogenic carbon cycles in LCA. Sources and handling of uncertainty in LCA.

### **Literature for L7:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 3.3.6.
- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 6.3.
- Brandão, M. et al (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. *Int J of Life Cycle Assessment*, 18, 230-240.

## **Lecture 8 – Social LCA**

**Lecturer:** Elisabeth Ekener

**Content:** Overview of Social LCA, its main characteristics, methodology and guidelines.

### **Literature for L7:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 7.4.
- Wu, R. Yang, D., and ChenWu, J. (2014) Social Life Cycle Assessment Revisited. *Sustainability*, 6, 4200-4226.

## **Lecture 9 – EPD and LCA in practice**

**Content first hour:** The international EPD system – a tool for communicating life cycle performance of products and services. **Lecturer:** Kristian Jelse, The International EPD® System.

**Content second hour:** Environmental product declarations of buildings. **Lecturer:** Nicklas Magnusson, Tyréns.

### **Literature for L7:**

- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 6.8.

## **COMPUTER EXERCISES (C1 – C6)**

We have six scheduled meetings in the computer lab. Teachers are present at these times to help you out with exercises and working on your projects. Of course, you also need to work on your own at other times in the computer lab with these exercises and your projects.

Learning to use SimaPro early on in the course is important to be able to complete a successful project. Attending computer exercises is well-invested time for you and your group!

Throughout the course, SimaPro will be available to you in three of the computers labs at KTH (Bure, MacLean and Faggot).

### **C1 – SimaPro demo and tutorial**

Work in pairs, with someone in your project group. Run the SimaPro demo and start working on the tutorial. Follow the instructions that you can download from Canvas.

#### **Literature for C1 (available in Canvas):**

- [Instructions to SimaPro demo in AG2800](#)
- PRé Consultants (2013) [SimaPro Introduction to LCA](#)
- PRé Consultants (2014) [SimaPro Tutorial](#)

### **C2 – Tutorial and exercises**

Work in pairs (same as C1). Continue working on the tutorial and do the exercises found in the instructions in Canvas.

#### **Literature for C1 (available in Canvas):**

- [Instructions to SimaPro demo in AG2800](#)
- PRé Consultants (2013) [SimaPro Introduction to LCA](#)
- PRé Consultants (2014) [SimaPro Tutorial](#)

### **C3 – C6 Own project modelling in SimaPro**

Work in project groups. The remaining C3-C6 are scheduled to make sure you have time to meet a teacher to ask questions about modelling in SimaPro. However, you also need to schedule own time with your project group in the lab, since time during scheduled computer labs will not be enough.

#### **Course requirement – Computer exercises**

Minimum attendance at 5 (out of 6) computer exercises is required. Don't forget to sign the attendance list!

## WRITTEN EXAM

A written home-exam is given at mid-term. The objective of this exam is to ensure that all students grasp what is necessary to actively contribute to the group projects.

Please check “Submission deadlines” above in this document for dates when the exam opens and should be submitted.

The exam covers Lectures 1-6 and the corresponding literature, including basic LCA theory and some minor calculation assignments. Make sure to study the literature along with the lectures in advance. Starting to read when the home exam opens is not a good path to success and will be very stressful!

### Instructions

- The exam is an on-line exam, available in Canvas ([Assignments/Home exam](#)).
- You can work on the exam anytime while it is open in Canvas.
- Any aid (eg. course book, collaboration with friends) is allowed, even encouraged! Working on the exam together is a way to better learning.
- Plagiarism is not allowed. This includes copying answers from other students, from the course book or other written sources. Exams are automaticall checked for plagiarism. Answers with high degree of similarity between each other will be assessed as failed (F).
- The exam is graded A-F.
- Exams graded as Fx (fail with the possibility of supplementing to a Pass) will require supplementing through an oral exam. After supplementing, the exam can only be graded as E.

### **Course requirement – Written exam**

To pass the course, you need to acquire the grade E or higher on the exam. Exams graded as Fx (fail with the possibility of supplementing) will require supplementing through an oral exam. After supplementing, the exam will be graded as E.

## PROJECTS AND PROJECT REPORTS

You will perform an LCA using the software SimaPro. The aim of the project is to put theory from lectures and the course literature into practice, and to give practical experience of LCA modelling with a state-of-the-art LCA software.

### *Select topics and form project groups*

LCA can be applied to assess life cycle environmental impacts of products, processes or service systems, for a range of different purposes. Students select their own project topics depending on their own area of expertise and interest.

Projects are performed in groups of 4 students. During Lecture 2, we will discuss what topics you are all interested in and help you to form groups. During supervision, we will then help groups to delimit the question to something which is meaningful and manageable within the scope of the project.

Please prepare before Lecture 2 by trying to think of areas and topics that you would like to work with in your projects.

NOTE! Once you have formed your project group, you must sign up in Canvas. Under [People/Groups](#) you find a list of project groups (Project group 1-12). Each student in a group logs in to Canvas and joins a project group (for example Project Group 1).

### *Project supervision (PS) meetings*

You will meet with your supervisor four times throughout the course for project supervision (PS) meetings.

- **Sign up for supervision:** You sign up for supervision in Canvas ([Calendar/Scheduler](#)). Choose the supervision meeting that you want to sign up for (e.g. supervision 1) and the name of your supervisor (e.g. Carolina) and choose a time slot. It is important that all project members can attend.
- **How to prepare:** Details on what to prepare before meetings are listed in "[Instructions for project meetings in AG2800](#)". It is important that you come well prepared, according to these instructions.
- **At the supervision meeting:** Each group member must act as "project coordinator" at one meeting, with responsibility to present the work of the group to that date, questions, or any other issues. By rotating this responsibility among the members of the group, we make sure that all group members share the responsibility of the project as evenly as possible.
- **Attendance:** The entire group is required to attend each meeting!
- **A professional attitude**, ie. coming well-prepared to every meeting, can improve your final grade, since the work process as such is also assessed.

### **Course requirement – Project supervision meetings**

You are required to attend each supervision meeting. Failing to show up for supervision, for whatever reason, without having made a sincere effort to contact your group and supervisor to reschedule the meeting, will affect your grade negatively.

Each group member must act as "coordinator" at one meeting, with responsibility to present the work of the group to that date, questions, or any other issues. Failing to take this role seriously will affect your grade negatively.

### ***Project log book***

Before each supervision meeting, short notes must be prepared according to the instructions in "[Instructions for project meetings in AG2800](#)", uploaded to Canvas ([Assignments/Logbook for supervision](#)), and brought on a paper copy to the meeting.

This will help you to plan and follow up your own work, it gives your teacher insight in the progress of your project, and provides a possibility for back-tracking events if problems arise.

#### **Course requirement – Project log book**

Before each supervision meeting, each group should update their log book and upload on Canvas. Failing to manage your log book properly will affect your grade negatively.

### ***Project reports***

Each group writes a report (15-20 pages). Detailed instructions on format and content are found in the document "[Instructions for report & critical review in AG2800](#)".

#### **Course requirement – Project report**

Hand in report according to instructions on format and content.

## **PRE-SEMINAR**

Each group will present its draft report at a pre-seminar, attended only by students. The purpose is to give you the opportunity to get feedback on your own project and to learn from the work of other students.

All groups will be responsible for giving peer feedback on another project during the pre-seminar. You will not prepare any feedback before the seminar, but during the seminar you will take the lead in asking questions and giving feedback. After the seminar each group should write a brief summary of their feedback and a reflection about possible improvements in their own project as a result of what they learned from other groups during the seminar.

### Before the pre-seminar

- Sign up for pre-seminar times in Canvas ([Calendar/Scheduler/Pre-seminar](#)).
- You must attend the entire pre-seminar (2h) when your project is presented.
- You do NOT need to submit anything before the pre-seminar.
- Prepare a 10 min presentation that you can re-use and develop further for the final seminar. The pre-seminar presentation should only cover:
  - Goal & scope,
  - Life cycle inventory analysis, and
  - Brief outline of expected results and interpretation.

### During the pre-seminar

- Bring your slides on a USB memory stick or own laptop.
- All group members must participate in the presentation.
- Outline of presentation (total 25 min per group):
  - 10 min presentation by project group
  - 15 min discussion. Discussion starts by responsible peer feedback group giving feedback and asking questions. After this, all attending groups can ask questions.
- A teacher will be present at the beginning of the seminar to get you started, and at the end to answer any remaining questions from the presentations. Therefore, take notes of unresolved questions during the seminar.

### After the pre-seminar: Written summary and reflection

After the pre-seminar, each peer-feedback group writes a summary and reflection (about 1 page) including the following:

1. Mention two things (at least) about the project that was particularly good/inspiring/creative.
2. Suggest two things (at least) that could be improved in the project.
3. Mention two things (at least) that you will improve in your own project, as a result of what you learned from others during the pre-seminar.

(continued on next page)

Upload in Canvas after the pre-seminar ([Assignemnts/Pre-seminar reflection](#)). Please check “Submission deadlines” above in this document. Afterwards, these will be posted on Canvas for everyone to read.

**Course requirement – Pre-seminar**

You must attend the entire pre-seminar when your project is presented, participate in your own group’s presentation and peer feedback on other groups.

Each group must write a summary and reflection document of the pre-seminar, and upload it in Canvas according to instructions.

## FINAL SEMINAR AND REPORT SUBMISSION

Project reports are presented at a final seminar. Comments on your report will be presented at the seminar by a critical review group.

NOTE: The report that you submit before the final seminar is the one that is graded. After the seminar you will receive written feedback from your supervisor with a preliminary grade and necessary amendments. The preliminary grade will be your final grade if you manage to make the required amendments. Otherwise you may receive a lower grade.

### Before the final seminar

- Submit your report in Canvas ([Assignment/Project report](#)). Please check “Submission deadlines” above in this document.
- See separate instructions on report format (“[Instructions for report & critical review in AG2800](#)”). It will be automatically checked for plagiarism.
- Prepare a critical review of the project report of another group. See separate section in course memo (“[Instructions for report & critical review in AG2800](#)”).
- At the seminar each group has 45 min at its disposal
  - 20 min presentation
  - 15 min critical review
  - 10 min comments and questions from the rest of the audience
- All group members must participate and be able to answer questions related to the entire project.
- Bring your slides on a USB memory stick, or your laptop.

### After the final seminar

- After the seminar you will receive written feedback from your supervisor with a preliminary grade and necessary amendments.
- Make revisions to final report, as required in written feedback from your supervisor.
- Final revised reports shall be handed in at Canvas ([Assignment/Revised project report](#)).
- Please check “Submission deadlines” above in this document.

### **Course requirement – Final seminar**

Submit report according to instructions.

Attend and participate actively in the entire final seminar when your project is presented.

Submit final revised report according to instructions.

## **CRITICAL REVIEW OF PROJECTS**

Each project group shall prepare a critical review of the project report of another group. Critical review is an important procedure for quality assurance of LCA. By reading thoroughly the report of another group and making a critical review, you will also gain deeper insights in LCA methodology and application.

### Instructions

- When reports have been submitted, the reports will be uploaded in Canvas ([Discussions/Project reports for peer review](#)). You will be informed about what report to review, and you should download it from Canvas.
- The review should be prepared and presented according to the instructions in "[Instructions for report & critical review in AG2800](#)".
- Submit your critical review in Canvas ([Assignment/Critical review of project report](#)). Please check "Submission deadlines" above in this document.
- Also bring a paper copy of the critical review to the final seminar, to give to the group that you are reviewing.

### **Literature for critical review:**

- [Instructions for report & critical review in AG2800](#)
- Curran, M. A. (2015) *Life Cycle Assessment Student Handbook*. Chapter 6.7

### **Course requirement – Critical review**

Each group shall prepare and present a written critical review of the project report of another group. Hand in according to instructions.

## **CO-OPERATION AND EQUAL CONTRIBUTION IN PROJECTS**

Co-operating in projects is sometimes challenging. Group members may have different ambition level, different communication styles, or different expectations on each other, which can create conflicts. One reason to work in projects in courses is to experience this and to learn how to resolve difficulties in a professional way. The project requirements and supervision are designed in part to help you to plan your project in a way so that problems are avoided.

As a way to prevent, as far as possible, misunderstanding or conflicts between project group members, there is a “Project group agreement” form for each group to fill in.

Please contact your group supervisor at an early stage if you experience problems of co-operating in your group that you don’t know how to resolve yourselves, so that we can find a way to help you.

### **Course requirement – Project contract**

Each group must fill in a “Project group agreement” (available in Canvas) and save among its project documents.

## EXAMINATION AND GRADING

The course examination consists of the following parts:

Written exam (2,5 hp), grade scale: A, B, C, D, E, FX, F

Project report (4 hp), grade scale: A, B, C, D, E, FX, F

Critical review (1 hp), grade scale: P, F

The final grade (A-F) is a weighted average of the written exam and the group project assignment. In order to receive a final grade, the requirements for an "E" for the written exam and project assignment must be fulfilled, and "Pass" grade on the critical review is required. Failing to meet other course requirements, deadlines etc. is considered a badly handled working process and will affect your grade negatively.

Fx represents a failing grade which lies on the boundary between pass/fail, and can be complemented to reach the grade E.

### ***Written mid-term exam (2.5 hp, A-F)***

The written exam is graded A-F. Fx denotes a failed grade, but with the possibility to pass the written exam by oral examination. After oral examination, the student can only receive the grade E.

### ***Critical review (1 hp, P/F)***

The Critical review is assessed as pass/fail (P/F). To pass this assignment, it should be prepared and presented according to the instructions.

### ***Group project assignment (4 hp, A-F)***

The project assignment is the most important part of this course. It is graded A-F (see grading criteria below). The grade of the project assignment is based on the following factors:

- The written report, considering its:
  - *content* (your understanding of LCA methodology, and ability to design and perform an LCA study)
  - *formal qualities* (outline, clarity, language, referencing).
- The group and individual student's performance at supervision meetings and at the final seminar.
- Fulfillment of course requirements, regarding e.g. attendance.

The written report is the most important aspect.

### ***Upping and appealing a grade***

Rules for upping and appealing grades apply according to student rights at:

<http://www.kth.se/en/student/studentliv/studentratt/overklagan-overklagande-av-myndighetsbeslut-1.323892>

***Evaluation criteria for group project assignment***

<b>Aspects and assessment criteria</b>	<b>A</b>	<b>C</b>	<b>E</b>	<b>Fx</b>
<b>A. Report content</b>				
LCA methodology	LCA methodological aspects are correctly defined and used wherever necessary.	LCA methodological aspects are for the most part correctly defined and used wherever necessary.	Some important errors in documentation and use of LCA methodological aspects, but that did not entirely mess up the project design and results.	Severe mistakes or gaps in LCA methodology that cannot be easily corrected or explained in revision of final report.
Clarity and completeness	Content is clear, precise, and complete, so that the reader gets a good understanding of background, methodological choices, scope of the project etc.	Content is for the most part clear, precise, and complete, so that the reader gets a fairly good understanding of the project.	Content mirrors aim of the project, but with some serious unclarity in content.	Because of lacking or unclear information the content does not give the reader a good understanding of the project.
Relevance and conciseness	Content is well delimited, including only relevant content with regard to the goal of the LCA.	Content is for the most part well delimited, including only relevant content with regard to the goal of the LCA.	The report is readable with regard to relevance of content.	The report is difficult to read because of too much irrelevant content.
Documentation of data	Data documentation is complete and transparent, so that the reader easily understands how the project was modelled.	Data documentation is for the most part complete and transparent.	Documentation of data is not complete and transparent, but gives the reader some basic understanding of how the project was modelled.	It is not possible from the documented data to get a general understanding of what was modelled and how.
Response to research question	Clear connection problem- goal - results - discussion - conclusions.	For the most part clear connection problem- goal - results - discussion - conclusions. Some aspects missing.	There is some connection problem- goal - results - discussion - conclusions, but in general it is not well organised.	Problem and goal of study are not mirrored in results, discussion, conclusions.
<b>B. Written presentation, language and format</b>				
Language	Excellent language throughout report, both in terms of spelling and grammar, and reader friendliness of the text.	Mostly good language, both in terms of spelling and grammar, and reader friendliness of the text.	Report is readable.	Bad language, so that the content is difficult to understand.
Disposition and coherence	Content is well-disposed, coherently and logically structured, follows outline in report instructions, and easy to follow.	Content is mostly well-disposed, follows outline in report instructions, and mostly easy to follow.	The report outline for the most part follows the report instructions, but is not easy to follow.	Many deviations from report instructions, without apparent reason.

<b>Aspects and assessment criteria</b>	<b>A</b>	<b>C</b>	<b>E</b>	<b>Fx</b>
Figures and tables	All figures and tables are relevant and contribute to the content, have legends using consistent format, are consistently numbered, and are referred to and explained in the text.	Most figures and tables are relevant to the content, have legends, are numbered, and are referred to in the text. Explanations are missing or are incomplete.	Figures and tables have legends and are mentioned in the text, but either are not explained in the text or are not relevant.	Figures and tables are not included in a way that contributes to the understanding of the text. Legends missing. Not explained in the text.
References	References are included wherever necessary, in a way that would be acceptable in a scientific context (complete and consistent).	References are included in a mostly complete and consistent way.	References are used so that it is mostly clear when information comes from other sources, but are not complete and consistent.	Many important references are missing. References not used in a consistent way.
<b>C. Oral presentation</b>				
Final seminar, group	Very well disposed presentation, with regard to content of slides and presentation, that gives a good understanding of the project. Content presented within time limits.	Mostly well disposed presentation, with regard to content of slides and presentation, Time limits not severely surpassed.	Presentation and slides cover most relevant parts of the project. Time limits not severely surpassed.	Presentation does not communicate content of project. Severe surpassing of time limits. Very unbalanced contribution by group members.
Final seminar, group	All group members actively and equally involved in presentation and discussion.	All group members contribute, but with some unbalance of contribution.	All group members contribute, but with very uneven contribution.	Very unbalanced contribution from project members, so that some totally dominate alternatively are not given room to contribute.
Final seminar, individual	The student shows very good ability to meet the opposition at the final seminar, with clear argumentation and reflection based on the course literature and other literature used in the project.	The student is able to meet the opposition at the final seminar, and to discuss the project in a way that shows basic understanding of LCA methodology.	The student shows basic understanding of own project, and is able to answer questions directly related to own subject.	Student is not able to answer basic questions related to own project at the final seminar.
Supervision meetings, individual	The student participates actively in the discussion at supervision meetings, showing good understanding of LCA methodology and own project topic.	The student participates in the discussion at supervision meetings, mostly showing understanding of LCA methodology and own project topic.	Student is mostly able to answer basic questions directly related to LCA methodology and own project topic.	Student is not able to answer basic questions related to LCA methodology and own project during supervision.
<b>D. Group process</b>				
Professional project management	The group comes well-prepared and on time to supervision. It is clear that the group actively includes all group members in the project. Problems are communicated at an early stage to supervisor.	The group comes prepared and on time to supervision. All group members make some contribution during supervision.	The group mostly comes prepared and on time to supervision.	Group repeatedly does not show up on time. Group fails to communicate problems in time so that the project work does not proceed.

<b>Aspects and assessment criteria</b>	<b>A</b>	<b>C</b>	<b>E</b>	<b>Fx</b>
Independence	The group is able to independently and in a creative manner manage the research, including identify and delimit research question, data needs, assessment, and interpretation. The supervisor is consulted for feedback.	The group is sometimes able to independently manage the research, including identify and delimit research question, data needs, assessment, and interpretation. The supervisor often has to interfere to point out necessary next steps in the project.	The group is able to complete the project assignment, but with no or little independence in relation to the supervisor.	The group work does not proceed without repeated interference by the supervisor.
Log book and deadlines	The group uses the log book in a good way to plan and show progress of the project, according to instructions. Submissions of log book and other project deliverables meet deadlines.	The group uses the log book in a way that shows progress of the project. Submissions of log book and other project deliverables mostly meet deadlines.	The group uses the log book, but not in a good way to plan and show progress of the project. Project deliverables are submitted, but often fail to meet deadlines.	Group repeatedly fails to use log book and/or repeatedly fails to meet deadlines for project deliverables.
<b>E. Individual process</b>				
Student shows understanding of project and LCA methodology during supervision and seminar. Does this without interfering with a positive work environment and dynamics in the project group.	Much better than average in the group	Average in the group.	Much below average in the group.	Failing to meet requirement for Pass, without communicating and resolving issues with course responsible.
Meets requirements of attendance, or otherwise handles motivated absence in a professional way in dialogue with supervisor and rest of the group.	Much better than average in the group	Average in the group.	Much below average in the group.	Failing to meet requirements, in a way that interferes negatively with the project work.

## HOW TO USE CANVAS

All registered students have access to Canvas, KTH's course web.

We use Canvas for course material, management of project groups, and submission of exam and reports. We also communicate with students by sending messages through Canvas.

### IMPORTANT!!!

Make sure that your e-mail address registered in Canvas is the one that you use regularly. If not, you will miss important information sent by your teachers from Canvas. You can change the registered e-mail address by changing your personal settings in Canvas.

We appreciate if you add a picture of yourself to your Canvas account!

**How to log in:** <https://kth.instructure.com/courses/362> (Note that you must be registered on the course to access Canvas).

**Modules:** Here you find all information about the course (course memo, power points from lectures, course literature, SimaPro manuals and instructions for computer labs, information about the project work, and links to all your assignments).

**Discussions:** Here you find discussion forums related to the course assignments.

**Assignments:** Here you hand in all your assignments and the supervision logbooks.

**Files:** Here you find all the files uploaded to the course page in Canvas in alphabetical order.

**People:** Here you find a list of all the other students in the class. Under “Groups” you find all the project groups. Once you have formed your project group you sign up here.

**Calendar:** Here you can find the course schedule with all your lectures, seminars, computer labs and assignment deadlines. Note that you can import the calendar in Canvas to your own personal calendar.

**Scheduler:** Here you sign up for supervision appointments and seminars.

## LITERATURE

All course material, except the course book, can be downloaded from the course site in Canvas.

### *Book*

Curran, M. A. (ed) (2015) *Life Cycle Assessment Student Handbook*. Wiley.

You can order this book from for instance AdLibris ([www.adlibris.se](http://www.adlibris.se)) or Bokus ([www.bokus.se](http://www.bokus.se)). It will not be available at the student book store, simply because it would be much more expensive.

### ***Scientific papers***

Listed under each lecture.

### ***SimaPro manuals***

- PRé Consultants (2013) *Introduction to LCA*
- PRé Consultants (2014) *SimaPro Tutorial*

### ***Other***

- *Examples of topics for LCA projects in AG2800*
- *Instructions for project meetings in AG2800*
- *List of usefull LCA data sources in AG2800*
- *Instructions for report & critical review in AG2800*
- *Instructions to SimaPro demo in AG2800*