Course Memo

LIFE CYCLE ASSESSMENT

Credits: 7.5 hp

Course code: AG2800

Year: 2014

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

ADMINISTRATIVE INFORMATION **3**

COURSE AIM, CONTENT, AND WORK LOAD **4**

IMPORTANT DATES **6**

COURSE REGISTRATION **7**

DISABLED STUDENTS (FUNKA) **7**

LECTURES (L1 – L9) **8**

COMPUTER EXERCISES (C1 – C6) **11**

WRITTEN EXAM **12**

PROJECTS **13**

PROJECT REPORTS **15**

PRE-SEMINAR **16**

FINAL SEMINAR AND REPORT SUBMISSION **18**

CRITICAL REVIEW OF PROJECTS **19**

CO-OPERATION AND EQUAL CONTRIBUTION TO PROJECTS **20**

COURSE REQUIREMENTS IN SUMMARY **21**

EXAMINATION AND GRADING **22**

KTH-ID AND ACCESS CARD **24**

HOW TO USE BILDA **25**

LITERATURE **27**

ADMINISTRATIVE INFORMATION

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

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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 limitiations 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:
    1. identify and delimit the system,
    2. specify and handle allocation problems,
    3. identify and use relevant data from LCA databases,
    4. collect and use data from other sources,
    5. choose characterisation method based on coverage and relevance to the intended application,
    6. implement and use a computer model of the system in the LCA software SimaPro,
    7. analyse, explain, and interpret model results.
- Write a report of the performed LCA, applying to 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

- Home exam: 4 h
- Reading: 1 week
- Project work: 2.5 weeks
- Critical review and final revision of report: 0.5 week

IMPORTANT DATES

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

In addition, the following important dates apply

- **Week 46:** Project supervision meeting 1 (PS1) scheduled with supervisor
- **Week 47:** Project supervision meeting 2 (PS2) scheduled with supervisor
- **Week 48:** Project supervision meeting 3 (PS3) scheduled with supervisor
- **Week 50:** Project supervision meeting 4 (PS4) scheduled with supervisor

- **November 20 (at 8.00):** Home exam posted in Bilda.
- **November 24 (at 9.00):** Deadline for submission of home exam in Bilda.
- **December 2 (at 9.00):** Deadline submission of summary and reflection document from pre-seminar.
- **December 12 (at 18.00):** Deadline for submission of reports before the final seminar.
- **January 9:** Feedback with instructions for necessary amendments and preliminary grade will be emailed to the group.
- **January 19:** Submit your final revised report no later than this date.
- Revised reports will be corrected within 3 weeks from final submission.

COURSE REGISTRATION

Please register on-line for the course through My Pages → Registrations. You will immediately see in your personal menu when you have registered successfully. If you encounter any problems when registering, please contact the education office (Teknikringen 74).

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.

DISABLED STUDENTS (FUNKA)

If you have a disability and need special facilities or support measures to follow this course, please contact the "Funka" coordinators at the latest when you have been accepted to the course. Phone: 08-790 70 98 or email: funka@kth.se.

It is important that you immediately, no later than the beginning of the course, contact the course coordinator and provide information and, if necessary a certificate from KTH Funka coordinators. This must be done in order for us to take into account your specific needs.

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, but not required, to do the exercises in the course book.

L1 - Introduction. What is LCA?

The lecture covers key features of LCA, such as the history and purpose of LCA, LCA methodology in brief, and applications of LCA. The purpose is to give students 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.

NOTE: Possible topics for project works are briefly introduced at the end of the lecture. Please start thinking about what you would be interested in and possible group members, until Lecture 2.

Literature for L1:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 1
- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 1

L2 – Forming project groups AND Goal definition and scoping

First hour: We will discuss project ideas and form project groups of (4 members per group). Prepare by considering what topic you would like to focus on in your project.

Second 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).

NOTE: If you miss this lecture, you need to contact the course coordinator ASAP in order to make sure that you join a project group!!!

Literature for L2:

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 8
- *Suggested topics for LCA projects in AG2800*

L3 - Goal definition and scoping continued

Goal definition and scoping continued.

Literature for L3:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 3.
- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 2.
- 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.

L4 - Inventory analysis

Constructing a flow model and collecting data of the technical system, as defined in the goal and scope. 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:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 4
- PRé Consultants (2008) *SimaPro 7 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.
- 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.

L5 – Impact assessment

Describing the environmental consequences of the environmental loads of a technical system, the principles and methods available for doing so. 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:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 5
- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 4 (p. 19-24)
- 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

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

Literature for L6:

- Bauman and Tillman (2004) *Hitch Hiker's Guide*, chapter 5 (p. 142-143)
- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*, chapter 4 (p. 25-27)
- Hellweg, S. and i Canals, L. M. (2014) Emerging approaches, challenges and opportunities in life cycle assessment. Science, 344, 1109-1113.

Lecture 7 – Social LCA

Overview of Social LCA, its main characteristics, methodology and guidlines. Presentation of a case study.

Literature for L7:

- Benoît, C., Norris, G.A., Valdivia, S., Ciroth, A., Moberg, A., Bos, U. et al (2010) The guidelines for social life cycle assessment of products: just in time! International Journal of Life Cycle Assessment 15(2):156–163
- Ekener-Petersen and Finnveden (2012) Potential hotspots identified by social LCA—part 1: a case study of a laptop computer. International Journal of Life Cycle Assessment, 18(1), 127-143.
- Wu, R. Yang, D., and ChenWu, J. (2014) Social Life Cycle Assessment Revisited. Sustainability, 6, 4200-4226.

Lecture 8 – LCA in practice

Lectures by invited speakers on the use of LCA for environmental product declarations.

- "The international EPD system – a tool for communicating life cycle performance of products and services", Katja Wehbi, The International EPD® System.
- "Development of a European environmental footprint framework (PEF)", Cecilia Mattson, Swedish Environmental Protection Agency.

Lecture 9 – LCA in practice

Lectures by invited speakers on application of LCA in companies and for planning purposes.

- "Environmental product declarations of buildings", Nicklas Magnusson, Tyréns.
- "LCA of ICT products and systems at Ericsson", Mine Ercan, Ericsson Research.

COMPUTER EXERCISES (C1 – C6)

We meet at six occasions in the computer lab. Teachers are present at these time to help you out. Ofcourse, 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! Attendance at five (5) computer labs is required.

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

C1 – SimaPro demo and tutorial

Work in pairs. Run the SimaPro demo and start working on the tutorial. Follow the instructions that you can download from Bilda.

Literature for C1:

- *Instructions to SimaPro demo in AG2800*
- PRé Consultants (2006) *SimaPro 7 Introduction to LCA*
- PRé Consultants (2006) *SimaPro 7 Tutorial*

C2 – Tutorial and excercises

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

Literature for C1:

- *Instructions to SimaPro demo in AG2800*
- PRé Consultants (2006) *SimaPro 7 Introduction to LCA*
- PRé Consultants (2006) *SimaPro 7 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 excercises

Minimum attendance at 5 (out of 6) computer exercises is required. Lower attendance will affect your grade negatively.

WRITTEN EXAM

A written home-exam is given at mid-term. Please check KTH Social for info about dates.

It covers Lectures 1-6 and the corresponding literature, including basic LCA theory and some minor calculation assignments. The objective of this exam is to ensure that all students grasp what is necessary to actively contribute to the group projects.

Instructions

- You can work on the exam anytime while it is open in Bilda.
- Answers are submitted by uploading your answers in Bilda (Assignments/Home exam).
- Any aid (eg. course book, collaboration with friends) is allowed, even encouraged! Working on the exam together is a way to better learning.
- Copying does not improve learning. Answers must be written individually. Copying text from the course book and other written sources, or from your friends, is plagiarism! Exams 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) will require supplementing through an oral exam. After supplementing, the exam can only be graded as E.

Important dates

- **Thursday, Nov 20 at 8.00:** Exam will be posted at Bilda (Message board)
- **Monday, Nov 24 at 9.00:** Submission of answers is allowed until this time. After this, the assignment submission in Bilda will be closed.
- Exams will be corrected within 3 weeks from the time submission in Bilda is closed.

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

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

LCA can be applied to technical product or service systems, for a range of different purposes. Students are encouraged to select their own topics, depending on their own area of expertise and interest. We will help in delimiting the question to something which is meaningful and manageable within the scope of the project.

Form project groups

Projects are performed in groups of 4 students, formed by students depending on interest. Suggestions of possible topics are introduced at Lecture 1. Groups are formed and topics selected at Lecture 2.

Project supervision (PS) meetings

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

- Your supervisor will pass around a list to sign up for meeting times. Select a time that suits all your project group members.
- 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.
- 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.
- 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

Each group has a project Log book in Bilda (Communication/Log book).

Before each supervision meeting, short notes must be prepared according to the instructions in *"Instructions for project meetings in AG2800"*, uploaded to the Log book in Bilda, 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 Bilda. Failing to manage your log book properly will affect your grade negatively.

PROJECT REPORTS

Each group writes a report (15-20 pages). Detailed instructions of required content are found in the document *"Instructions for report & critical review in AG2800"*.

Report submission

Reports are submitted in Bilda (Assignments/Report) before the final seminar. For dates, please see "Final seminar" below. Your report will be automatically checked for plagiarism.

The report that you submit 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.

Course requirement – Submitting reports

Your project report must be submitted according to instructions.

Report feedback

After the final seminar, each group will be notified about the preliminary grade and necessary amendments. For dates, please see "Important dates" in this document.

Submission of final revised reports

Final revised reports shall be handed in at Bilda (Assignments/Final revised report). Along with the final revised report the list of corrections and answers to reviewer's comments should be provided. For dates, please see "Important dates" in this document.

Course requirement – Submission of final revised reports

Final revised report must be submitted according to instructions and dates in the schedule.

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. You should prepare a presentation that you can re-use and develop further for the final seminar. The presentation is made at a stage when projects are not yet complete, hence it should only cover:

1. Goal & scope,
2. Life cycle inventory analysis, and
3. Brief outline of expected results and interpretation.

All groups are assigned as main responsible for giving peer feedback on another project during the pre-seminar. You do not prepare this feedback, but after the seminar each group should write a brief summary of their feedback and a reflection about any possible ideas for improvement in their own project.

Instructions for the pre-seminar:

- Sign up for pre-seminar times at lists passed around during computer exercise.
- You must attend the entire pre-seminar when your project is presented.
- You do NOT need to submit a draft report before the pre-seminar.
- All group members must be involved in the presentation.
- Each group has 20 min at its disposal (10 min presentation and 10 min discussion.)
- Discussion starts by responsible peer feedback group giving feedback and asking questions. After this, all attending groups
- 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.
- Bring your slides on a USB memory stick.
- For dates, please see “Important dates” in this document.
-

Instructions for written summary and reflection (about 1 page)

After the pre-seminar, write a brief (about 1 page) summary of your feedback and a reflection about any possible ideas for improvement in their own project. Include the following:

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

Upload in Bilda (Assignments/Pre-seminar reflection) 2 days after the pre-seminar. These will be posted on Bilda 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 Bilda 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.

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.

Instructions

- Submit report in Bilda (Assignments/Report). See separate instructions on report format. It will be automatically checked for plagiarism.
- Prepare a critical review (see separate section in course memo) of the project report of another group.
- At the seminar each group has 45 min at its disposal (25 min presentation, 20 min critical review, comments and questions).
- All group members must participate and be able to answer questions related to the entire project.
- Bring your slides on a USB memory stick.
- For dates, please see "Important dates" in this document.

Course requirement – Final seminar

You must attend and participate actively in the entire final seminar when your project is presented.

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

- The same day that reports have been submitted, you will receive by email the report that you should review.
- The review should be prepared and presented according to the instructions in *"Instructions for report and critical review in AG2800"*.
- Submit your critical review in Bilda (Assignments/Critical review) after the final seminar (same day).
- 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:

- *Hitch Hiker's Guide*, chapter 7
- *"Instructions for report & critical review in AG2800"*

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 TO PROJECTS

Co-operating in projects is sometimes challanging. One reason to work in projects is to experience this and to learn how to resolve difficulties. The project requirements and supervision are designed in part to help you to plan your project in a way so that problems are avoided.

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. After the report is handed in, it is too late.

COURSE REQUIREMENTS IN SUMMARY

Course requirements, as highlighted throughout this document, are summarised below.

Computer exercises

Minimum attendance at 5 (out of 6) computer exercises is required. Lower attendance will affect your grade negatively.

Mid-term 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.

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, each group should prepare notes in a log book. Failing to manage your log book properly will affect your grade negatively.

Pre-seminar

You must attend the entire pre-seminar when your project is presented.

Each group must write a summary and reflection of the pre-seminar, and upload it in Bilda.

Submitting report

Report must be submitted according to instructions and dates in course memo.

Final seminar

You must attend and participate actively in the entire final seminar when your project is presented.

Critical review

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

Revision of draft reports

Final revised report must be submitted according to instructions and dates in course memo.

EXAMINATION AND GRADING

The course examination consists of the following:

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 eaxmination. 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 student’s performance at supervision meetings and at the final seminar.
- Fulfillment of course requirements, regarding e.g. attendance.
- The student’s contribution to the final report, if not divided equally among group members (stated in the Declaration of cooperation).

Content of the report is the most important out of those three. The report that you submit 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.

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

Grade	Criteria
A	Besides the demands for a B • The report is well-written and easy to follow. • The content of the report meets all the report instructions. It contains a relevant and self-dependantly developed critical analysis and discussion. • The student shows 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.
B	Besides the demands for a C • The student shows initiative and participates actively in the dicsussion at supervision meetings and seminars. • References are used in a way that would be acceptable in a scientific context (see report instructions).
C	Besides the demands for a D • The student comes prepared to the supervision meetings, according to the instructions (see meeting instructions). • The student is open to supervision and critique and able to incorporate this in it's own work. • Key aspects of LCA and methodolgical choices are correctly defined and documented in in the report (see report instructions). • The results relate clearly to the goal and scope of the study.
D	Besides the demands for an E • Fulfillment of course requirements and time-constraints concerning project log book and submission of report drafts and critical review. • Shows understanding of own project, and is able to answer questions directly related to own subject.
E	• The student can identify and explain, in word and in writing, the main life cycle stages related to the studied product or service. • Fulfillment of required attendance supervision meetings, computer exercises, pre-seminar, and final seminar. • The report outline follows the assignment instructions, including each of the indicated headings. • The report is readible, ie not too difficult to follow and not containing too many language errors. • The report is written in a way so that it is clear what parts of the report are the writers' own thoughts, and what parts are taken from other sources, what those sources are, where they can be found. • A signed Declaration of cooperation is handed in.
Fx	Failing grade, on the boundary between pass/fail. Possibility to supplement the grade to pass the project assignment, receiving at most the grade E. This should be done by showing that the failed course goals have been achieved. The examinor will design a relevant examination task in each case. The additional examination should be performed within six weeks (scheduled) of receiving the grade Fx.
F	Failed

KTH-ID AND ACCESS CARD

Access to SimaPro, Bilda, and KTH Social

To have access to SimaPro and Bilda you will need a kth.se account. Instructions are available at

http://www.kth.se/en/student/support/information-om-kth-se-konto-1.46570

Access card

You will need an access card to get into computer labs. Pick up your access card at the IT-SupportCenter.

Address: Drottning Kristinas väg 19 (THS Kårhuset)

Open: vardagar 08:00 – 16:30

Phone: 08-790 9300

Email: kortexp@admin.kth.se

HOW TO USE BILDA

All registered students have access to Bilda, KTH's web-based tool for netbased learning. This is where course material is available, and assignments are handed in. Check in on Bilda regularly during the course, to keep updated for course news!!!

IMPORTANT!!!

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

Please also add a picture of yourself to your Bilda accont.

The address is http://bilda.kth.se. You enter the course page in Bilda by selecting "AG2800 Life cycle assessment" from "My events". You can choose among the following:

Overview

An overview of all functions available to students in Bilda in this course.

Documents

Event documents

Students can download documents from here. It includes course material (course memo, instructions, lecture notes, scientific papers etc.) that are either posted from the start of the course, or will be posted by your teachers as the course proceeds.

My documents

Here you may upload personal documents. They are only visible and available to you.

Group documents

Each project group will have access to a group folder of their own, that is only visible and available to the members of that group.

Assignments

This is where you hand in answers to the mid-term exam, reports before the final seminar, final revised report after the final seminar, and your critical review.

Participants

A list of all participants and their email addresses.

Message board

Teachers can post messages to the entire course, or to selected project groups. The Home exam will be posted as a message, available from Nov 12.

Discussion

- A discussion forum is available for the entire course (Course café). This is where you ask questions to all other students of the LCA course, or tell everyone about remarkable LCA experiences that you have made!

- A special discussion forum will be open during the home exam, to pose questions to your teachers.
- A discussion forum is also available for every project group. Only members of that group have access to these forums.

Project groups

A project group account is set upp for all groups. From here, you can view everything that your group has access to in Bilda.

LITERATURE

All course material, except the course book, can be downloaded from the course site in Bilda (http://bilda.kth.se).

Book

- Baumann, H. and Tillman, A.-M. (2005) *The Hitch Hiker's Guide to LCA. An orientation in life cycle assessment methodology and application.* Studentlitteratur.

You can order this book from AdLibris (www.adlibris.se), Bokus (www.bokus.se), or Studentlitteratur (www.studentlitteratur.se). It will not be available at the student book store, simply because it would be much more expensive.

Scientific papers

- 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.
- Hellweg, S. and i Canals, L. M. (2014) Emerging approaches, challenges and opportunities in life cycle assessment. Science, 344, 1109-1113.
- Benoît, C., Norris, G.A., Valdivia, S., Ciroth, A., Moberg, A., Bos, U. et al (2010) The guidelines for social life cycle assessment of products: just in time! International Journal of Life Cycle Assessment 15(2):156–163
- Ekener-Petersen and Finnveden (2012) Potential hotspots identified by social LCA—part 1: a case study of a laptop computer. International Journal of Life Cycle Assessment, 18(1), 127-143.
- Wu, R. Yang, D., and ChenWu, J. (2014) Social Life Cycle Assessment Revisited. Sustainability, 6, 4200-4226.

SimaPro manuals

- PRé Consultants (2008) *SimaPro 7 Introduction to LCA*
- PRé Consultants (2008) *SimaPro 7 Tutorial*

Other

- *Suggested 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*