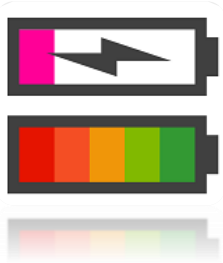
Course analysis

EI2460 Batteries for Energy Storage in Electrical Systems 6.0 credits

VT23 (P3)



By:
Daniel Månsson: examiner, teacher and course responsible for ei2460.

LABA – 1 cr.
INLA – 1 cr.
TEN1 – 4 cr.
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6 cr.

Lectures/Seminars: 11 á 2h
Tutelage for INL and LAB: 3 á 2h
Presentation seminar: 1 á 3h

Number of students: 33 initially registered; 27 accepting; 24+1 "active"

Course literature:

- Different books available via KTHB library and/or search engine, e.g.:
  - "*Electrochemistry - A Guide for Newcomers*" H.Baumgärtel,
  - "*Energy storage for power systems*" A.G. Ter-Gazarian
  - "*Energy storage*" R. A Huggins
  - "*Energy storage systems and components*" A. Rufer
- Relevant articles and reports related to subjects discussed.
- Lecture notes with reference to the above.

"Kursanalys -Analysmallen uppdaterad feb 2020."

1. ***" DESCRIPTION OF THE COURSE EVALUATION PROCESS -Describe the course evaluation process. Describe how all students have been given the possibility to give their opinions on the course. Describe how aspects regarding gender, and disabled students are investigated."***
   --> All students have had the opportunity to submit opinions anonymously through LEQ. In the course we have many discussion exercises and I have encouraged an open environment where the students can comment directly, or via email, to me. The LEQ had a very low response rate (4 of 25) and no indicators existed there.
   (Interestingly, there is in the course a dedicated section on sustainability in connection to batteries in the grid and aspects of e.g. gender is discussed via, e.g., UN goal no. 5 "Gender equality" but also in

the context of the other development goals.)

2. ***"DESCRIPTION OF MEETINGS WITH STUDENTS- Describe which meetings that has been arranged with students during the course and after its completion."***
   --> In the course I have dedicated sessions to help/tutor the students on the learning activities and especially the LAB and INL course components but I use these to "probe" into the status of the course and the students and I often get good feedback. However, after the completion of the course it is very difficult to engage students and during the course, it is difficult to engage students in "student study boards" (often not possible at MSc level courses in my experience).

3. ***"COURSE DESIGN - Briefly describe the course design (learning activities, examinations) and any changes that have been implemented since the last course offering."***
   --> See above for course structure and below for discussion and potential changes and reflections concerning these.

4. ***"THE STUDENTS' WORKLOAD – Does the students' workload correspond to the expected level (40 hours/1.5 credits)? If these is a significant deviation from the expected, what can be the reason?"***
   --> Due to the low response rate (4 of 25 = 16%) I do not want, and cannot, draw any conclusions from the LEQ questionnaire but the little I saw, and know from previous years, is that a few students put a disproportionate amount of time on INL and LAB. During the tutorial sessions and the lectures I try to enforce the scope, given in the instructions, of these but some student have difficulties limiting themselves. On the other hand, I find it hard to suppress this if they find the topic interesting.
   Also, even though we have discussions as learning activates during every lecture (thus, the evaluation is distributed) a few students still seem to start to study only near the exam (which is a known phenomenon).

5. ***" STUDENTS´ANSWERS TO OPEN QUESTIONS - What does students say in response to the open questions?"***
   --> See below.

6. ***"OVERALL IMPRESSION - Summarize the teachers' overall impressions of the course offering in relation to students' results and their evaluation of the course, as well as in relation to the changes implemented since last course offering."***
   --> See below.

7. ***"ANALYSIS - Is it possible to identify stronger and weaker areas in the learning environment based on the information you have gathered during the evaluation and analysis process? What can the reason be? Are there significant differences in experience between: - students identifying as female/male? - international/national students? - students with/without disabilities?"***
   --> Due to the low response rate (4 of 25 = 16%) I do not want, and cannot, draw any conclusions on these issues from the LEQ questionnaire but I have noticed that the degree of exchange students that have difficulties with "non-fixed formats" such as the discussion during the lecture is larger than for Swedish students perhaps used to such things at KTH. But I want to stress that I have not quantified this and I refrain from drawing sweeping conclusions.

8. ***"PRIORITIZED COURSE DEVELOPMENT - What aspects of the course should be developed primarily? How can these aspects be developed in short and long term?"***
   --> See below.

9. ***"OTHER INFORMATION - Is there anything else you would like to add?"***
   --> See below.

General thoughts from the course round

1. Again there was a very low number of students answering the LEQ (4/25≈16%) so the data can't be trusted. Thus, I will try to implement my own course questionnaire, on

paper, the last lecture (it will still be anonymous).

2. I noticed that the exam came a week earlier than before. It could just be a coincidence of the scheduling process but it created much more stress for me. I will check this the next course round.

3. Previous years, I was, in general, happy with the exam format, i.e., a mix of shorter questions and essay type questions, and the division into sections (connecting to the ILOs). This time I had only essay type questions and I did not like it as it gave me much too much material to evaluate and I felt it didn't really add anything in the way of having the students more accurately show their level of understanding. Thus, next time I will go back to the mix of questions of previous years.

4. As previous years, I think that the lectures and the discussion in the classroom went well which, I think, aided the students in selecting and working with the INL. It worked well with the Q&A/tutelage seminar ("handledning") sessions both for INLA and LABA although not all students opted to attend.. The INLA was individual and the topics of the INLA presented by the students in the 3h session were, in general, both broad and interesting for all of us. The quality of the work and the presentation was good so it was a success I think that the students seem to take this task to heart. Also, the peer-review on the fellow student's reports again worked well. I was very clear with how KTH handled suspected plagiarism and communicated what this constituted and I also improved the instructions even further so no such was cases were suspected.
    - One note here, again I noticed that the 3h is somewhat short to have all approx. 30 students report their INL project and I feel that a 4h session is a bit long. Also, I have to more emphasize the nature of the INL project; that they should pick an original (some degree) problem/research question and study it. Even if it becomes a situation of an "unsolvable problem" and not just a bland literature study of a broad topic. This last I already enforce to some degree by forcing the students selecting very specific topic but I have noticed that this takes some attempts for some students.

      I think I will change INL to a two-person-group-project next year (also due to LEQ point 21 below) so the students collaborate more, the level of complexities of the projects can further increase and there will be more time for discussions and feedback.

5. The visit to the battery manufacturer was, as always, very well liked and the students got good contacts via, e.g., meeting former students from the course and students from KTH doing their MSc thesis. I tried, but didn't manage, to arrange more visits/guest lectures but I will try again next course round (I have had representatives from a power utility talking before).

6. <u>Input from LEQ and comments (remember that only 4 out of 25 give input):</u>
1. I worked with interesting issues = 7/7
4. The course was challenging in a stimulating way = 5.2/7

15. I could practice and receive feedback without being graded = 5.5/7
--> I think this would be higher as we had the discussions with feedback (that works well and similar to my other MSc course) during the lecture. But I will add "control questions" after each lecture that the students can utilize as formative feedback to evaluate their understanding.
16. The assessment on the course was fair and honest = 6.2/7
21. I was able to learn by collaborating and discussing with others = 5.2/7
--> Make INL a two-person-group-project as discussed above.
22. I was able to get support if I needed it = 6.5/7
(1 = No, I strongly disagree with the statement
4 = I am neutral to the statement
7 = Yes, I strongly agree with the statement*)*

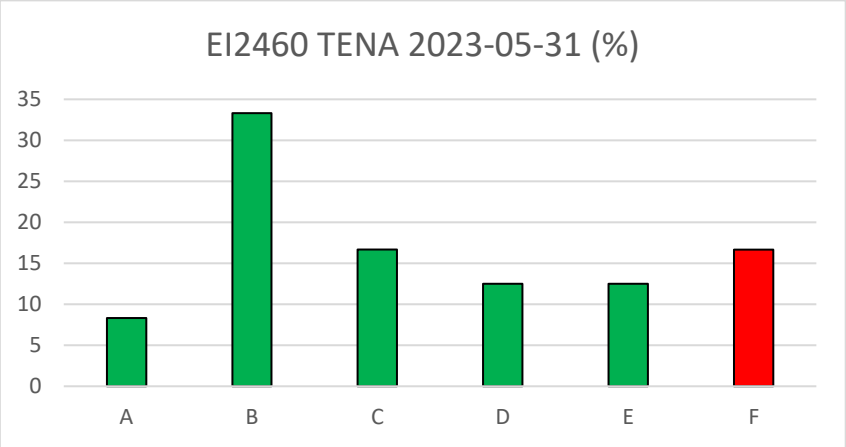
Some comments on the "open questions".

- I will add even more examples of calculations and technical analyses; in-part as I have thought about this myself and now one students commented on wanting this. But I will evaluate how it goes.
- One comment asked for more on sustainability of batteries; this part is now ½-1 lecture but perhaps I will plan for it always being a full lecture. Today it is not a direct ILO (only part of one) so I hesitate adding more today but I will evaluate the change and see if students want more after next course round.
- I felt that some students do not check the comments I make on the assignments in Canvas. I get questions from some students where I know I gave feedback in Canvas answering their questions. But I will make sure to emphasize that all feedback is given via Canvas so they have to check there. Also I will be more critical (of my feedback) next time to see if I am not clear.
- One idea was to have INL presentations in smaller groups but I think that then the students won't see all the projects which is a loss. I think this will be solved by having two-person-groups as it gives more time for the presentation and feedback/comments.
- One comment wants a lab of how to prepare a small coin battery and test it but I feel this is a bit out of scope for the course but I can perhaps link to instructions of how to create a simple battery at home and how to test it. Remember, this is not a chemistry course even if we use some chemistry to base parts of our models on.
- One comment wanted more text on the slides, but these are not a book, those I refer to in the slides, so I won't be doing that. But I will check to see if there are e.g. single graphs on slides without any background information or explanation. There I can enter some explanatory text.

Thoughts for next course round

I. The GAMS lab (LABA) is still well liked and I can clearly see that the students implemented what they learned during LABA for the exam. For this year, I expanded LABA a bit to encompass a few more items to further help the students understand how battery services to the grid can be investigated but I think I can add some few more items for next year. I will monitor the introduction of these new tasks in LABA but it should be fine within the 1 Cr. in Ladok.

II. Too few answers the LEQ, 4 out of 25, it can't be trusted or really used so next year I will implement my own course questionnaire (as mentioned above).
III. Also implement control questions at the end of each lecture.



Figur 1, approximately 83 % passed the ordinary exam.

Conclusion:
The course was again improved and changed a fraction since last year, but not much. I am, for the most part, happy with the lectures and the discussions herein and also how LABA and INLA turned out. For next course round, I will implement some additions to LABA and change INLA to two-person-group-project. I will also implement control questions at the end of each lecture and my own course questionnaire.