

Course analysis

EI2460 Batteries for Energy Storage in Electrical Systems 6.0 credits

VT20 (p3)

LAB1 – 1 cr.

INL1 – 1 cr.

TEN1 – 4 cr.

6 cr.

By:

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Parts

Lectures: 11 á 2h

Lab: 1 á 2h

Tutelage for report: 2 á 2 h

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.

General thoughts

1. First, I noticed that the most unbalanced negative comments came from students that put 0-2 h/week into the course and the most fair and positive comments from those that spent more time on the course (6-8 h/week). That seems to be an indication that perhaps those students that where the most negative didn't have such a fair interest in the subject or put enough time into the course to put enough time-on-task to develop.
2. As this was the first time the course was given I knew this was going to be a sort of test run to see what worked and what did not, i.e., what I later could remove or add to the course in the form of content, topics and parts. When the Covid-19 pandemic hit, just as the course was about to start and KTH took the decision to move most teaching online I got with sick with flue like symptoms (most probably Covid-19) and I knew that I wouldn't be able to give the lectures online via zoom (I couldn't trust I was well enough). In addition, with VAB, I was very unsure that I was going to able to keep the regular schedule to give online live classes. Thus, to still be able to give the course with any sense of cohesive and conformity in the course I decided to post all lecture notes online instead for the students to study. So this was done to not have to repeatedly rebook and cancel lectures for the students when I couldn't teach them. (The exception being the two guest lectures (from KTH and Northvolt) that were given via zoom). I did not receive

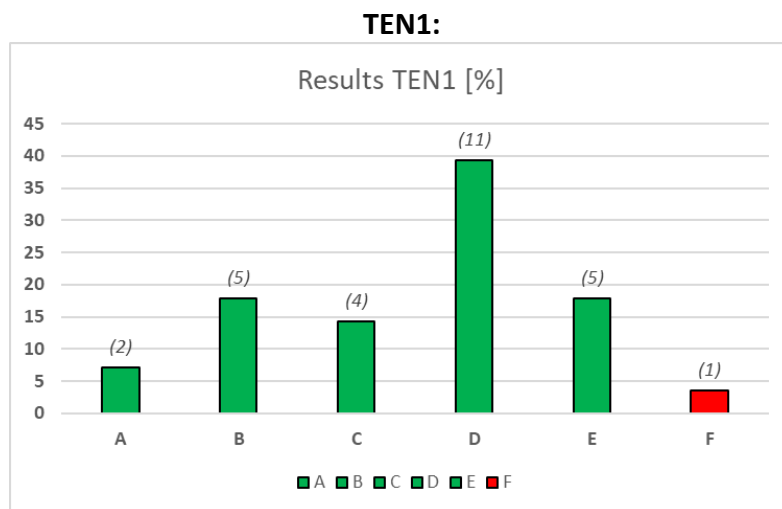
any complaints or suggestions about this system from the students during the course. Questions I got I tried to respond to swiftly to keep the momentum and student interest in the online course format. In the LEQ some student raised strong objection to the lack of “live lectures” despite not voicing this before during the course. With the above mentioned points, I find these comments/attacks perplexing and in some cases the comments show a strange lack of understanding of the situation the covid-19 isolation forced upon us and the decisions KTH took.

- 2.1. I did get emails from some students thanking me for the course and who felt it was an excellent course and, as said before, the most negative comments came from students who self-reported little activities in the course.
3. For the Labs in the course, to remove the risk of spreading Covid-19 I managed to arrange to keep the IoLs of the labs by doing them via a free software (“Yenko”) and keep more or less what I wanted from them. Some students told me they liked this and some felt it was bad. Hopefully, this is not big concern for the next course round as, hopefully, the labs will be done as normal then (but again I find it strange that some students did not understand the lack of possibility to do the labs at KTH).
4. Even though different book chapters and articles were highlighted to be used, there was one comment that the lecture slides was not explicative enough to be used solely (which they never were intended to...). I had I tried to add more text than originally intended for the live lectures but I have noted passages were more text will be added for the next course round. Some students on the other hand liked the lecture slides so a definitive conclusion is hard to give.
5. Some students complained that they didn’t get any feedback on their reports, but this was done via peer review by their fellow students and they had received instructions of how do this peer review. This would perhaps also be less of a problem if I could have pressed this also during normal live lectures.
 - 5.1. I think this highlights the problem of peer review and expectations of some students when it comes to comments on their reports.
 - 5.2. However overall, I think that the INL1 reports went well. For all students I offered to read their initial draft, and many took me up on this offer, to comment and give directions. This was instead of the two 2h tutelage sessions originally planned.
 - 5.3. One unfortunate thing, that again was related to Covid-19, was that we could not practically arrange an oral presentation of all these reports. Hopefully, this can be done next year if all is back to normal (otherwise more time can be scheduled to do this via Zoom).
6. Before the start, I was approached by some PhD students who wanted to take the course but this became problematic as some of them where in chemistry so the intricate subject of electrochemistry for batteries was here presented at a level perhaps to basic level for these PhD student. Some of the students complained about this but I think the responsibility is entirely upon them to select to follow a Msc level course in electrical engineering and batteries in the power grid where the electrochemistry is not focused upon.

7. Again, to make it easier for the students to study, I chose to have the exam as a non-proctored open-book exam. I think that in EE subjects most students are not used to this type of exams where the questions are much more complex so there was some initial confusion on the nature of the exam but I think that in the end the students did relatively satisfactorily.

Thoughts for next course round

- I. I have identified some course topics I want to add, from the progress in the field and from reading the reports of the students, that I think will be relevant and interesting.
- II. I will try to keep the software labs, but optional, in addition to the regular lab as the simulations give students with little, or no, experience with this topic more experience with it. I think the 1 cr. in Ladok covers for it.
- III. I think that I will keep the online type of exam but I will make one part proctored over zoom consisting of quiz like question in Canvas and then a second part that can be done as an take home open-book exam that is non-proctored.
- IV. As I think the guest lectures went very well, I will try to add one from the side of the grid operator such as Vattenfall or Fortum. Hopefully, this can be planned.



Figur 1, ca 96 % passed the TEN1 exam.

Conclusion: The Covid-19 pandemic, subsequent isolation and remote teaching put some difficulties for the course, especially as this was the first time the course was ever given and that I myself got sick. I have identified what to keep and what to improve. Overall, with the situation being what is was I think the course went ok and I believe it will be improved the next course round.