

Course analysis – ei2402 “Electromagnetic Compatibility (7.5 Credits)” Ht2022

Staffing

Responsible department / division: EE / EME

Course-responsible, lecturer and examiner: Daniel Månsson

Events

Lectures: nine double-period sessions (i.e., $9 \cdot 2 \cdot 0.75 \text{ h} = 13.5 \text{ h}$) approximately two per week.

Additional tasks: one experimental laboratory group task one including numerical simulations, two individual home assignment.

Registered students following the course

HT2022: = 17 registered and I would say that 16 students “followed” the course in an active way.

Course evaluation:

Unfortunately, only 3 of the 17 students answered the LEQ so these results cannot be trusted or really used! Nothing can be said about the workload of the students or how different groups of students approached the course. However, the few results were in-line with what is usually said (that the course is generally very well liked and useful). A few strange comments given (see my comments below).

Course components and points

Extract from Kopps:

- LAB1 3.5 Credits (P, F). To pass LAB1 a student has to finish:
 - Experimental lab with numerical simulations as well as handed in a satisfying report.
 - Hand in a satisfying report for individual home assignment 1 (ha1).
 - Hand in a satisfying report for individual home assignment 2 (ha2), peer-review two other students reports and present their selected topic for the class during the specially session.
- TEN1 4.0 Credits (A, B, C, D, E, FX, F).

If LAB1 has a “P” then the final grade of the course is set by the grade from TEN1.

Results

For LAB1 (at the time of writing) 13 of the 16 students (i.e.) has finished all the different assignments to pass LAB1. Two students missed one individual assignment and one student has not done any (but took the TEN1 exam).

The grade distribution, for TEN1 in HT2022, is given below. 15 students (of the 16 “active”) wrote the exam.

| Grade | # | % | Ratio |
|-------|---|-----|-------------|
| A | 5 | 33 | |
| B | 6 | 40 | |
| C | 1 | 6.7 | |
| D | 0 | | |
| E | 0 | | 0,8 |
| Fx | 1 | | 0,07 |
| F | 2 | 13 | 0,13 |

A comment here is that the grade distribution is quite good, but I somewhat expected this as I felt that the discussions during the concept cases during the lectures was very good.

Course material

Course compendium, lecture notes and the book [C.R Paul, "Introduction to Electromagnetic Compatibility"] (accessed via KTHB). Many students like the availability of the book via KTHB.

Intended learning outcomes

The course provides basic understanding of how electromagnetic disturbances appear in, propagate and influence electromagnetic components and systems. Moreover, the participant acquires knowledge about methods and strategies that reduce the influence of disturbances. After completion of the course, the participant shall be able to

1. construct simple models that describe non-ideal properties for electrical components
2. understand and apply the concept of zone-division in electrical systems
3. analyse cross-talk in multiconductor systems
4. identify low frequency (electric and magnetic) coupling mechanisms and calculate simple examples
5. identify high frequency (electromagnetic) coupling mechanisms and calculate simple examples
6. design effective shielding devices and filters
7. describe typical misconceptions in designs

Comments and notes:

- This year I implemented a study visit to Ericsson and their EMC labs in Kista. The students liked this very much (and also Ericsson I was told). I believe some students got an MSc project from the visit. Huge success!
- Lectures are, in general, very well attended and liked and I think that the concept cases, that I use to discuss different topics are, as always, very well liked as they link the different ILOs and discussions together.
 - One comment in the LEQ said, as I understood it, that some references in the lecture material lacked but I don't think this is true. There are for all derivations references to either the book or the course compendium. I have to look at this to see if I missed something but it is strange. (*again this is only one comment of one student out of 3 people answering out of 17...*)
- The classroom demonstration went well and was, as always, very well liked. I understood from the discussions that they really connected the experimental phenomenon to the theoretical material.
 - However, I fear that the equipment needs soon to be replaced due to old age (but as these are commercial consumer items it should be ok).
- I have felt that the old labs, although worked well as demonstrations did not fully aid the learning. So for last year I did some changes which I continued this year. I have left only one experimental lab but I added a part with more theoretical questions and the need to do numerical analysis for the lab report. This worked well as I could see that for the corresponding questions in the written exam the answers/essays of the students were even more in-depth (*yeay*).
- This new lab, together with the two individual home assignments now covers, more or less, the removed labs fully. I like this especially as now the students can do numerical analyses of these phenomena that I believe is more useful than experiments as the tools to do such experiments are often harder to acquire. Should be more beneficial for their future careers. :-)

- I added peer-review to the larger individual home assignment, along with peer-review instructions. This worked well and the students did not have so many questions on the format and I think that the quality, in the end, was improved.
 - Only issue was that I felt a bit stressed during the presentations that all students would have time, during the 3h session, to satisfactorily present their work. It all worked out well but next time I will be stricter with the time for each student as some took more time than was given to them.
 - I do not think I will add peer-review for the experimental lab report and ha1. There is already enough for them to do. (But as the LEQ had a very poor response rate I can unfortunately not say anything of their time-on-task for the course.)
 - One comment in the LEQ perplexed me a bit as it said that they needed “more feedback” on their individual topics before submission but this is very strange as I told them to contact me with the projects so I could give them feedback over the duration but only a few did this!
 - I will however for next course round add an extra session in the schedule for tutoring of the individual project so they cannot escape this! *(again this is only one comment of one student out of 3 people answering out of 17...)*
- The individual cross-talk home assignment covered very well ILO 3, 4 and, in part, also 5. The filter experimental (group) lab covered ILO 1, 6 and 7 and the new numerical part aided to this very well. The ILO 2 is hard to cover in a lab but this is discussed quite well during the lectures and the “concept cases” I use. Overall, I think, even though I, again, had to put some time to construct a new individual home assignment that it works really well now.
 - As before, the exam was a mix of multiple choice questions and essay questions and I feel this reliably tested the students. For the exam, the ILOs of the course was now clearly and strictly tied to one of the sections of the exam and if a student fell below 50% of an individual section they failed the exam (but still only two “F” were awarded). There was one Fx case also to consider, “For (Fx) it is required that, in a group, a maximum of 1 point reduces the result below approved score.”. One student got the Fx mark but at the time of this writing the Fx completion has not yet taken place (but is planned). From experience from last year’s exam, I added a word limitation for some of the essay questions and this went well.
 - One LEQ comment stated it would be good with an overview of what was “important” but this list was actually given in the very first lecture...*(again this is only one comment of one student out of 3 people answering out of 17...)*

Future items.

- I will ponder to perhaps modify from today “LAB1 3.5 Cr. (P/F)” to “LABA 1 Cr. (P/F) + INL1 1 Cr. (P/F) + INL2 1.5 Cr. (P/F)” to make it easier for the students to collect points and for me to administrate the grades.
- I am (still since many years) considering to make all the lectures more into discussion seminars that the students have to prepare for. However, I am not sure, as the lectures are well liked and it would need some careful planning of the topics and that the students review the material before the class.
- Next year I will skip the LEQ and use my old method of anonymous “Ris&Ros” questionnaires during the last lecture. I am tired of getting so few responses and I have to at least get some reliable data on the opinions of the students and not just what is said to me during the lectures, labs or discussions.