

Course analysis – ei2402 “Electromagnetic Compatibility (7.5 Credits)” Ht2024

Staffing

Responsible department / division: EE / EMF

Course-responsible, lecturer and examiner: Daniel Månsson

Events

Lectures: nine double-period sessions (i.e., $9 \times 2\text{h} = 18\text{ h}$) approximately two per week.

Additional tasks: one experimental laboratory group task with one numerical simulation task, one individual home assignment on crosstalk (analytical and numerical) and one individual project on a selected EMC topic. Discussion, so called “concept cases”, during each lecture.

Registered students following the course

HT2024: = 18 registered (from Ladok) and I would say that 17 students actively participated the course.

Course evaluation:

This course round I skipped the LEQ, as it never receives enough answers to be statistically significant. I used my own “Ris&Ros” paper that I distributed during the final lecture and I got almost all students responses (a few was not present at the last lecture). I will not publish these in full here but have them available for myself and only summarize them.

Course components and points

- LAB1 3.5 Credits (P, F). To pass LAB1 students have 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 the report of another student and present their selected topic for the class during the presentation session.
- TEN1 4.0 Credits (A, B, C, D, E, FX, F).
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If LAB1 has a “P” then the final grade of the course is set by the grade from TEN1.

Results

The grade distribution, for the ordinary written exam, TEN1 HT24, is given below.

Betyg	#	kvot	
A	1		
B	4		
C	4		
D	2		
E	1	12	0,85714
F	2	2	0,14286

Three students missed the registration for the exam and two did not pass so the re-exam will probably not be so large. Otherwise, I am happy with the grade distribution.

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 passing the course, the student should be able to

- analyse electrical systems by means of models that describe non-ideal properties of electrical components,
- apply the zoning concept on electrical systems,
- analyse crosstalk in multi-conductor systems,
- design efficient surge protection and filters,
- design efficient shielding,
- explain typical construction errors within the scope of the course.

Comments and notes:

- Like last year, I generally felt (during the discussions) that there were some gap in the prerequisite knowledge of the students.
- Strangely, many (not all) did not participate in the discussions during the "concept cases". These concept cases have always been very well-liked, which was also reflected in the comments in the course survey this year, so I am confused. Students are more passive during the group and class-room discussions but still comment that they like the discussions and want more interactivity (possibly these are different students). I must discuss this in-depth with the PA(s).
 - The concept cases, that I use to discuss different topics are, as again, very well liked as they link the different ILOs and discussions together.
- The course survey also revealed that:
 - The students liked my lectures and concept cases,
 - The assignments were liked in general, and some students wants more experiments (which I have considered adding, see below).
 - This year I again had a study visit to Ericsson and their EMC labs in Kista. The students liked this very much.
 - Some wanted more info on how the exam was going to be, but this was given both in the first lecture slides and examples of the exam available in Canvas as well as during classroom discussions.
- Many students, again, felt the individual projects were good but that it was a bit hard to pick a topic. However, I do have an "assignment help session" in the schedule (but not many students attended it) as well as discuss it during the lectures.
- The classroom demonstration went well and was, as always, very well liked.
 - 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 mention this to the teacher responsible for the equipment; perhaps new setup can be constructed.
- As before, the exam was a mix of multiple choice questions and essay questions and I feel this reliably assesses 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 (except Fx criterion - "For (Fx) it is required that, in a group, a

maximum of 1 point reduces the result below approved score.”). Two students hinted to me that they had some issues with finishing the exam in time (it was 4h) but I can’t see it from these results. But I will consider this for next year and will try to fine-tune it.

- 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 that it works well.

Future items.

- For next year I will add more examples from the “EMC Bananaskins” cases to connect to real-life incidents.
- I think I will add some more experimental part to LAB1, as there is time, and some students have made comments in this regard and then decrease a bit the extent of the individual project.
- I will add more class-room demonstrations, perhaps have all of them at the same time in one session for ease.
- I am (still) considering 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 but I am not sure yet.