KursPM (Administrative information) EI1120 VT2020

Please read this page carefully! This page is particularly important because it explains what you have to do in order to get through the course. It is an online "KursPM" document that describes details such as registration, timetable, contact details for teachers, requirements about exams and homework, etc.

Previous KursPM

- kurspm_EI1120_VT2013.pdf
- kurspm_EI1120_VT2014.pdf
- kurspm_EI1120_VT2015.html
- kurspm_EI1120_VT2016.html
- kurspm_EI1120_VT2017.html
- kurspm_EI1120_VT2018.html
- kurspm_EI1120_VT2019.html

Schedule

The EI1120 homepage has a link to the KTH Schedule with the dates, times and rooms for course events such as lectures and tutorials. The homepage itself presents all the course-material, in the sequence in which it is expected to be used for lectures, tutorials, exercises, homeworks, labs and tests.

Admin: registering for the course and exams

The EECS School's Studentexpedition och servicecenter is the proper contact **for all questions about registrations** to the course and exams: e.g. late registration, web-based registration not working, re-registration, problems with viewing marked exams, etc. Contact them from details in the link above, or visit the office at the entrance of Malvinasväg 10.
These sorts of administrative questions should not initially come to the course teachers – we do not even have access to some features of the administrative systems, and the rules and details are complex beyond our comprehension.

You should **register for the course** as soon as you start it. See KTH's Kursregistrering page. You can ask the EECS Student Office (above) if there's a problem with getting registered, e.g. if needing to re-register.

Note the new KTH exam rules in 2017: KTH tentaregler; if you are not registered, you need to wait for a chance to enter, and to prove your course registration on paper ... better just to ensure

you register for exams (tentor), re-exams (omtentor), and mini-exams (kontrollskrivningar). Registration can be made on Mina Sidor. See the above link for the times when registration is open.

When multiple rooms are booked for exams/KS, an email will besent **to each** exam-registered student (between 1 and 3 days before the event) to say which room to go to. Do check your (KTH) mail, including the junk, if you find you haven't had this notice a day before the exam. If you forward your KTH mail you might not (in fact they say "will not") get the automatic messages.

Teachers in the course

Nathaniel Taylor
Md Tanbhir Hoq
Md Zakaria Habib

Books

See the Books page for more information. There is no book that you are supposed to use as the main course book. The files provided on this website are the course literature, along with questions and solutions from homeworks and past exams. An old KTH compendium is suggested as a source of further practice questions and correct Swedish terminology.

Exhortations about Working Habits!

See study habits ... please!

Syllabus (content) and Aims

If you're looking for a Syllabus (list of "learning outcomes", purpose of course, etc), it is probably most useful to look at the content of the notes, homeworks and past exams of the last two years. These give a detailed view of the included subjects and our emphasis, and of the typical style of problems that we solve. If you prefer formality, you can try the official course-plan: however, in view of the small space this inevitably cannot provide much information about the style and level (note also that we don't do much "mesh analysis" now).

The course is about *analysis of linear circuits*.

The main aim is to get competent at taking a circuit diagram and finding what values certain variables such as voltages, currents and powers would have. We will also sometimes look at the backward question of what parameters, such as sources and resistors, should be chosen in order to make a variable have a specified value.

We would like students to develop abilities in two rather different approaches to circuit analysis. One is the "intuitive sense", of being able to estimate some of the behaviour of a circuit from just looking at a circuit diagram. The other is to use systematic methods to translate a circuit diagram into a set of equations that allow a variable or parameter to be determined. Both of these are useful for real situations, and they are often used together. In practical use of circuit analysis, the former skill is important for making estimates and starting in the right direction with a design. The

latter skill is important for dealing with later stages of analysis where more detail is needed, such as solutions of complicated circuits where we have to program computers to generate and solve the equations. The latter seems generally easier to train, particularly if the equations are to be solved by computer. In view of the large number of methods and concepts that we need to introduce in this course, and the opportunity of developing more "feeling" for circuits during practical applications in later courses, the course assessment is designed without rigid demands about demonstrating skills of estimation and conceptual thinking; however, some minor parts of exam questions can benefit from these skills.

A circuit diagram represents an idealised model: for example, a voltage source is assumed to give an exact voltage regardless of the current through it. The diagrams are thus directly related to equations. Idealised circuit analysis is basically a mathematical puzzle, with a special sort of representation! A large part of *practically applied* circuit analysis consists in *choosing* a suitable model (diagram) for an actual circuit, then solving the diagram (the straightforward part!), then analysing what the results means the context of the actual circuit. This can be surprisingly difficult; one has to decide what phenomena can safely be neglected. In this course we almost entirely omit the parts other than solving the diagrams. The other parts could be very educational, but we do not have time to deviate far from our quite idealised content. In our limited time, we want to get good core skills at solving the diagrams. Later courses will build on these skills, and apply them to the more practical applications in power, communications, control, etc.

Students taking this course should also use it as an opportunity to improve their general skills at checking the reasonableness of answers by methods such as extreme cases ("suppose we set R to zero, ...") and dimensional analysis. These skills are only required to a small extent in the course's assessment, but some sort of checking should ideally be used for all results; some credit is given for correctly identifying a wrong solution as being wrong. Checking is important in later studies and work, as well as in homeworks and exams in the course.

Course Structure: Topics organized in three Sections

The course is divided into three Sections, which are studied in this sequence:

- ***Section A:*** **Direct current (dc)** (likström). This corresponds to *statics* within mechanics. We introduce some basic circuit components of resistors, constant-valued sources of voltage or current, and later the operational amplifier. Each of these components puts some constraint (requirement) upon a voltage or current, or on the relation *between* voltages and currents. The connection of components by nodes imposes further constraints, described by Kirchhoff's laws. Together, all these constraints determine the circuit's solution. We learn methods for simplifying a circuit and converting it to equations that can be solved to find a desired value.
- ***Section B:*** **Transients**. Some new components are now added: the energy-storing components called inductors and capacitors are the most important, but we also introduce switches, diodes, and components whose value changes as a `step-function' at some time. The circuit quantities, with these components present, become time-functions instead of single values. In general, differential equations must now be solved to get circuit solutions. We look at equilibria and sudden changes from equilibria, and at simple cases of finding time-functions.

- ***Section C:*** **Alternating current (ac)** (växelström). AC analysis means an assumption that all voltages and currents are sinusoidal time-functions; this is sometimes called harmonic excitation. In this case, circuit solutions can be made using a similar approach to dc analysis, but using complex numbers instead of real numbers. This is of course somewhat more difficult than dc analysis, but it is a great deal easier than working with high-order differential equations for a circuit with several inductors and capacitors! The ac situation is of great practical importance. Most electric power systems work with approximately sinusoidal time-functions. Communication systems too have traditionally depended on modulation of sinusoids to convey information. Other waveforms can also be studied as a mixture of different sinusoids.

The exam has three Sections: A, B, and C, corresponding to the above list.

Assessment: required work to pass the course

There are three `Ladokmoment' (PRO1,PRO2,TEN1) that make up the full 7.5p course.

If you are re-registered on the course, you keep any Ladokmoment that is already completed (registered as a pass) from a previous course-round; that's a basic rule of the system, that given grades can't be taken away. So – for example – if you took the course two years ago and passed PRO2 due to doing all the required labs, but you have not yet passed the course, then this year you do not need to do the things we require for passing PRO2; you just have to pass the other parts.

However, partial completion of the requirements for a Ladokmoment in a previous year is *not* counted. If you did only some of the homeworks or labs, and didn't pass the Ladokmoment, you should start from the beginning this time. (This is partly in order to give extra practice, partly to encourage passing PRO[12] on your first chance, and partly to simplify for later teachers if someone else has the course in a later year.)

PRO1: Homework

- For most of the Topics, there is a corresponding homework task. (Exceptions are: 01, which is just introduction; 14, which has a longer project task; and 05 and 10, which have tight scheduling with other events and are less power-oriented than some other topics.) Submitted solutions do not have to be perfectly correct, as long as they show a "sincere attempt"!
- Homeworks will usually be submitted by uploading scans or photographs of handwritten solutions. The exact details will be given within each homework task.
- Half of the homeworks (any 5 of the 10) must be approved in order to pass PRO1. If at least 5 were submitted, but not all were approved, alternative tasks can be provided at the end of the course to give a chance of passing PRO1.
- Some exam *bonus points* can come from the homeworks, in proportion to the number of approved homeworks. This bonus is added to the total exam score before setting the grade. The bonus is directly proportional to the number of approved homeworks. At the most (for 10 in-time approved homeworks) the bonus is an additional 5% on the exam. This is nearly half a grade-boundary, and thus has a good chance of making a difference to the grade.

The bonus can affect even the pass/fail decision, but it cannot help if you get below the minimum for a particular section of the exam (40%); it only helps to change the total score, for which 50% is the pass level. See below for the link to exam rules.

PRO2: Lab tasks

- There are two obligatory laboratory tasks. The aim is to get some experience with concepts and measurements, including familiarity with common instruments.
- Active participation in the lab sessions is all that is required. Careful reading of the notes beforehand, and of the `solutions' afterwards, is of course *advised* in order to get the most benefit from the lab work. For each of the lab tasks there will be several sessions provided, with up to 20 people at each.

TEN1: Written Examination (optionally including Kontrollskrivningar)

The detail about calculation of exam grades will be similar to that at the top of last year's exam, 2019-03_EM_tenta.pdf.

- The exam will be structured with the same "cumulative" nature as it has had since VT14. This means that the first two of the three sections can be replaced by KS1 and KS2 marks: it is like splitting the exam into three occasions, but with the option of using the last occasion to write all the parts. That system seems very popular, for spreading the load of the course, reducing stress, and giving a second chance for two of the Sections.
- You do not *need* to attend the mini-exams KS1 or KS2. However, KS1 fully covers Section A of the exam, and KS2 fully covers Section B: if your score in a KS is more than in the corresponding Section of the exam, the KS score is used instead.
- If your KS1 and/or KS2 scores are high enough that you already have passed Sections A and/or B in the exam, then during the exam you can focus entirely on Section C. If you didn't do the KS or got a low score, you can write all Sections of the exam.
  (You will probably find that the system is more simple in practice than in the above description! See the instructions on the past exams for a formula-based description.)
- The results from a KS can only be used to replace Exam sections from the same course-round. For example, results from KS1 or KS2 taken in VT19 can be used within the exam in March 2019, or the re-exam in June 2019, but cannot be transferred to later years.
- The re-exam is a *substitute* for the main exam, not an extension. In the re-exam you *can* use the better score out of e.g. KS2 and the re-exams's Section B, just as in the main exam. But you *can't* e.g. use the better score out of Section C in the re-exam and Section C from the main exam. If you've taken both exams, you can keep the result from whichever one gave you the better result (this is relevant to anyone who tries to improve their grade – plussa – after already passing in the first exam).
- In VT19 we continue a similar system to VT18, by providing a final task after the homeworks, explicitly using numeric solutions by computer. This is submitted in the week before the exams. If approved, it provides the full points for the final question in the exam. So if you do this task and get it approved, you can miss this last question. It is not obligatory, and this year it does not count as a homework, but as a further task.

Permitted material at exam or KS: hjälpmedel

For this round we do as in the recent years: 1 piece of A4 paper at KS1, but then 2 at KS2, and 3 at the final exam or re-exam. That's so that you can each time add one piece of paper with notes on the topics that were studied since the last test, re-using the notes from previous sections of the course.

The course teachers do not require these papers to be submitted with the exam, **but** with the new KTH exam rules there's a risk that you will get asked by an enthusiastic inviligator (tentavakt) to leave all extra papers. Keep a copy – or bring a copy – if you want to have your notes later.

We intend to repeat last year's text on the exam front-page, to show the invigilators that the papers are allowed and need not be collected. Any change in the text would only be to make this clearer, not to be more restrictive about what's allowed.

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