EI1120 Administrative information (KursPM)

Please read this page carefully! It's good to read *all* the pages on this site carefully, to ensure you know what activities we have and what resources are available ... but *this* page is particularly important because it explains what you have to do in order to get through the course.

A KTH course customarily has a "KursPM" document that describes details such as registration, timetable, contact details for teachers, requirements about exams and homework, etc. For this course, **this webpage** (i.e. the text below this point) provides most such information; there is no separate pdf file of the KursPM. The schedule can be found in the link below, and the content of each scheduled event is shown in the table on the course's main page.

Schedule

The EI1120-VT15 Schedule shows dates and rooms for course events, such as lectures and tutorials.

More about the subjects for each lecture, tutorial and lab can be seen in the table on the homepage, or inferred in more detail from the course-notes or the homeworks when these appear. The aim is that notes and homeworks should be up the day before the event. That might not always manage to be kept to.

Admin: registering for the course and exams

All questions about course registration, registering for exams, late registration, problems with viewing marked exams, etc, should be made to the Student Office, **STEX**. See the STEX webpage for contact details: email to `stex@ee.kth.se` is a convenient choice.

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.

The KTH website **"Mina Sidor"** is used for **registering for the course and for exams**. You can also view your written exams through Mina Sidor soon after writing them, and then in their new state after marking (rättning).

You should **register for the course** as soon as you start it. New registrations can be done in Mina Sidor.

If you're taking the course again after registering on an earlier round, you need to **re-register**. This *cannot* yet be done on Mina Sidor, so you should email STEX, or visit STEX and fill a form.

For exams (tentor), re-exams (omtentor), and mini-exams (kontrollskrivningar), registration should be made **two weeks before** the event. This is also done through Mina Sidor. Registration is important in order that STEX can organise sufficient rooms and staff and guarantee you a place. When multiple rooms are booked for these events, you will normally be contacted by email sometime on the day before the test, to tell you which room you will be in.

Teachers in the course

Nathaniel Taylor
Roya Nikjoo
Mahsa Ebrahimpouri Hamikar

Books

See the Books page for more information. There is no book that you are supposed to use as the main course book. Instead, the notes 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.

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*. (One inherently nonlinear component -- a diode -- is briefly introduced, but is not an critical part of the course.)

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

The course's *subjects* are divided into three Sections:

- ***Section A:*** **Direct current (dc)** (likström). This corresponds to the subject of *statics* in 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.

Assessment (required work)

This year, for **new** students the following is valid, for passing the three `Ladokmoment' that make up the full 7.5p course.

To pass **PRO1**: Homework.

- There is a homework task corresponding to almost every `Topic', i.e. to almost every lecture. (For one or two, we might decide not to have another homework, depending on when the labs get scheduled.)
- Homeworks will be submitted by emailing scans or photographs. In some cases, equations or numbers in plain text in the email will be requested; the exact details will be given within each homework task.
- Each homework has an **obligatory** part which must be submitted and approved in order to pass the course. It does not have to be perfectly correct, as long as it shows a "sincere attempt"!
- *Updated with numbers:* An exam bonus can be gained from submitting all homeworks in time (if they get approved). The bonus will be proportional to the number of in-time homeworks, with a maximum of 5% of the exam points (half of a grade-boundary). It is added to the total exam score before setting the grade. The exact calculation can be seen at the top of last year's exam, 2014-03_EM_tenta.pdf. The bonus can thus affect even the pass/fail decision, but it cannot help if you get below the minimum for a particular section of the exam (40% for A and B, 30% for C); it only helps to change the total score, for which 50% is the pass level.
- If you have missed a homework (and its solution is already published) you should ask about what task to do in order to qualify.

To pass **PRO2**: Lab tasks.

- There are three laboratory tasks. This year, these are all **obligatory** (previously there was just one, optional). The aim is to get some experience with concepts and measurements, including familiarity with common instruments.
- There will not be a high demand for preparation, reports or answering questions. Active participation in the lab session 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 three lab tasks there will be four or five sessions provided, with up to 20 people at each; the are hoped to be fitted into one or two days if timetabling allowed.

To pass **TEN1**: Written Examination (optionally including Kontrollskrivningar)

- The exam will be structure with the same "cumulative" nature as it had during VT14. That seemed very popular, for spreading the load of the course, reducing stress, and giving a second chance. See the instructions on the 2014-03_EM exam for a better understanding of the Sections in the exam, and the way that KS1 results can be included (note: the `max(x,y)` function means the higher value out of `x` and `y`).
- You do not *need* to attend the mini-exams KS1 or KS2. However, KS1 fully covers Section A of the course, and KS2 fully covers Section B. So if you get a good grade in a KS, you can use this in the exam, and avoid writing one Section there. See the "Course Structure" paragraphs, above, for more detail. The earlier exams said "Part" instead of "Section": we've changed to make the words fit with another course, where the split between different KTH periods is called "Patrs
- If you have already passed Sections A and B then you don't need to answer these part in the final exam in March, but can focus on just Section C. Or you can try to improve your grade by answering A and/or B in the final exam (after completing Section C). If you have not already passed Section A or B, you can take another chance in this Part 2 exam. (You will probably find that the system is more simple in practice than it might sound from the above!)
- 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 VT15 can be used within the exam in March 2015, or the re-exam in June 2015. The results cannot be transferred to different years.
- The re-exam is treated an alternative to the main exam. In the re-exam you *can* use the better score out of e.g. KS2 and the re-exams's Section B. But you *can't* take e.g. Section B from the main exam to replace a poorly written Section B in the re-exam. If you've taken both exams, you can keep the result from whichever one gave you the better result (this is mainly relevant to anyone who tries to improve their grade, after already passing in the first exam).

Note: if you are **re-registering**, having registered in a previous year but not yet passed, then you are permitted to use the conditions from when you first registered: in VT14 the homeworks but not labs were obligatory; in VT13 and VT12 only the exam was obligatory. In your case, PRO1 or PRO2 (which now require homeworks or lab) will be automatically passed by passing the exam, if that is how it was done in the year you first registered.
However, you are welcome to participate in the other activities of homeworks and labs, just as the new students will; this will almost certainly improve your chances in the exam, but it might be hard to fit into your schedule. You can get an `on-time homework' bonus just like the new students, if you do the homeworks. You can do KS1 and KS2 to contribute to the corresponding sections of the exam, in the same way as the new students can.

Exhortations about Working Habits!

From experience of circuits courses, the following advice is offered.

- It is important to keep up with the course. The Topics are *not* a set of unrelated concepts. Almost every part of the course builds upon (i.e. requires) the majority of the previous parts of the course. If you fall behind, the next Topic will arrive, and you won't easily understand it.
- Actually *doing* circuit analysis -- solving problems -- is very important to becoming competent at the subject. Yes, it's also nice to read explanations and look at examples, but you should also ensure that you can *do* circuit analysis by yourself. A common story from students who fail the course is that they thought they knew how to do it, because it seemed so obvious when they read solutions to past exams or heard a friend explain it ... but because they didn't actually try solving lots of *new* problems, alone, unaided, with realistic time-limits, they never realised that

actually there were steps they did *not* understand!

- Working in pairs or groups appears to be a very useful way to study (for many people, although not all!). You can do study and homeworks with friends, helping each other to understand the right way to go. But make sure you *first* try solving some of the parts by yourself, unaided, so that you really know how competent you are at it. Use friends and model answers as the *next* step, after you've tried it by yourself.
- Take advantage of the homeworks as a way to keep up to date with the course material. Don't just try to finish and submit the homework with the minimum work "because you have to". The main point of the homework is to ensure that you have practised the material early in the course, and that you are prepared for the later Topics, and that you keep an up-to-date reality-check about your skill-level. Study each homework and its solution as a way to get its Topic well learned.
- If you have spare time during the course, start doing further exercises in the subjects that you've already studied: you can find these in past exam papers, textbooks, etc.
- Take advantage of the exam structure. Although the mini-exams (KS) are optional, you would be wise to work hard at these, to get good grades in part of the course before the main exam. Then you have less risk in the main exam, and more time to focus on its final part.
- Try hard to pass the course on the first time! Our system is very "kind" at offering re-exams; but this can be an unkindness if it encourages postponing (delaying) the work in a difficult course. By dropping such a course, and trying to take it in a later year, there will be bad effects on later courses due to time taken in studying for re-exams. It will also be more difficult to study some later courses if you haven't yet achieved a high competence at circuit analysis.
- Don't be inhibited about avoiding things that seem a bad use of time, even if other people appear to use them. For example, if you like reading and thinking at your own speed without disturbance, and can't concentrate in lectures or tutorials, then perhaps it's best for you to miss these events and instead read and practice by yourself or with a colleague. Choose your best way of studying, as long as you manage to do the required things of homeworks, labs and exams.
- Beware of the temptation to spend time (and money) getting books, finding videos, downloading pdf files, downloading whole websites with `wget -mpk http://.....`, etc., in the belief that this will help your study. There's a severe limit to what you have time to study properly. It's probably better just to get on with the hard work of *doing* the study with the existing materials that we provide, or with one or a few other sources if you find those better. It's thinking about and doing the problems that will most help you, although sometimes of course you may find that one source helps you understand the concepts better than another does! Homeworks, old exam solutions, *and some hard thinking without distractions*, will probably turn out more useful than a pile of colourful textbooks.
- Even if you don't like the subject, or find it very hard, try to find a way to feel positive(!) -- here are some suggestions. Think of your general skills you're improving, in algebra, checking of reasonableness and dimensions, etc; these skills are useful in any calculation-based work in physical science and technology. Think of it as a training of your ability to be efficient and organised in your studies: it's a useful skill to be able to focus hard on something even when your motivation is just the long-term goal of getting it properly finished. Think of your studies as a job where you have a duty to spend (on average) at least 40h/week of focused work, even it if seems amazingly boring; a lot of your borrowed money and taxpayers' money is going into the process of your education! If you know that you *can* like technical things in this area, but are finding the early years too theoretical and abstract, try to find out more about the interesting third-year and masters-level courses that you can later choose in your preferred direction ... you will probably be surprised later to realise how useful the skills from practically *all* the early theoretical courses can be for understanding the more technically-interesting later courses.