Lecture Hours

- Tuesday: 14:40-16:30 EA-207
- Thursday: 13:40-14:30 EA-207

Course Assistants

- Furkan Karakaya (Coordinator, Office: ARC-300)
- Gökhan Çakal (Office: ARC-300)

Presentations:

Presentations will be added to keysan.me/ee463 weekly (but please also use the other sources given below:

- Week#1 (23/09): Info, Introduction
- Week#2 (30/09): Basics, Single Phase Diode Rectifier
- Week#3 (07/10): Single Phase Diode Rectifier, Three Phase Diode Rectifier
- Week#4 (14/10): Three Phase Diode Rectifiers
- Week#5 (21/10): Power Semiconductor Devices
- Week#6 (28/10): Single Phase Controlled Rectifiers
- Week#7 (04/11): Three Phase Controlled Rectifiers
- Week#8 (11/11): Other Converter Topologies, Introduction to DC/DC Converters
- Week#9 (18/11): Buck Converter, Boost Converter
- Week#10 (25/11): Buck-Boost Converter
- Week#11 (02/12): Thermal Design
- Week#12 (09/12): Snubbers, Harmonics, Filters
- Week#13 (16/12): Isolation, Gate Drivers
- Week#14 (23/12): Presentations

Brief Info:

EE463 and EE464 are the two core courses for power electronics and electric machines option. In these courses, you will learn about basics of power electronic topologies, components and control techniques. In the first semester we will focus on AC-DC converters (rectifiers), whereas in the second semester it will be mainly about

DC-DC converters and inverters. You will find chance to design and implement fundamental circuit topologies and get understanding of other design factors such as selection of switches, passive components within electrical and thermal constraints. There will a hardware project to implement.

Important Notes:

In this course I will apply learning by doing, thus I expect (and encourage) you to actively participate to the lectures. Here are the important points:

- There are no stupid questions.
- Even if there is, asking a stupid question doesn't mean that you are stupid.
- Studying is an activity of students, not of lecturers.

Course Objectives:

At the end of course you will be able to:

- Understand the fundamental principles of power electronics topologies.
- Analyze and design controlled and uncontrolled AC/DC rectifiers (1ph and 3ph)
- Select commercial power switches and passive components for various applications.
- Evaluate and compare various options for power electronic topologies
- Use a few power electronic software (e.g. PSIM, Simulink etc.)
- Prepare design reports and use version control system (GitHub) to build your online portfolio.
- Design and implement a hardware project.

Grading:

- 1 Midterm: 15%
- Laboratory: 20% (Attending to all lab sessions is compulsory)
- Homeworks: 20% (+some bonus for good homeworks)
- Final: 25%
- Participation: 5% (quizzes, active participation, attendance)
- Hardware Project: %15 (+some bonus for good projects)

Important Note: Any of the following actions will result in NA grade:

- Not submitting at least three software projects
- Not attending to one laboratory session
- Not attending to the final exam

Textbooks & References:

- Power Electronics: Converters, Applications, and Design, N. Mohan, T. Undeland, W. Robbins, Wiley (Available in the bookstore)
- Cyril W. Lander, Power Electronics, McGraw-Hill, 1993, Third Edition.
- Modern Power Electronics and AC Drives, Bimal K.Bose, Prentice Hall

Frequently Asked Questions

- **Why can't I choose my partner for the simulation projects?** Next year you will graduate and start working in companies or in research institutes. However, in your professional life you will not be able to choose your colleagues, and you will have to work with many people with different personal characters and backgrounds. Unfortunately, team working is a neglected aspect in our department and I hope in this course you will improve your competence to work with different people. Furthermore, once you begin your professional career you will see that your personal network is one of your valuable assets, so please consider these projects as a chance to have connection with 5-6 extra people, which all will be working in different companies in the following years.

- **But, there is my high school friend, whom I partnered with the all laboratories in the past so far...** Then, it is you that needs to meet with new people most.

- **But, I do all of the work, and my partner does not help at all. It is not fair!** That's why you have to use version control system. Each student will be graded separately based on their contributions and number of commits. If one of partners did not contribute at all, he/she will get zero.

- **What happens if I don't submit these projects?** If you don't submit three projects or more, you will get NA.

- **I already know how to use Simulink, why do I have to learn PSIM?** I think in the long run, it will be better for you to know more than one simulation software. At least, I am sure it will increase your chances of finding a job.

Please note that, you will be free to use any software you like after the second project.

Projects Grading

Number of Commits:25%: The number of edits of your project files as seen from the contributors list. For example, if you start making your project in the last few days, you'll get no credit. If you start early and continue editing your files, you'll get full credit. The project topics are not easy, so this is a way to encourage you to start early and work regularly.

Level of Information:50%: The detail level of your designs (see requirements above), and the accuracy of your calculations.

Report Quality:25%: Text explaining your design decisions, quality of your figures, citing relevant studies and your conclusion section.