MICRO-101

Electrotechnics II

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Cursus	Sem.	Type
Microtechnics	BA2	Obl.

Language of teaching	English
Coefficient	2
Session	Summer
Semester	Spring
Exam	Written
Workload	60h
Weeks	14
Hours	**3 weekly**
Courses	1 weekly
Exercises	.5 weekly
TP	.5 weekly
Number of positions	

Summary

This course gives an introduction to electronic systems, building upon the foundational components you have learned about in Electrotechnique-I. You will study the frequency behavior of complex RLC systems, three-phase systems and time-dependent systems.

Content

Learning outcomes

Lecture

1. Recap Electrotechnique-I
   - What is a resistor, capacitor, and inductor?
   - Why do they behave in the way they do?
   - How do they behave as a function of frequency?
   - How can we explain this intuitively from the perspective of electrons?

2. Frequency behavior of complex electronic circuits
   - How can we represent impedances and admittances in the complex plane?
   - What is the 1/z transform and how does it help us?
   - Why are RLC circuits special?
   - What kind of phase relationships between current and voltage do resistors, capacitors and inductors introduce?

3. Three-phase systems
   - Why do we care about three-phase systems?
   - Where are they essential and why? Concepts of active, reactive, instantaneous and average power.
   - Why do we usually neglect the neutral?
   - What happens if the load is not balanced?

4. Time-dependent systems
   - What happens in time domain when an RL/RC system is turned on?
   - How can you explain the behavior intuitively?

Labs (two sessions, at the end of the semester)

- Three-phase systems
- Time-dependent systems

Keywords

lumped elements, impedances, complex plane representation, three-phase systems, time-dependent systems, RC time constant, differential equations

Learning Prerequisites

Required courses

Electrotechnique - I

Important concepts to start the course

- Concepts from analysis
- Complex numbers
- Differential equations

Learning Outcomes

By the end of the course, the student must be able to:

- Describe the behavior of complex systems from lumped elements.
- Represent possible values of the impedance of a circuit in the complex plane.
- Explain the unique properties of a three-phase system.
- Deduce the time-dependent behavior of circuits upon switch-on.
- Compute the power dissipated and the phase relationships of currents and voltages in a three-phase system.
- Compute the step response of a system using differential equations.
- Manipulate electronic circuits and measurement instrumentation.

Transversal skills

- Collect data.
- Communicate effectively, being understood, including across different languages and cultures.
- Write a scientific or technical report.
- Demonstrate the capacity for critical thinking

Teaching methods

Classroom teaching, followed by weekly exercises where students put into practice the knowledge they acquire.
Hands-on lab sessions to measure real electronic circuits.

Expected student activities

Regular attendance of the class. Active participation.
Solving exercise sheets.
Lab exercises in small groups.

Assessment methods

The assessment will consist of a final written exam (covering the classroom teaching material, counting towards 80% of the final grade) and a multiple choice exam (covering the two lab sessions, counting towards 20% of the final grade).

Supervision

Office hours	Yes

Assistants	Yes
Forum	Yes
Others	Office hours Weeks 1 through 9: Fridays 11:00-13:00 in B3138

Resources

Bibliography

https://slsp-epfl.primo.exlibrisgroup.com/discovery/search?tab=41SLSP_EPF_MyInst_and_CI&search_scope=MyInst_ar

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Ressources en bibliothèque

- Introduction à l'electrotechnique / Frédéric de Coulon
- Electrotechnique : Base de l'électricité / Marcel Jufer

Notes/Handbook

A script will be provided for the lecture.

Moodle Link

- https://go.epfl.ch/MICRO-101

Videos

- https://app.courseware.epfl.ch/learning/course/course-v1:EPFL+EE-102+2018_t3/home