EE-445 **Microwaves, the basics of wireless communications**

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Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course is an introduction to microwaves and microwave passive circuits. A special attention is given to the introduction of the notion of distributed circuits and to the scattering matrix

Content

Introduction: Definition of the basic notions, applications: radar ,wireless communications, satellites, wireless sensors, atomic clocks, biological effects
Microwave networks: Notion of modes, S-parameters and scattering matrix. Waveguides and microwave printed circuits
Microwave circuits: Description of devices with 1, 2, 3 and 4 ports. Basic passive components for wireless devices
Device and signal measurements: Basic principles, reflectometry, vector network analyzer, attenuation and phaseshift, TDR. Calibration for error compensation and deembedding. Measurement of frequency and power.

Keywords

microwaves, S-parameters, passive devices

Learning Prerequisites

Recommended courses

Electromagnetics

Learning Outcomes

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

- Analyze Microwave circuits
- Create Microwave components
- Formalize S-parameter model
- Synthesize Microwave components

Transversal skills

- Use a work methodology appropriate to the task.

Teaching methods

Ex cathedra with demonstrations and exercises

Assessment methods

With mandatory continuous control

Resources

Bibliography

Handouts

Websites

- https://www.epfl.ch/labs/mag/page-141487-en-html/

Moodle Link

- https://go.epfl.ch/EE-445

Prerequisite for

Microwaves, practical work and projects