

MICRO-461

Low-power radio design for IoT

Enz Christian

Cursus	Sem.	Type
Data and Internet of Things minor	E	Opt.
Electrical and Electronical Engineering	MA2, MA4	Opt.
Microtechnics	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

The basic function of an IoT node is to collect data and send it through a wireless channel to the cloud. Since the power consumption of an IoT node is largely dominated by the wireless communication, it is therefore key to understand the trade-offs faced when designing the radio.

Content

- Introduction to the IoT.
- Brief description of the IoT wireless standards.
- General architecture of an IoT node.
- IoT radio architectures.
- Building blocks analysis and optimization in terms of power consumption, including LNA, mixer, oscillator, frequency synthesis, PA, baseband.
- Examples of a simple BTLE radio.

Keywords

IoT, IoT node, low-power, wireless communication, radios

Learning Prerequisites**Required courses**

- Analog Integrated Circuit Design
- Advanced Analog and RF IC Design

Learning Outcomes

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

- Analyze the power consumption in IoT radios.
- Develop an appropriate solution for an IoT radio.
- Synthesize the radio specifications.
- Elaborate the design of a IoT radio optimized for low-power operation.
- Model the different building blocks of a low-power radio.
- Explore the overall system perspectives and broader trade-off in the context of the IoT.

Teaching methods

- Lectures.
- Exercises.

Assessment methods

Written exam.

Resources

Bibliography

1. Enabling the Internet of Things – From Integrated Circuits to Integrated Systems, Massimo Alioto, Editor, Springer 2017.
2. B. Razavi, RF Microelectronics, 2nd ed. Pearson, 2012.
3. T. H. Lee, The Design of CMOS Radio-Frequency Integrated Circuits, 2nd ed. Cambridge University Press, 2004.

Ressources en bibliothèque

- [The Design of CMOS Radio-Frequency Integrated Circuits / Lee](#)
- [Enabling the Internet of Things – From Integrated Circuits to Integrated Systems / Alioto](#)
- [RF Microelectronics / Razavi](#)