

COM-413

**Real-time networks**

Decotignie Jean-Dominique

Cursus	Sem.	Type
Computer science	MA2	Opt.
Energy Management and Sustainability	MA2, MA4	Opt.
Robotics	MA2	Opt.
SC master EPFL	MA2, MA4	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	

**Summary**

At course completion, the student will be able to analyse the real-time properties of a communication network; and will also be able to create a new solution either balancing the tradeoffs between the different design parameters or composing building blocks. Applications to multimedia, transports,

**Content**

1. Introduction (hierarchy in communications, motivation for networks, types of applications)
2. Requirements (delay, jitter, predictability, topology, cost, etc.)
3. Communication systems architecture and its influence on temporal behavior(OSI model, communication models, real-time paradigms : Time-Triggered vs. Event-Triggered, interworking)
4. Fieldbusses and how real-time performance assessment : FIP and CAN as examples
5. Ethernet, industrial Ethernet and real-time Ethernet
6. Wireless communications and their impact on real-time guarantees
7. IEEE 802.11 and IEEE 802.11e
8. Bluetooth, IEEE 802.15.4 (ZigBee) and wireless sensor networks
9. Real-time in wireless sensor networks

**Keywords**

real-time, networking, wireless, wireless sensor networks, medium access control, quality of service

**Learning Prerequisites****Required courses**

none

**Recommended courses**

real-time systems, protocols

**Important concepts to start the course**

Protocols and real-time system background

**Learning Outcomes**

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

- master real-time techniques in wired and wireless networking
- modelling of quality of service requirements
- deep knowledge of real-time medium access control techniques

- exercise the real-time guarantee evaluation techniques
- capability to design a new real-time solution

### Transversal skills

- Communicate effectively, being understood, including across different languages and cultures.

### Teaching methods

Ex cathedra + student presentations + exercises

### Expected student activities

Learning the course material, reading, presentation and discussion of a scientific paper as an introduction to research

### Assessment methods

Mid-term presentation 50% and final exam 50%

### Supervision

Office hours	No
Assistants	No
Forum	Yes

### Resources

#### Bibliography

See course URL

#### Websites

- <http://lamspeople.epfl.ch/decotignie/>
- <http://moodle.epfl.ch>

#### Moodle Link

- <http://moodle.epfl.ch/course/view.php?id=10761>