COM-405

Mobile networks

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Cursus	Sem.	Type
Communication systems minor	H	Opt.
Computer science	MA1, MA3	Obl.
Cybersecurity	MA1, MA3	Opt.
Electrical and Electronical Engineering	MA1, MA3	Opt.
Robotics, Control and Intelligent Systems		Opt.
SC master EPFL	MA1, MA3	Obl.

Language of teaching	English
Credits	8
Session	Winter
Semester	Fall
Exam	Written
Workload	240h
Weeks	14
Hours	**7 weekly**
Courses	3 weekly
Exercises	2 weekly
Lab	2 weekly
Number of positions	

Summary

This course provides a detailed description of the organization and operating principles of mobile and wireless communication networks, as well as the use of wireless signals for sensing and imaging.

Content

The course includes weekly lectures on the below topics, weekly exercise sessions used to help students with the homework problems, weekly lab sessions used to help students on the programming assignments, and two hands on tutorial done in class during lecture time.
A. There will be 3 homeworks which can be done in groups of 2.
B. There will be 4 lab assignments on OFDM, MIMO, Wireless Localization, and Wireless Imaging which can also be done in groups of 2.
C. The two hands on tutorials will allow students to program hardware and will cover:

1. How to build your own 5G base station and private 5G Network
2. How to use wirelss signals for sensing and imaging in non-line-of-sight.

D. There will be weekly quizzes on moodle which are meant to prevent students from falling behind. The quizzes are short (3-4 multiple choice or True/False questions). They will be released at the end of each lecture and students have 1 week to submit them.
E. There will be bonus surveys to get feedback on the course for extra points.
F. There will be a final exam similar to the homework questions. (Sample exams will be provided)
G. Covered Topics (Tentative):

- Introduction to wireless networks
- Wireless PHY Layer Techniques
- MAC (Medium Access Control) Layer Protocols
- Wi-Fi & Bluetooth
- Cellular networks (3G, 4G, 5G).
- Internet of Things (IoT) Networks and Technologies.
- Multi-Hop Networks, Mesh Networks, and Sensor Networks
- Routing in Wireless Networks
- Network Coding
- Cross Layer Networking
- Multipath TCP
- Satellite Networks
- Wireless Localization
- Wireless Sensing

- Wireless Imaging
- Wireless Security & Privacy

Keywords

Communication networks, protocols, wireless, IoT

Learning Prerequisites

Required courses

Basic understanding of Computer Networks and Digital Communications

Recommended courses

These courses are not required for taking this class but can be very helpful.
CS-202 Computer systems or COM-208 Computer Networks
COM-302 Principles of Digital Communications
COM-430 Modern Digital Communications: A Hands-on Approach

Teaching methods

Lectures
Weekly Quizzes
Exercise sessions
Homework Problems
Lab Sessions
Programming assignments
Hands on Tutorials

Expected student activities

Class Participation, Quizzes, Homework, Labs, Tutorials, Exercise Sessions

Assessment methods

Homeworks
Quizzez
Labs
Tutorials
Final exam

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Ressources en bibliothèque

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Moodle Link

- https://go.epfl.ch/COM-405