

Mobile and wireless networks

Lecturer

Jean-Michel DRICOT (Coordinator)

Course mnemonic

ELEC-H423

Language(s) of instruction

English

Course period

First term

Course content

Upon successful completion of this course, students will have learned:

- > Understand the structure of current 2G/3G/4G cellular networks (including LTE) and the requirements of 5G cellular networks
- > Compute the capacity of cellular system and
- > Understand the infrastructure and requirements of Mobile IP and Mobile IPv6
- > Internet of Things standards such as Zigbee(IEEE 802.15.4), WiFi (IEEE 802.11), LoRa
- > Analyze routing and scheduling in complex mobile architectures and the Internet of Things
- > Assess the security of mobile and wireless systems.

Objectives (and/or specific learning outcomes)

This course will cover the fundamental aspects of wireless networks, with emphasis on current and next-generation wireless networks. Various aspects of wireless networking will be covered including: fundamentals of cellular communication, mobile radio propagation, cellular engineering and capacity computation, multiple access techniques, mobility support, channel allocation, Wireless PAN/LAN/MAN standards, mobile ad-hoc networks, wireless sensor networks, and security of mobile and wireless architectures. The goal of this course is to introduce the students to state-of-the-art wireless network protocols and architectures. The course is open to engineers/computer scientists with various backgrounds: computer sciences, computer engineering, telecommunications, etc.

We will also look at industry trends and discuss some innovative ideas that have recently been developed.

Pre-requisites and co-requisites

Pre-requisites courses

ELEC-H417 | Communication networks : protocols and architectures | 5 crédits

Teaching method and learning activities

It involves students in group projects to identify challenging problems in wireless networks through extensive reading and discussion, to propose solutions to those problems, then conduct a group project.

Laboratories include

- > Deployment and configuration of an experimental GSM network
- > Security labs (IMSI catcher, VoIP relaying)
- > Research project on Internet of Things

Contribution to the teaching profile

This teaching unit contributes to the following competences:

- > In-depth knowledge and understanding of integrated structural design methods in the framework of a global design strategy
- > Reformulate complex engineering problems in order to solve them (simplifying assumptions, reducing complexity)
- > Collaborate in a (multidisciplinary) team
- > Work in an industrial environment with attention to safety, quality assurance, communication and reporting
- > Think critically about and evaluate projects, systems and processes, particularly when based on incomplete, contradictory and/or redundant information
- > A creative, problem-solving, result-driven and evidence-based attitude, aiming at innovation and applicability in industry and society
- > A critical attitude towards one's own results and those of others
- > The flexibility and adaptability to work in an international and/or intercultural context
- > An attitude of life-long learning as needed for the future development of his/her career
- > Has an active knowledge of the theory and applications of electronics, information and communication technology, from component up to system level.
- > Has a profound knowledge of either (i) nano- and opto-electronics and embedded systems, (ii) information and communication technology systems or (iii) measuring, modelling and control.

- > Has a broad overview of the role of electronics, informatics and telecommunications in industry, business and society.
- > Is able to analyse, specify, design, implement, test and evaluate individual electronic devices, components and algorithms, for signal-processing, communication and complex systems.
- > Is aware of and critical about the impact of electronics, information and communication technology on society.

References, bibliography and recommended reading

Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson, 2004.

Important : several parts of the course are drawn from the industry, latest research publications, etc. and there is no textbook for these parts

Evaluation method(s)

Other

Evaluation method(s) (additional information)

Oral exam and year project.

Main language(s) of evaluation

English

Programmes

Programmes proposing this course at the Brussels School of Engineering

MA-IREL | **Master of science in Electrical Engineering** | finalité electronics and information technologies/unit 2

Programmes proposing this course at the faculty of Sciences

MA-SECU | **Master in cybersecurity** | finalité Cryptanalysis and Forensics/unit 2, finalité Corporate Strategies/unit 2 and finalité Erasmus Mundus joint master in Cybersecurity (CYBERUS)/unit 2

