

# Mobile and wireless networks

## Titulaire

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## Mnémonique du cours

ELEC-H423

## Langue(s) d'enseignement

Anglais

## Période du cours

Premier quadrimestre

## Contenu du cours

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.

More precisely, the objectives of this course are for the students:

- To acquire hands-on experience of wireless and mobile networking technologies. To experiment with state-of-the-art networking technologies and tools that enable students to diagnose and perform measurements on a network.
  - To get involved in research projects on advanced topics in mobile ad hoc networks (MANets), and be able to present and write high quality technical reports on protocol design, analysis and simulation.
  - To be part of a team and to tackle challenging research problems in a semester-long project. To suggest solutions to these problems and to be able to demonstrate the feasibility and performance of the solution.
  - To learn how to read and review publications in the wireless networking field from selected journal articles and conference proceedings.
- Skills acquired in this class should emphasize and supplement deep understanding of actual protocol and network behavior. Students develop and enhance their understanding of the basics of wireless networking, mainly at the network and MAC layers, the behavior of the fundamental and evolving network protocols (e.g., unicast/multicast ad hoc routing protocols, media access control (MAC) protocol of wireless networks, among others). Students also study that the network behavior is a collective behavior of all such protocols (and others), their interaction among themselves, and with the 'faulty' and dynamic network environment. By integrating network dynamics, such as packet losses, link/node failures and

mobility, and through diagnostic and measurement tools, students study and analyze the effects of various network conditions on the overall behavior of the network.

Such deep practical understanding, along with strong analytical skills, are essential for future networking research and industry, that would greatly help in understanding today's networks, and designing networks of the future.

## Objectifs (et/ou acquis d'apprentissages spécifiques)

This course will cover the fundamental aspects of wireless networks, with emphasis on current and next-generation wireless networks.

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.

The course should provide the students with a good understanding of the wireless networking concepts and research directions.

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

It also involves students in group projects to identify challenging problems in wireless ad hoc networks through extensive reading and discussion, to propose solutions to those problems, then conduct high quality research (through extensive simulations, analysis and implementation) to produce a term project report (of conference and journal quality) that is the final product of their work.

## Pré-requis et co-requis

### Cours pré-requis

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

## Méthodes d'enseignement et activités d'apprentissages

(interactive) Lectures in classes

Laboratories and hands-on sessions in the telecommunications lab.

Personnal / Group Project.

## Contribution au profil d'enseignement

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 optoelectronics 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.

## Méthode(s) d'évaluation

Autre

## Programmes

### Programmes proposant ce cours à l'école polytechnique de Bruxelles

MA-IREL | **Master : ingénieur civil électricien** | finalité Spécialisée électronique et technologies de l'information/bloc 2

### Programmes proposant ce cours à la faculté des Sciences

MA-SECU | **Master en cybersécurité** | finalité Conception et Analyse de Systèmes/bloc 2, finalité Stratégies en entreprise/bloc 2 et finalité Erasmus Mundus joint master in Cybersecurity (CYBERUS)/bloc 2