Module IT2302

Cellular Mobile Technologies

Person in charge: Emmanuelle Vivier
Prerequisite: Fundamentals of Telecommunications
Organization: 14 x 3h Lectures/Labs
Evaluation: Exams and Project
ECTS: 5 credits

Context

In recent decades, the use of mobile phones has spread around the world. In addition, the usage made of these phones is constantly evolving: from a simple voice call in the late 20th century, to the handling of a real small embedded computer quickly connecting with internet networks in order to download increasingly large data. This need to offer ever increasing throughputs and the penetration rate success have motivated the evolution of mobile telephony standards, the maximum throughput and capacity offered by each generation of standard quickly being too weak to propose new services to subscribers.

This module provides a comprehensive description of wireless mobile cellular communications systems, from 2G to 5G beginnings. Systems architectures, radio interface, multi-user access, logical and physical communication channels, mobility management, dimensioning and capacity are addressed in this course.

Objectives

The objective of this module is to address, first the common and fundamental concepts of cellular mobile systems, and then the specific characteristics of each generation of these systems, from 2G to 5G.

Skills

In terms of skills, this module aims to enable students to:

- compare services & performances proposed by cellular mobile communication networks, as well as their architectures.
- provide fundamentals related to conception and roll-out (dimensioning and planning) of cellular mobile communication networks, by the appropriation
of these networks technical diversity, their capacity and their services offered to users.

Knowledge

This module enables students to develop the following concepts and skills.

- **Concepts**
  - Cellular mobile communication networks Architecture and Engineering
  - Radio propagation (noise, interference, protection against errors)
  - Mobility & Security in cellular mobile communication networks
  - Users Multiplexing

- **Know-How**
  - Good practices for cellular networks radio dimensioning
  - Support to capacity management in cellular radio networks
  - Support to planning in cellular radio networks

Pedagogical Approach

Fundamentals are provided by lectures and Lab activities. They are coupled with conferences given by professionals.

This module is divided in two parts: first the common and fundamental concepts of cellular mobile systems, and then the specific characteristics of each generation of these systems: 2G, 3G, 4G and 5G.

During the module, individual or in group written exams will check students' learning progress and their capabilities to apply the acquired knowledge to solve simple problems.

A dimensioning case study assigned to a small group will allow to check the comprehension from a system perspective and to compare results from simulations with field measures.

References

- Handouts (copies of viewgraphs and selected texts)