Module Description, available in: EN

Wireless Communications

General Information

Number of ECTS Credits

3

Module code

TSM_WireCom

Valid for academic year

2025-26

Last modification

2023-08-30

Coordinator of the module

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Explanations regarding the language definitions for each location:

- Instruction is given in the language defined below for each location/each time the module is held.
- Documentation is available in the languages defined below. Where documents are in several languages, the percentage distribution is shown (100% = all the documentation).
- The examination is available 100% in the languages shown for each location/each time it is held.

	Lausanne			Lugano	Zurich		
Instruction					**X** E 100%		
Documentation					**X** E 100%		
Examination					**X** E 100%		

Module Category

TSM Technical scientific module

Profile Recommendations

This module is recommended for the following profiles:

	Zurich
Profile	CS

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

The students are expected to have basic knowledge on serial communication, communication topologies (e.g. point-to-point, point-to-multipoint), OSI reference model, statistics and Fourier analysis.

Brief course description of module objectives and content

The module starts with the physical properties of radio propagation, analog and digital modulation and forward error correction.

Then the students will be exposed to the functioning and characteristics of a selection of the most important wireless standards at the present time. The focus will be on the physical layer and the medium-access layer.

Exercises will be used throughout the course to exemplify the use and application of the module content to examine existing standards for a given problem in the context of the merits and limitations of each technology.

Aims, content, methods

Learning objectives and competencies to be acquired

The student will be able to

- discriminate between the various advanced modulation, coding and transmission concepts and explain their benefits and limitations
- explain the key characteristics of a selection of the most important wireless standards at the present time in regards to the Physical and Data Link layers
- research information on different wireless technologies
- select the most suitable wireless technology for a practical problem.

Module content with weighting of different components

Common Fundamentals (25%)

Applications, requirements, market and frequency spectrum issues in wireless communications. Wireless receivers and transmitters, Radio propagation and Digital modulation and coding.

Standards(75%)

Introduction to a selection of the most important standards and technologies at the time of the course (the actual technologies taught may differ somewhat fom this list) :

- GSM / UMTS / LTE / 5G / IoT
- GNSS (GPS, Galileo)
- Satellite Communication
- WLAN / Bluetooth
- RFID
- DAB
- etc.

Teaching and learning methods

- Lectures
- Work through exercises
- Self-study:
    - completion of exercises
    - research using online and print resources
    - Analysis of case studies

Literature

- Ke-Lin Du, M.N.S. Swamy, "Wireless Communication Systems", Cambridge, 2010
- J.-F. Wagen, "Mobile & Wireless Networks and Services", HEIA-FR book
- J. Proakis, M. Salehi, "Digital Communications", McGraw-Hill Press
- A. Paulraj, N. Nabar, D. Gore, "Introduction to Space-Time Wireless Communications", Cambridge Press
- C. Lüders, "Mobilfunksysteme", Vogel Verlag
- M. Sauter, "Grundkurs Mobile Kommunikationssysteme", Springer Vieweg Verlag
- D. von Grünigen, "Digitale Signalverarbeitung", Fachbuchverlag Leipzig
- Klaus Finkenzeller, "RFID-Handbuch", 7. Auflage, Hanser Verlag
- J. Schiller, "Mobilkommunikation", Addison-Wesley
- J.-M. Zogg, "Telemetrie mit GSM/SMS und GPS Einführung", Franzis Verlag
- R. Tanner (ed.), J. Woodard (ed.), "WCDMA Requirements and Practical Design", Wiley
- M. Sauter, "From GSM to LTE Advanced PRO and 5G", Wiley, 2011
- E. Dahlman, St. Parkvall, J. Skold, "4G LTE / LTE Advanced for Mobile Broadband", Elsevier
- E. Dahlman, St. Parkvall, J. Skold, "5G NR: The Next Generation Wireless Access Technology", Academic Press
- Gordon Colbach, "The WiFi Networking Book"
- Standards, e.g. 3GPP, IEEE 802.x, ETS 300 401, ISO/IEC 18000-6C, ISO/IEC 15693

Assessment

Additional performance assessment during the semester

The module does not contain an additional performance assessment during the semester

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

Calculator

Other permissible aids

Part of the exam will be open book and there may be also a part in which no reference material is allowed.

Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final permissible aids prior to the exam session.

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

Calculator.

Other permissible aids

No reference material will be allowed.