Modul Description

Wireless Communications

General Information

Number of ECTS-Credits

3

Abbreviation

TSM_WireCom

Version

10.10.2015

Responsible of module

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Language

	Lausanne	Bern	Zürich
Instruction	☑ E ☑ F	☐ D ☐ E ☐ F	☑ D ☐ E
Documentation	☑ E ☑ F	☐ D ☐ E ☐ F	☑ D ☑ E
Examination	☑ E ☑ F	☐ D ☐ E ☐ F	☑ D ☐ E

Module category

☐ Fundamental theoretical principles

☑ Technical/scientific specialization module

☐ Context module

Lessons

☑ 2 lecture periods and 1 tutorial period per week

☐ 2 lecture periods per week

Brief course description of module objectives and content

The module starts with the basics of the Physical and Data Link layers of advanced wireless systems.

Then the students will be exposed to the definition or functioning 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 learnt material to compare the existing standards for a given problem in the context of the merits and limitations of each technology.

Aims, content, methods

Learning objectives and acquired competences

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
- find specific information in the standardisation documents
- select the most suitable wireless technology for a practical problem

Contents of module with emphasis on teaching content

Common Fundamentals (25%)

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

Standards(75%)

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

- GPS
- RFID
- WLAN / Bluetooth
- GSM / UMTS / LTE
- DAB / DVB
- etc.

Teaching and learning methods

- Lectures
- Work through exercises or perform simulations under supervision
- Self-study:
  - completion of exercises
  - research using the standards documents, online and library resources
  - analysis of case studies

Prerequisites, previous knowledge, entrance competence

The students are expected to have knowledge on the basic modulation schemes including amplitude, frequency and phase. They must also have studied the fundamentals of coding techniques. 0 ther r through personal work are statistics, probabilities, wave theory, Fourier analysis and the OSI reference model

Literature

- Ke-Lin Du, M.N.S. Swamy, „Wireless Communication Systems“, Cambridge, 2010
- M. Sauter, „From GSM to LTE“, Wiley, 2011
- Mobile & Wireless Networks and Services, Jean-Frédéric Wagen
- Digital Communications, J. Proakis, M. Salehi, McGraw-Hill Press
- Introduction to Communication Systems, F. G. Stremmler, Addison-Wesley
- Information Transmission, Modulation and Noise, M. Schwarz, McGraw-Hill
- Principles of Mobile Communication, G. Stuber, Kluwer Academic Publishers
- Introduction to Space-Time Wireless Communications, A. Paulraj, N. Nabar, D. Gore, Cambridge Press
- Mobilfunksysteme, C. Lüders, Vogel Verlag
- Grundkurs Mobile Kommunikationssysteme, M. Sauter, Wieweg Verlag
- Digitale Signalverarbeitung, D. von Grünigen, Fachbuchverlag Leipzig
- Standards, e.g. 3GPP, IEEE 802.x, ETS 300 401, ISO-IEC_CD 18000-6C, ISO/IEC FDIS 15693-x: 2000(E),
- Klaus Finkenzeller, RFID-Handbuch, 3. Auflage, Hanser.
- WCDMA Requirements and Practical Design, (ed.) R. Tanner, J. Woodard, Wiley
- J. Schiller, Mobilkommunikation, Addison-Wesley.
- Digitale Fernsehtechnik in Theorie und Praxis; W. Fischer, 2006 Springer
- Digital Television; W. Fischer, 2007 Springer
- Digital Video Broadcasting; U. Reimers, 2005 Springer
- Telemetrie mit GSM/SMS und GPS Einführung, J-M Zogg, Franzis Verlag

Assessment

Certification requirements for final examinations (conditions for attestation)

Intermediate evaluation instruments will be used for max 20% of the module grade.

Written module examination

Duration of exam:	120 minutes
Permissible aids:	Part of the exam will be open book and there may be also a part in which no reference material is allowed.