Signal Processing and Transmission

General Information

Number of ECTS Credits
3

Module code
TSM_SignProc

Valid for academic year
2019-20

Last modification
2019-06-21

Coordinator of the module
Heinz Mathis (FHO, heinz.mathis@hsr.ch)

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.

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

Module Category
TSM Technical scientific module

Lessons
2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

- Basics in probability theory
- Basics of information theory: entropy, basic source coding, linear block codes (e.g., CRC, Hamming)
- Basics in free-space propagation
- Basic modulation techniques: AM/FM, digital modulations
- Knowledge of the Fourier transform (theory and applications)
- Matlab user knowledge

Brief course description of module objectives and content

The aim of this module is to provide insight into state-of-the-art methods of how to make a signal fit for transmission over a cable or over the air. It starts with some information-theoretic aspects, covers modern modulation formats, hardware used, and closes with an excursion into propagation mechanisms.

Aims, content, methods

Learning objectives and acquired competencies

The students:
- understand the basic descriptions of a communication chain from a signal processing point of view,
- can describe the complete transmission chain, for several state-of-the-art communication systems,
- know the main characteristics, advantages and disadvantages of the presented techniques,
- are aware of the current research directions in advanced transmission technologies.

Contents of module with emphasis on teaching content

- Complex base-band representation, CIC filters
- Detection theory
- Adaptive filters (LMS, RLS, Kalman Filter)
- Code-Division Multiple Access (CDMA), Ultrawideband (UWB)
- Orthogonal Frequency Division Multiplex (OFDM)
- Trellis-Coded Modulation (TCM)
- Architectures of optimal receivers
- Zero-IF, low-IF, bandpass architecture
- Wave propagation models for wireless communications
- Digital signal transmission over multipath channels
- Smart antenna systems

Teaching and learning methods

Lectures with problem-solving sessions

Literature

Lecture notes and slides in English

Assessment

Certification requirements

Module does not use certification requirements

Basic principle for exams

As a rule, all the standard final exams for modules and also all resit exams are to be in written form

Standard final exam for a module and written resit exam

Kind of exam

written

Duration of exam

120 minutes

Permissible aids

Aids permitted as specified below:

Permissible electronic aids

Calculator and laptop/tablet in Airplane mode

Other permissible aids

Lecture notes and slides

Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted