Module Description, available in: EN

Advanced Electronic Design

General Information

Number of ECTS Credits

3

Module code

TSM_AdvElDes

Valid for academic year

2021-22

Last modification

2021-05-12

Coordinator of the module

Hanspeter Schmid (FHNW, hanspeter.schmid@fhnw.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.

	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

The student must have knowledge and experience in the following areas:

- Circuit analysis
- Electrical and magnetic fields
- Active and passive electronic components, operational amplifiers
- AD and DA conversion principle
- Digital circuits

Brief course description of module objectives and content

This Advanced Electronic Design module gives to the students the key elements for the development of high performance electronic systems. These systems are characterized by:

- a mixed-signal PCB (Printed Circuit Board)

- the presence of sensitive analogue circuits and signals
- the presence of complex and high-speed digital ICs (Integrated Circuits)

Aims, content, methods

Learning objectives and acquired competencies

- The student is able to design a high-performance electronic board composed of sensitive analogue, mixed signal and high speed digital circuits.
- The student is able to implement high-speed and high-resolution signal processing chains based on A/D and D/A converters, analogue functions blocs and complex digital ICs

Contents of module with emphasis on teaching content

Course	Title	Weeks	Emphasis
1	High-speed digital electronic design : • high-speed signaling and timing, clock distribution, skew, jitter, latch-based design, low-power	1 – 5	~35%
2	Advanced analogue electronic design : • Advanced operational amplifier applications: low level and sensor signal conditioning, electronic noise, high-speed and low-power amplifiers, frequency response analysis • Advanced ADC and DAC implementations: high-speed, high-resolution, sigma-delta converter, low-power, anti-aliasing and post-filter	6 – 14	~65%

Teaching and learning methods

- Lecture
- Exercises
- Presentation and discussion of case studies
- Self-study of the presented cases and exercises

Literature

The Op Amp Applications Handbook, Walt Jung, Analog Devices, 2006

Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, McGraw-Hill 2002.

The Data Conversion Handbook, Walt Kester, Analog devices, March 2004.

High Speed Signal Propagation: Advanced Black Magic, Howard Johnson – Martin Graham, Prentice Hall, 2003.

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

pocket calculator

Other permissible aids

Course material

Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted