Module Description, available in: EN

Intelligent and Hyperconnected Machine

General Information

Number of ECTS Credits

3

Module code

FTP_SmartMach

Valid for academic year

2021-22

Last modification

2021-03-18

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

FTP Fundamental theoretical principles

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

- General mechanics
- IT basics

Brief course description of module objectives and content

Students learn and experience an advanced approach to designing an autonomous real-time process monitoring system (cyber-physical system)

Aims, content, methods

Learning objectives and acquired competencies

Students learn and experience an advanced approach to designing **an autonomous real-time process monitoring system**.

This will allow them to experience a development project by directly integrating an expert reflection on the digital autonomy expected of automated mechanisms in the Industry 4.0 world.

They will also be introduced to the multidisciplinary roles that the engineer-designer of tomorrow will have to play in the face of the **challenges of digitization** and the advent of intelligent and autonomous machines.

This course uses as a red thread **the Micro5 eco-demonstrator** developed in the framework of the HES-SO thematic programs (2013-2016) and recently equipped with an original and very advanced cognitive system.

Contents of module with emphasis on teaching content

The learning objectives are to allow the student to develop a critical sense and to experience the steps and difficulties related to defining and developing an artificial intelligence system on a production tool.

The following steps will be covered:

- Positioning and role of the engineer-designer in the face of digitalization issues
- Definition of a digital cognitive system (prospective and decision-making capacities)
- Goals to be achieved by the system being developed (issues and methods)
- Definition of the tools to be developed
- Development of a relevant cyber-physical system in production (choice of relevant data, signal processing, documentation and data feedback, real-time management, data storage)
- Data processing and analysis
- Experimentation through monitored and precursor machining (visualization, experience report)
- Digitalisation of know-how (empowerment tools)
- Development of a digital behavioral twin

Teaching and learning methods

Theory:

- Cognitive system (what and how)
- Prospective capabilities
- Cyber-physical system
- Data feedback and analysis

Practical:

- Application to machines
- Case studies

Experimentation:

- Machining with data feedback
- Labeling
- Analyses
- AI restitution

Literature

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

No aids permitted

Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted