

**Module Description, available in: EN**

## *Intelligent and Hyperconnected Machine*

**General Information****Number of ECTS Credits**

3

**Module code**

FTP\_SmartMach

**Valid for academic year**

2023-24

**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		
<b>Instruction</b>	X E 100%						
<b>Documentation</b>	X E 100%						
<b>Examination</b>	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