

**Module Description, available in: EN**

## *Automatic Drive Systems*

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

3

**Module code**

TSM\_AutoSys

**Valid for academic year**

2024-25

**Last modification**

2021-02-12

**Coordinator of the module**

Norman Baier (BFH, norman.baier@bfh.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		
<b>Instruction</b>					X E 100%		
<b>Documentation</b>					X E 100%		
<b>Examination</b>					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**

- Basic knowledge of control engineering and machines (Bachelor degree level)
- Mastery of *Matlab* and *Simulink*
- Possession of a laptop with *Matlab / Simulink* installed

**Brief course description of module objectives and content**

This module treats methods of concept, dimensioning and development in the servo drive technology sector which are particularly compatible with the various industries.

## Aims, content, methods

### Learning objectives and acquired competencies

After the completion of this module, students will be able to:

- analyze the dynamics of a drive,
- quantify or even improve its dynamic behavior, and
- integrate a drive into a mechatronic system.

### Contents of module with emphasis on teaching content

Electric motor drives (DC, synchronous, asynchronous, stepper, reluctance, and piezoelectric motors), pneumatic drives, hydraulic drives  
Actuator selection from the energy source to the mechanical process: modeling, dimensioning, alignment  
Selection of case studies from the industrial sector

Preface for documentation: <https://moodle.msengineering.ch/course/view.php?id=35>

### Content

1. Presentations, description of module, organization
2. Introduction on drives
3. Evaluation: development of model on Matlab/Simulink for a drive, and simulation.
4. Variants on drive solutions.
5. Drive solutions with DC or BLDC motors
  - dynamic description of movement
  - modeling (*Matlab+Simulink*)
  - transmitters and power electronics
  - transmissions
  - cascade regulation of drives.
  - synchronous motor
  - asynchronous motor
  - stepper motor
  - reluctance motor
6. Several case studies from the industrial sector: multiaxial drives, robotics, medical, railway, automotive, ...

### Teaching and learning methods

- Ex-cathedra teaching
- Case studies
- Exercises (*Matlab*)

### Literature

H. Bühler: Réglage d'électronique de puissance, PPUR, vol 1 & 2.

E. Riefenstahl: Elektrische Antriebssysteme, Teubner Verlag, 2006.

A. Shumway-Cook, M. H. Woollacott: Motor Control: Theory and Practical Applications.

W. N. Alerich, S. L. Hermann: Electric Motor Control.

M. Nakamura, S. Goto, N. Kyura: Mechatronic Servo System Control: Problems in Industries and their Solutions.

Scripts on Moodle

## 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, laptop with *Matlab / Simulink*

Other permissible aids

Module documents, forms, (all means of communication are forbidden).

### Special case: Resit exam as oral exam

Kind of exam

oral

Duration of exam

30 minutes

Permissible aids

No aids permitted