MASTER OF SCIENCE IN ENGINEERING

Module Description, available in: EN

Automatic Drive Systems

General Information

Number of ECTS Credits

3

Module code

TSM_AutoSys

Valid for academic year

2025-26

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		
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

- 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 competencies to be acquired

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.

Module content with weighting of different components

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

Additional performance assessment during the semester

The module does not contain an additional performance assessment during the semester

Basic principle for exams

As a rule, all standard final exams are conducted in written form. For resit exams, lecturers will communicate the exam format (written/oral) together with the exam schedule.

Standard final exam for a module and written resit exam

Kind of exam

Written exam

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).

Exception: In case of an electronic Moodle exam, adjustments to the permissible aids may occur. Lecturers will announce the final permissible aids prior to the exam session.

Special case: Resit exam as oral exam

Kind of exam

Oral exam

Duration of exam

30 minutes

Permissible aids

No aids permitted