Module Description, available in: EN

New Design Methodologies for Microengineering Products

General Information

Number of ECTS Credits

3

Module code

TSM_MTProdDes

Valid for academic year

2026-27

Last modification

2022-01-10

Coordinator of the module

Sylvain Hugon (HES-SO, sylvain.hugon@heig-vd.ch)

Explanations regarding the language definitions for each location:

- Instruction is given in the language specified for each location and module execution.
- Documentation is available in the language(s) listed for each location and module execution. If the documentation is in multiple languages, the percentage distributed is indicated (100% = all documentation provided).
- The examination, including both questions and answers, is provided entirely (100%) in the language(s) specified for each location and module execution. The exams are on-site.

	Lausanne			Lugano	Zurich		
Instruction	**X** E 100%						
Documentation	**X** E 100%						
Examination	**X** E 100%						

Module Category

TSM Technical scientific module

Profile Recommendations

This module is recommended for the following profiles:

	Lausanne
Profile	Mic

Lessons

2 lecture periods and 1 tutorial period per week

Entry level competences

Prerequisites, previous knowledge

Basic knowledge of design methodologies

Brief course description of module objectives and content

By the end of this course, students will have acquired the skills to analyse, understand and identify the design process environment for microengineering devices. The course includes concepts specific to design processes in microengineering, such as the specificities due to the size of devices and microfabrication tools.

Students will be trained to understand the customer's need, formalise the problem, establish the requirements and derive the primary specifications. They will also know how to build the functional and physical architectures, and, if necessary, simulate, predict and validate the behaviours and performances to analyse the safety of operation. The course is designed to integrate concrete cases, allowing students to build a reference base.

Aims, content, methods

Learning objectives and competencies to be acquired

- Know how to apply design methods (writing functional specifications, functional analysis, FMECA, FAST, APTE, V-Model) and how to choose the most suitable in a given design process.
- Integrate into the design the specificities of the physical phenomena of microengineering products by implementing, if necessary, on a multi-criterias and product management software. For this module, "Knowllence: Robust Engineering Suite - Medical Device Suite" is used.
- Understand and consider microengineering interactions for the production and maintenance of prototypes or series products.
- At the end of the course, the student will be able to apply and critically examine design techniques in microengineering in order to produce solutions that take into account health and safety aspects while respecting environmental and economic constraints.

Module content with weighting of different components

- *(a+b) a theoretical periods + b practical exercises/application periods*
- (3+3) Design methods
    - Structures of companies in the microengineering field
    - Product life cycle
    - user needs
    - functional analysis : writing functional specifications
    - choice of the most suitable method in a given design process (examples and application cases)
    - presentation of typical software (Knowllence: Robust Engineering Suite - Medical Device Suite)
- (3+3) Specificities of microengineering products
    - Products specifications - URS
    - Solutions research
    - Patent review
- (3+3) Value analysis
    - Value analysis calculation
    - FAST + APTE methods
- (3+3) Microengineering interactions for production and maintenance - Project management
    - prototype vs. series products - (traceability, documentation, design master file, standards, V-model)
    - Management driving tools, (projects review and milestones)
    - FMEA - FMECA

- (3+3) Design to cost
    - Design calculation
    - First approach of DFM - Design for manufacturing - including production environnement
- (0+3) Product design validation - validation of all design steps
    - Open technology transfer

Teaching and learning methods

Lecture-type classes, illustrated with videos and models

Red thread (an application project that follows the course progression: throughout the semester, students construct their project, step by step, while following the course program)

Literature

- La conception mécanique, 2e Edition, Méthodologie et optimisation, Philippe Boisseau, Editions Dunod.

- Reference works for the choice of professors.

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

Allowed: Computer, common software, internet access

Not allowed: Telephone, access to social networks

Other permissible aids

Allowed: Personal notes, reference works

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

Aids permitted as specified below:

Permissible electronic aids

Length of exam:

30 minutes presentation and 30 minutes preparation

Allowed: Computer, common software, internet access, personal notes, reference works

Other permissible aids

Allowed: Personal notes, reference works