

**Module Description, available in: EN**

## *Product Innovation and Product Lifecycle Management*

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

3

**Module code**

TSM\_Product

**Valid for academic year**

2022-2023

**Last modification**

2021-01-03

**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**

TSM Technical scientific module

**Lessons**

2 lecture periods and 1 tutorial period per week

**Entry level competences****Prerequisites, previous knowledge**

To attend this module, students must have a Bachelor's degree in Mechanical Engineering from a Swiss University of Applied Sciences. Depending on the specific nature of the course, a Bachelor's degree in Electrical Engineering from a Swiss University of Applied Sciences may also be acceptable, providing that the student has successfully completed modules covering methodological product development in the field of consumer and/or investment goods.

**Development methods and Product innovation**

The students:

- know the purpose and content of project specifications and requirements with respect to user needs,
- know several methods of finding solutions (such as, for example, functional structures active principles, morphological box)
- know the evaluation methods (value benefit analysis, SWOT analysis, etc.)
- have worked in a team on at least one small development project

**Product Lifecycle Management**

The students:

- know the product conception process (in the consumption and/or investment goods sectors)

- know the meaning and purpose of product structures
- have experience in the application of a 3D CAX system (Master Model Approach) or have worked with complex-structured data in other applications

## Brief course description of module objectives and content

Students become acquainted with the product innovation process and its strategic importance for enterprises. They recognize the relationship between the **product innovation** process and the **product development** process. Students will get to know and train typical methods of both processes and will gain deeper knowledge of the subject by doing “hands-on”-project work.

In **Product Lifecycle Management (PLM)**, product innovation and development deal with in the context of the entire product lifecycle. The course will focus on the information flow across an industrial enterprise from data considering its organization (local, global), the processes (engineering, sales, manufacturing, purchasing, service), the product characteristics and the different IT tools (CAX, PLM, ERP). Aspects such as product structures, product variants, and release and change processes are important components of PLM. In team and project work, students will solve real life problems in a “laboratory environment”.

## Aims, content, methods

### Learning objectives and acquired competencies

#### Students

- know the importance of innovation for enterprises,
- understand the integration of technological product innovation and product development in business processes within enterprises,
- possess an in-depth knowledge of the product innovation process (processes, methods, and tools),
- can correctly apply methods and tools in the innovation process according to the situation,
- know the importance of PLM in enterprises,
- possess an in-depth knowledge of the product conception process,
- possess an in-depth knowledge concerning product structure and product variants (serial and plant production) and can apply these in concrete examples,
- know the relationship between the most important data generation systems and management systems of technological product data,
- know the impact of design decisions and design data for all subsequent processes in an enterprise,
- understand the role of product information and its relationship with industry 4.0,
- can define the most important workflows in concrete application in the product conception stage (as an essential condition for the operation of a PLM system).

### Contents of module with emphasis on teaching content

The module comprises the two main subject areas: “Development methods and product innovation” and “Product lifecycle management”.

The two areas have been divided up into a total of 14 courses, which are listed below. The individual courses all have roughly the same weighting. A “convergence phase” of approximately two lessons is provided for in each area.

#### Development Methods and Product Innovation

- TRIZ/ TIPS (Theory of inventive problem solving): The importance of task formulation, the ideal machine, matrix of contradiction matrix, procedural principles, substance-field analysis, the evolution of technical systems
- Innovation strength
- Classical methods VDI 2221, 2222, 2206
- Product innovation process
- Strategic product planning: potential planning, product planning, business planning, strategic control
- Integrative product development
- Virtual product development tools for components, machines, and manufacturing plants: 3D CAX systems, digital mock-up, model building, model analysis, production (process) planning, product data technology

#### Product Lifecycle Management

- Basic principles: Product model, Product Data Management (PDM), Product Lifecycle Management (PLM)
- Product conception process: Business processes, data-process relationship, from the idea to waste disposal
- Product structures: Variant management, product configuration, material master data, product description data
- Lifecycle: Lifecycles of individual data objects, status of objects
- Release processes and change management
- Data models and authorizations
- Advanced topics of product lifecycle management (industry 4.0)

### Teaching and learning methods

- Ex-cathedra teaching
- Project-oriented work in the form of group work during the students' self-study hours (students will be assisted through Moodle, presentations, etc.)

### Literature

#### Development methods and product innovation

- **German:** Pahl, G.; Beitz, W.; Feldhusen, J.; Grote, K.-H.: „Pahl/Beitz. Konstruktionslehre. Grundlagen erfolgreicher Produktentwicklung.

- Methoden und Anwendung". Berlin: Springer-Verlag, 2007. – ISBN-10 3-540-34060-2, ISBN-13 978-3-540-34060-7
- **French:** Tassinari Robert, Pratique de l'analyse fonctionnelle, L'Usine Nouvelle, France, 2003, ISBN : 2-10-005338-8
  - **English:** Pahl, G., Beitz, W., Feldhusen, J., Grote, K.-H.: Engineering Design, A Systematic Approach, 3rd ed., 2007, XXI, 617 p., Hardcover, ISBN 978-1-84628-318-5
  - **English:** Ulrich, T. U., Eppinger, S.D., Product Design and Development, 3rd ed., 366p, Hardcover, ISBN 007-123273-7

#### Product Lifecycle Management

- **German:** Eigner Martin / Stelzer Ralph: Produktdatenmanagement-Systeme, Springer, ISBN-10: 3-540-66870-5
- **French:** Debaecker Denis: PLM : La gestion collaborative du cycle de vie des produits, Hermes, France, 2004, ISBN : 2-7462-0884-9
- **English:** Stark John, Product Lifecycle Management : 21st century paradigm for product realisation, Springer, London, 2005
- **English:** Saaksvuori Antti / Immonen Anselmie, Product Lifecycle Management, Springer, ISBN-10: 3-540-25731-4

## Assessment

### Certification requirements

Module uses certification requirements

### Certification requirements for final examinations (conditions for attestation)

Two "mini projects" done in groups as the condition for attestation (requirement fulfilled).

### 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

No electronic aids permitted

#### Other permissible aids

Any auxiliary materials or other documents required for the examination will be provided only by the lecturers.

### Special case: Resit exam as oral exam

#### Kind of exam

oral

#### Duration of exam

30 minutes

#### Permissible aids

*Aids permitted as specified below:*

#### Permissible electronic aids

No electronic aids permitted

#### Other permissible aids

Any auxiliary materials or other documents required for the examination will be provided only by the lecturers.