

## Module Description

# Product Innovation and Product Lifecycle Management

## General Information

## Number of ECTS Credits

3

## Abbreviation

TSM\_Product

## Version

03.10.2016

## Responsible of module

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## Language

	Lausanne	Bern	Zürich
Instruction	<input type="checkbox"/> E <input checked="" type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Documentation	<input type="checkbox"/> E <input checked="" type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Examination	<input type="checkbox"/> E <input checked="" type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E

## Module category

- Fundamental theoretical principles
- Technical/scientific specialization module
- Context module

## Lessons

- 2 lecture periods and 1 tutorial period per week

## 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. Typical methods of both processes will be dealt with as tools and “hands-on”-project work will provide deeper knowledge of the subject.

In **Product Lifecycle Management (PLM)**, product innovation and development will be examined in connection with 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 (CAD, CAM, PLM, ERP). Aspects such as product structures, product variants, and release and change processes are regarded as important components of PLM. In team and project work real life problems will be solved 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 on different levels for new concepts such as closed loop lifecycle management,

digitization and 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
- Classical methods: VDI 2221, VDI 2222, VDI2206
- Innovation strength
- 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 CAD systems, digital mock-up, model building, model analysis, production (process) planning, product data technology
- Databases: physical effects, active principles, patents

#### 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

#### 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.)

#### Prerequisites, previous knowledge, entrance competencies

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
- 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 CAD system (Master Model Approach) or have worked with complex-structured data in other applications

**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*, 3<sup>rd</sup> 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 for final examinations (conditions for attestation)**

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

**Written module examination**

Duration of exam :	120 minutes
Permissible aids:	Open book
	No laptops