Engineering Modules (EM)

State-of-the-art technology expertise in product development processes

EM 1: Design and Validation Process & Information Systems for Product Development

The module gives an **in-depth insight in the fundamentals of product development processes and its challenges**. Individual process steps and the organization are defined. Moreover, the **product lifecycle is implemented in the form of the Product Lifecycle Management (PLM) system**. When using **virtual reality systems (e.g. CRM, ERP)**, it is important to identify both opportunities and limits of this new technology. The participants identify **workflows relevant to data modeling**.

The module also covers **methods of validation in a Product Design Project (PDP) and specific environment simulations (e.g. FEM, BEM)**. The typical approach to planning and executing a simulation study is applied.

EM 2: Integrated Product Development

One of the most important factors of success of product development is the systematic planning and use of adequate tools and methods. **Application of the portfolio analysis, of mind mapping or Data Stream Management (DSM)** is essential. Apart from these tools, it is important to understand the **structures, standards, and modifications in CAx and VR systems**. Knowledge of the background of information technology is an absolute necessity.

Participants realize the **effects and impacts of design modifications as well as the influence of prototypes or simulations on the innovation process**.

EM 3: Product Generation Development

While the first two modules systematically explain and deepen into the principles of the product development process, this module focuses on further aspects for a successful product development. Crucial factors of success in product development, such as **Total Quality Management (TQM) and Total Cost of Ownership (TCO)**, are explained and illustrated by examples.

Methods presented, such as **FMEA (Failure Mode and Effects Analysis) and FTA (Failure Tree Analysis) as well as target costing**, are efficient tools to support the product development process. Using examples, the participants learn to structure and systematically manage the design process in teams. The participants are aware of the **significance and limits of modern interface technologies**. They can assess and classify business strategies in terms of international competitiveness.

Finally methods are presented, for **analyzing lightweight-potentials in overall systems, design by multi-material as well as methods for synthesis and structural optimization of isotropic and anisotropic materials**.

EM 4: Systems & Cases

Systems engineering is an interdisciplinary approach to the early definition of customers' needs and functionalities, the documentation of requirements on the system to be developed, and the continuous synthesis and validation of the system along the development process. A wide range of **methodological aids is available to support the developer in systems synthesis and analysis**. **Eco-design methods** are adequate tools to use ecological aspects as chances for product innovations.

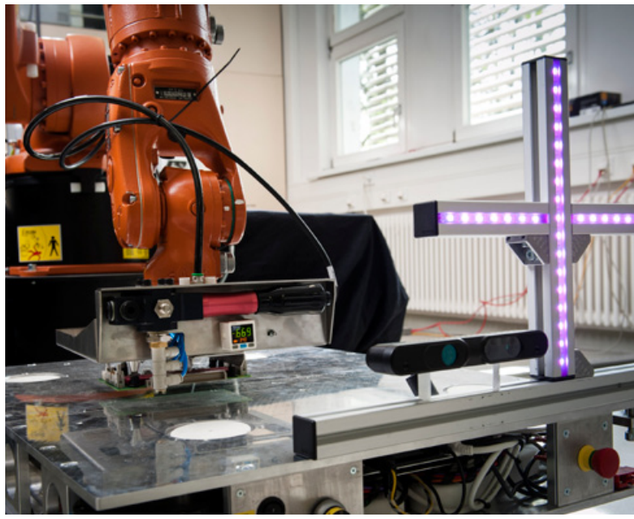
A final case study serves to acquire **competence in the use of development methods**. For this purpose, a development task is to be defined based on a concrete market situation and using the scenario technique. Then, this definition is to be implemented in a product concept. **Intuitive and discursive creativity techniques based on TRIZ-box or methods of cost control** are used under close-to-reality conditions. Based on this case study, all skills and theories learned are implemented in a practice-oriented environment. **Product planning, product specification, and concept development processes** are applied.

EM 5: Multi-technological Systems & Workshops

Successful work on complex **multi-technological systems** requires work in interdisciplinary teams. Apart from the use of **appropriate support methods, such as the V-model**, understanding of the varying perspectives of the team members is required. This results in high requirements on the quality assurance of interdisciplinary product development processes. Basic principles are presented and made available in the form of a practical guide.

Finally, key methods of product development are trained in workshops and first application competence is acquired. Among others, **analysis methods, universal problem solution methods, and verification and validation methods (DoE, XiL – X-in-the-Loop)** are applied.

Order your free course guide book with detailed contents of the Master Program!



Engineering Modules

EM 1: Design and validation process & information systems for product development
Courses: Vision & mission in product development | Test Based Development | Methods of Simulation | Information systems: Fundamentals of computer science for engineers

EM 2: Integrated Product Development
Courses: Integrated product development | Information systems: Product lifecycle management | Industrial design engineering

EM 3: Product Generation Development
Courses: Target costing | Strategic product portfolio | Variables for efficiency improvement in product development | Information systems: Virtual engineering | Production engineering | Lightweight design

EM 4: Systems & Cases
Courses: Systems engineering | Eco-design - methodology for sustainability | Case study in product development

EM 5: Multi-technological Systems & Workshops
Courses: Introduction & application to SysML | Quality management | Patent strategy in industry | Workshop in methods product development