



Management of Product Development

Executive Master's Program Agile Engineering of Mechatronic Systems



Become a HECTOR School Master

Leadership Know-How for Demanding Careers



»Personally, the HECTOR Master Program was an excellence experience. The Management in Product Development Program provided me a comprehensive set of tools to master today's product development challenges. In addition, the course in business accounting and management expanded my knowledge for my daily professional work as Manager. The technical course delivered state-of-the-art-knowledge in technology and methodology, ready for use. Overall the Executive Master Program was great professional development training.«

Thomas Kiefer

Alumus of Intake 2005



»HECTOR School provided me an opportunity to look outside the box. The experience helped me understand creating solutions does not always mean "doing it yourself" but also a fair deal of "learning from State of the Art". The Management of Product Development Program as such helped me immensely in my daily business and in my endeavor to combine Schaeffler culture of Product Development to Best Practices in Industry.«

Pulijala Vaibhav Rao

Alumus of Intake 2015



Executive Master's Program

Management of Product Development

**AGILE ENGINEERING & DESIGN
THINKING DIGITAL TWIN DESIGN
THINKING MULTICULTURAL AND
VIRTUAL TEAMS ADVANCED SYSTEMS
ENGINEERING COLLABORATION
METHODS INTERDISCIPLINARY
DEVELOPMENT DIGITALIZATION
UX / UI / USER-CENTERED DESIGN
INNOVATION MANAGEMENT**



Product development is the process of entirely planning and prototyping novel technical systems. It ranges from finding the product profile to creating a concept, designing, making prototypes, testing and validating. The actual manufacturing phase follows subsequently and is the second and final stage of the product creation process.

Thus, product development is certainly one of the core means of adding value into companies and is crucial for their success through innovation. Creativity and performance potential define the success of product development.

Participants of the master program Management of Product Development (MPD) are able to analyze, design, operate and implement the product development process in their companies in an optimized way by means of acquired research and application-oriented methods and processes.

Program Directors



Prof. Dr.-Ing. Dr. h. c. Albert Albers
Institute of Product Engineering, KIT

Prof. Dr. Martin E. Ruckes
Institute of Finance, Banking, and Insurance, KIT

Based on an integrated approach to product creation processes, the graduates can successfully implement innovative ideas and innovation in competitive products, while they draw a special focus on major criteria such as customized product solutions, the reduction of production costs as well as the optimization of quality standards. Furthermore, they are capable of implementing creativity techniques to accompany further innovation processes.

Additionally, due to increasing performance and competition pressure in product development, graduates can counteract shorter development times and product life cycles with appropriate methods and techniques.

Finally, Management of Product Development shares five management modules with the other master programs. This fosters networking across sectors and provides the participants with general knowledge in finance, accounting, marketing, international multi-project management, international law, and human resource management. In this way, they can consider the commercial implications of project decisions and develop a holistic view.



Shape the Future through Innovation



Case Study beginning with the analysis phase followed by the technical implementation and prototype construction resulting in the final presentation and transportation of cold beverages.

ABOUT THE CASE STUDIES

During their studies, we give participants the opportunity to directly implement what they have learned in a development project based on a given problem. During the course of the project, participants are accompanied by academic staff, so that they acquire the necessary knowledge about processes, methods, and tools in their project work. For example, analysis methods, universal problem-solving methods as well as verification and validation methods (DoE, XiL - X-in-the-Loop) are used. This teaching format characterizes an extremely practical education and optimally prepares the participants for their future tasks in companies.



»Product development is the driver of innovation. You learn to manage product development in an efficient, methodical, creative and success-oriented way in this master program. You become qualified to be the driving force for successful product innovation in your company with the scientifically sound and practice-oriented training program for professionals.«

Prof. Dr.-Ing. Dr. h.c. Albert Albers

Program Director

EM 1: Integrated Product Development by ASD – Agile Systems Design

The key factor of successful product development is the systematic planning and use of adequate tools and methods depending on various situations. For example the application of the portfolio analysis, of mind mapping or Design Structure Matrices (DSM) is essential. ASD – Agile Systems Design supports the product developer across the entire product development process.

By a situation-oriented combination of structuring and agile elements, as well as the consistent integration of the model of PGE – Product Generation Engineering, the developer is able to develop products efficiently and effectively through continuous customer integration.

ASD – Agile Systems Design also supports the developer in continuous validation. The first prototypes are set up early in the process and continuously gain functionality and maturity through joint validation with the customer. In this way, the direction of development is secured at an early stage and late, expensive changes to the product are avoided. In addition, customers, users and provider benefits are systematically integrated in the form of product profiles.

ASD – Agile Systems Design structures development processes, follows nine integrated principles, integrates problem solving techniques and a methodological toolbox, through which current development methods are recommended according to the situation and needs of the development team. Participants realize the effect and impact of design modifications as well as the influence of prototypes or simulations on the innovation process.

In addition to that, an understanding of structures, standards, and modifications in CAX and VR systems is provided. Knowledge of the background of information technology is an absolute necessity.

Engineering Modules (EM)

State-of-the-Art Technology Expertise in Product Development Processes

EM 2: Design and Validation Process & Information Systems for Product Development (PD)

The module offers in-depth insight into 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 a Product Lifecycle Management (PLM) system.

When using virtual reality systems (e.g. CRM, ERP), it is important to identify both the opportunities and limits for this new technology. The participants identify workflows relevant to data modeling.

EM 3: Simulation and Target Values in PD

While the first two modules systematically explain and deepen knowledge of the principles of the product development process, this module focuses on further aspects for successful product development.

Crucial success factors 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 limitations of modern interface technologies. They can assess and classify business strategies in terms of international competitiveness.

Furthermore, 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. 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.

Project Work serves to acquire competence in the use of development methods. For this purpose, the development task is to be refined based on the market situation. 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, all skills and theories learned are implemented in a practice-oriented environment. Product planning, product specification, and concept development processes are applied.

EM 1	Integrated Product Development by ASD – Agile Systems Design	
Courses	Mission & Vision in Product Development, Integrated Product Development*, Industrial Design Engineering, Data Structures and Algorithms for Intelligent Engineering	
EM 2	Design & Validation Process and Information Systems for Product Development (PD)	
Courses	Structured Problem Solving in Mechatronic System Development - SPALTEN*, Product development processes and activities*, Patent Strategy in Industry, Introduction and Application to SysML, Lightweight Design, IoT Solutions for Product Lifecycle Management (PLM)	
EM 3	Simulation and Target Values in PD	
Courses	Methods of Simulation, Target Costing, Virtual Twins & Immersive Environments, Project Work I: Conception*	
EM 4	Validation and Verification in PD	
Courses	Project Work II: Realization*, Test Based Development, Systems Engineering, Eco-Design Methodology of Sustainability	
EM 5	Tools and Methods of Product Engineering	
Courses	Project Work III: 2DR Documentation, Reflection Theory, and Practice*, Quality Management, Supplier Management	

Curriculum may be subject to change.

*Case Study

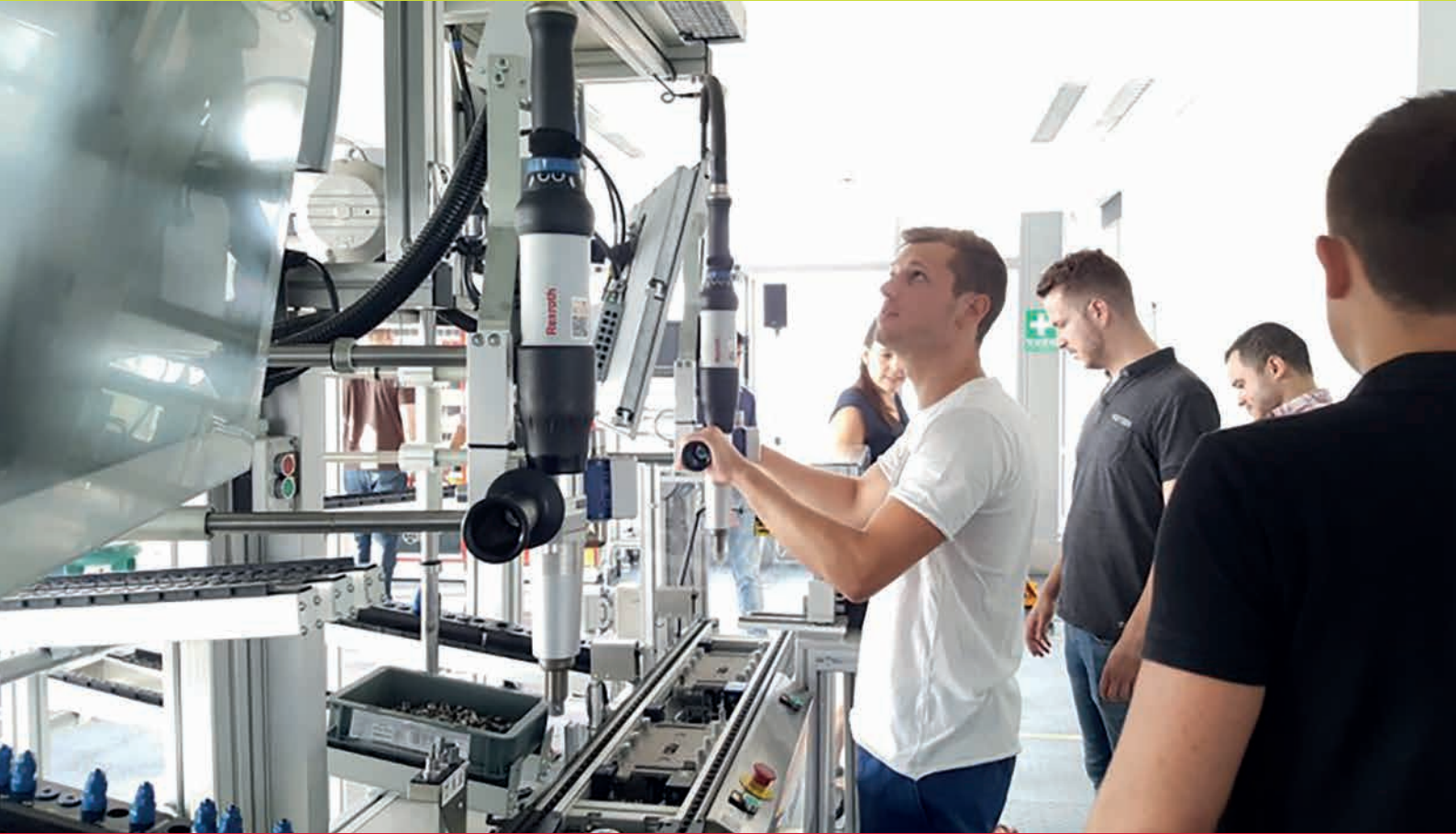
EM 4: Validation and Verification in PD

Systems engineering is an interdisciplinary approach to the early definition of customers' needs and functionalities, the documentation of system requirements to be developed, and the continuous synthesis and validation of the system during 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. Methods and tools for prototyping, verification, and validation are introduced and used directly in the project work.

Engineering Modules (EM)

International Module in China



Global Education for Global Players

EM 5: Tools and Methods of Product Engineering

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.

EM 5 is held at the KIT China Branch in Suzhou in cooperation with the Global Advanced Manufacturing Institute (GAMI). Many global companies not only have production but also development capacities in China. In order to adapt or develop their products for the local market a thorough understanding of the market as well as of potential cultural differences in the development team are crucial success factors.



Management Modules (MM)

Economic Know-How for Successful Managers

Big Picture Management Modules

Management is becoming increasingly complex and networked in data-driven companies (INFORMATION). Therefore, engineers and managers must obtain a holistic understanding of all corporate divisions to be able to make complex decisions (DECISIONS & RISK), see innovation as an integrated system (CORPORATE INNOVATION & INTRAPRENEURSHIP) from the perspective of the market (MARKETING), the employees (STRATEGY & PEOPLE), and the company (FINANCE & VALUE).

All Master's Programs share five management modules conveying the latest theories and methods in management. Participants from different branches and international locations can exchange their expertise, discuss current technological and commercial challenges from different viewpoints and build up a sustainable network of peers.

MM 1: Marketing & Information

Many of today's most successful businesses excel in satisfying customer needs because their decisions are based on data instead of good feeling. This is what this module is about: One focus is on how to use data for designing customer solutions (and get paid according to their value) and the other focus is a more general one at issues surrounding the use of (big) data for business decision-making.

MM 2: Finance & Value

Modern corporate governance is based on the creation of values. In the Finance & Value module, students learn essential methods of measuring, processing, and communicating the value added by corporate decisions that enable effective planning, management, and monitoring of corporate activity and corporate units. External value-based communication makes it possible to win stakeholders who are committed to the company over the long term.

MM 3: Decisions & Risk

Management implies making decisions. A valid data warehouse forms the basis for these decisions. The aim of this module is to give students a toolkit of various quantitative decision-making models so that the possibilities and limitations of methodical decision-making support (among others also optimization methods) can be used efficiently in the day-to-day running of projects.

MM 4: Innovation & Projects

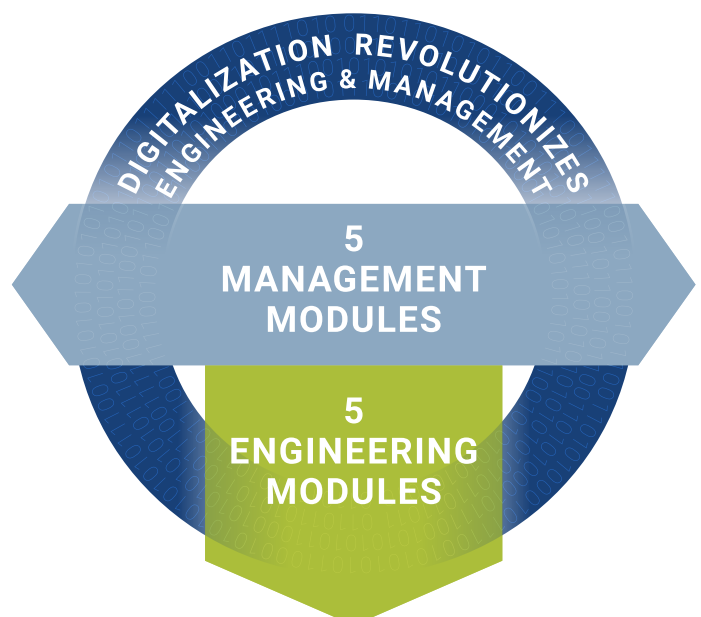
Numerous paradigm shifts are currently being driven by the development and extensive use of new technologies. Profound changes in rapidly changing markets flow directly from this. Consequently, apart from classic project management, new management tools and methods are required because agility and innovation are some of the success factors in the current business climate. The module thus focuses on one of KIT's unique selling points: technology-driven innovation.

MM 1	Marketing & Information
Courses	Designing and Selling Solutions (incl. Negotiation Training), Information Systems Design, Big Data Methods, Legal Aspects of Information
MM 2	Finance & Value
Courses	Management Accounting, Financial Accounting, Strategic Financial Management, Case Studies
MM 3	Decisions & Risk
Courses	Decision Modeling (+ Computer Tutorials), Risk Aware Decisions (+ Case Studies + Finance), Interactive Decisions, Robust and Stochastic Optimization
MM 4	Innovation and Projects
Courses	Technology Driven Innovation, International Intellectual Property Law, Project Management, Multi-Project Management in an International Setting
MM 5	Strategy & People
Courses	Strategic Management, Managerial Economics, Business Organization and Corporate Law, Strategic Human Resource Management, Leadership and Conflict Management

Curriculum may be subject to change.

MM 5: Strategy & People

The key to corporate success lies in the correct strategy. But how do you recognize opportunities, develop a viable concept, and successfully implement it? In times of scarce human capital, it is more important than ever before to ensure employees are a perfect fit for their position and to motivate them to implement the strategy together. The module imparts state-of-the-art management techniques and know-how on evidence-based human resources management, people analytics, and leadership approaches.





Technology & Management Know-How

Quality Made by the Karlsruhe Institute of Technology (KIT)

The HECTOR School is the Technology Business School of the Karlsruhe Institute of Technology (KIT). It is named after Dr. Hans-Werner Hector, one of the co-founders of SAP SE.

The school aims to provide professionals with state-of-the-art technological expertise and management know-how within part-time education programs. The HECTOR School fosters lifelong learning within industry. Participants are supported in their career development with executive Master's degree programs, certificate courses, and customized partner programs.

The benefits of the executive Master's programs are numerous for participants as well as for the companies they work for:

- **Unique Holistic Approach:** A combination of technology expertise and management know-how.
- **State-of-the-Art Knowledge:** Direct transfer from the Karlsruhe Institute of Technology (KIT) research.
- **Part-Time Structure:** Allows participants to continue with their demanding careers whilst acquiring new skills.
- **Master Thesis to set up Innovation Projects:** Companies gain outstanding added value through the consultation of such projects by professors from KIT.
- **Excellent Networking Opportunities:** Professional networking is fostered across industries and on an international scale.

Portrait of the



HECTOR School



Employability Ranking 2022



Germany
Europe
Worldwide

Executive Education @HECTOR School

1 Technology Transfer & Innovation

from the internationally renowned university - the KIT.

2 Power of Networks

benefit from a comprehensive professional network of academics and industry partners worldwide.

3 Management & Engineering

combined makes our programs unique

and ensures long term sustainability and competitiveness.

4 Part-Time Programs

allow for simultaneous work and study for participants and their companies.

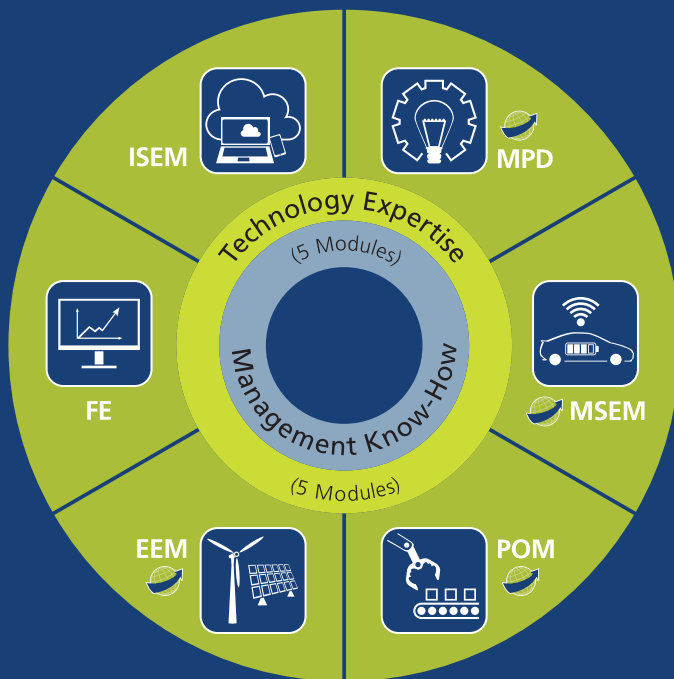
REASONS

for the Technology Business School of the KIT




Executive Master of Science Programs

Cutting Edge Technology Combined with the Latest Management Expertise



- EEM** Energy Engineering & Management
- FE** Financial Engineering
- ISEM** Information Systems Engineering & Management
- MPD** Management of Product Development
- MSEM** Mobility Systems Engineering & Management
- POM** Production & Operations Management

 = including module at another international location

Key Facts

Part-Time Master's Program, English-Taught, Duration of 20 Months

Academic Degree

Master of Science (M.Sc.) from the KIT

Accreditation

The KIT is system-accredited by AAQ.



All HECTOR School Master's Programs are accredited by the internal quality assurance system of the KIT.

Admission Requirements

A first academic degree: e.g. Bachelor, Master or Diploma

At least 1-2 years work experience (depending on the level of the first degree, recommended > 3 years)

If English is not your mother tongue nor has it been the language of instruction for the last five years, language proficiency is required, e.g. test certificate (e.g. TOEFL score of at least 570 PBT; 230 CBT; 90 iBT or IELTSs at least 6,5 points) or appropriate proof of C1 level.

Program Structure

Part-time, 10 x 2-week modules

Duration of approx. 20 months

Master thesis = project work in the company

5 Engineering and 5 Management Modules





Teaching language: English

Yearly program start: October

Academic Calendar

Job-Compatible Format and an Ideal Work-Study Balance

September 2022							October 2022							November 2022							December 2022								
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 Welcome Event
 Management Modules
 Engineering Modules
 Exams
 Please note: Dates are subject to change.

The academic calendar for each program starts annually in October. It consists of 10 modules, each with a duration of 2 weeks. All programs conclude with a master thesis.

>> **Master Thesis:** 9 months project work



HECTOR SCHOOL

OF ENGINEERING & MANAGEMENT

Do You Have
Questions? We are
looking forward
to assisting you.



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