



## Executive Master Program Production & Operations Management

Technology + Management

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 degree programs, certificate courses, and customized partner programs.

The benefits of the executive master 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



## Key Facts: Part-Time Master of Science (M.Sc.) Programs

### Program Structure

- Part-time, 10 x 2-week modules
- Duration: part-time lecture period of ~15 months
- Master thesis: project work in the company, 9 months
- 5 Engineering and 5 Management Modules
- Teaching language: English
- Yearly program start: October

### Academic Degree

Master of Science (M.Sc.) from the KIT (90 ECTS)

### 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 IELTS at least 6,5 points) or appropriate proof of C1 level.

### Accreditation

The KIT is system-accredited by AAQ. All HECTOR School master programs are accredited by the internal quality assurance system of the KIT.



# Master Program

## Production & Operations Management (POM)

**STRATEGY & PEOPLE OPERATIONS**  
**RESEARCH DECISION & RISK**  
**QUALITY MANAGEMENT**  
**SMART MANUFACTURING &**  
**AUTOMATION INDUSTRY 4.0**  
**LIFECYCLE MANAGEMENT**  
**SUPPLY NETWORK MANAGEMENT**  
**FINANCE & VALUE SUPPLY**  
**CHAINS VIRTUAL ENGINEERING**  
**INTERNATIONAL PRODUCTION**  
**DISTRIBUTION NETWORKS**  
**INNOVATION & PROJECTS COMPUTER**  
**SCIENCE MARKETING & DATA**



Prof. Dr.-Ing. Kai Furmans  
Institute for Material Handling and Logistics, KIT

Prof. Dr. Stefan Nickel  
Institute of Operations Research, KIT

**Program Directors POM**

*»The design and operation of production systems and supply chains is undergoing rapid change. Driven by new technology, as reflected by industry 4.0, the education of the past is no longer sufficient to guide companies through the changes. A master in POM equips participants with the necessary competences, bridging the gap between up-to-date theories and advanced technologies.«*

Prof. Dr.-Ing. Kai Furmans

Production technology and supply chain topics shape the future of the manufacturing industry. Major developments in the context of industry 4.0 require highly qualified engineers with comprehensive knowledge of state-of-the-art technology and methods to successfully realize innovative concepts. Only a multi-disciplinary approach can meet the requirements of today's interconnected flow of data, products, and money in production and logistics.

Graduates of the master program Production & Operations Management (POM) are able to analyze and optimize the efficiency of value-added processes within the operation of production and service systems. They can understand and analyze service and production processes, capture and formally describe requirements, frame boundary conditions and targets and achieve a targeted improvement by means of the skills they acquired in the master program concerning production management with a special focus on production processes, information technology, logistics and human resources as well as on the technical methods and tools required.

The graduates are familiar with state-of-the-art concepts and methods and are able to apply them in problemsolving and to further develop them. Methods and techniques in conjunction with decision making are especially focused on in Operations Management.

In addition, graduates can identify the possibilities and limitations of formal methods and models as well as the challenges that represent the transmission between the modeled world and reality and handle them in a solution-driven way. Given that the flow of data, products and money are closely interconnected in production and logistics nowadays, graduates are able to solve problems by taking these three factors into account and applying multi-disciplinary solution approaches.

Furthermore, the master program shares five management modules with the other master programs. This fosters networking across industries and provides the participants with general knowledge in finance, accounting, marketing, international multiproject management, international law, and human resource management. In this way, they can consider the commercial implications of project decisions and develop a holistic view.

# Engineering Modules (EM)

State-of-the-Art Expertise in Production Systems & Supply Chains



## EM 1: Fundamentals in Production & Operations Management

Industrial management and engineering has a holistic character. So far, industrial engineering has been aimed at integrating man, material, equipment, and funds in production systems. Now, activities also focus on IT and technology infrastructure to control complex systems. Hence, the industrial engineer concept has expanded to include the concept of a “knowledge worker” in addition to an “efficiency expert” and “productivity expert”.

Today, industrial engineering also deals with the development, optimization, installation, and management of holistic systems, consisting of man, materials, and infrastructure, for any type of production or service. This module enables graduates to understand all necessary concepts and underlying methods of industrial management. It focuses on deterministic and stochastic operations research, which is of great help for the planning process of logistic systems (modeling, simulation, etc.) as well as IT concepts and tools that accompany the product life cycle management process during the interface of product development and production.

## EM 2: IT Support of Production Systems

IT support for production systems is an essential part of state-of-the-art production systems. Virtual engineering, e.g., is the early, continuous, integrated support of the development process with regard to the adjustment,

evaluation, and concreteness of the development results from all partners with the help of virtual prototypes.

Modern production and logistic systems strongly depend on an appropriate IT support during the complete lifecycle. Therefore, this module focuses on understanding, generating, and analyzing models from various domains. On this basis, evaluation and optimization methods are applied to new problems and extended. Methodological competences are combined with scientific work in the areas of product lifecycle management, simulation, and optimization.

## EM 3: Methods of Operations Management

The ever-growing integration and globalization of production structures has led to the increasing importance of logistics for cost and performance development in operations networks. The design phase of products and processes is followed by the operations phase. Consequently, module EM3 focuses on the further development of the corresponding skills and competences in this field. Participants are to enhance their knowledge in order to be able to understand production and supply chain management taking into account human resources.

At the same time, mapping the physical world onto the world of controlling has to be understood. On this basis, this module concentrates on applying the lessons learned as well as on the further development of the methodology and its integration in the teamwork at the production company.

#### EM 4: Networks of Supply & Production Systems

Today's competitive environment regarding supply chains has dramatically changed. Emerging economies such as China have become key players and have changed the view on modern network systems. Supply Chain Management plays a key role in Production & Operations Management. Having understood the individual objects in the added value chain, these have to be combined in the supply chain. This includes the internationalization of values added processes, their distribution to physical and dispositive processes as well as methods for their planning and control.

Therefore, new models have to be generated and existing models need to be further developed and adapted. Multi-disciplinary analysis of the production logistics point of view and its mathematical modeling are of particular significance. In this way, the participants can derive profound statements relating to the performance of novel network structures.

#### EM 5: Global Production & Distribution Systems

Made in China is becoming more and more important for companies operating globally. In 1990, China produced less than 3% of global manufacturing output by value. Nowadays its share is nearly a quarter. The white heat of China's ascent-formed supply chains that reach deep into South-East Asia.

Global players therefore continually extend their production sites in China. At the same time, the demand for engineers with highly developed technological know-how and the ability to meet the different on-site requirements is rapidly growing.

Due to this, the final engineering module takes place in Suzhou and Shanghai (China) in cooperation with GAMI and AMTC. It includes the compact transfer of knowledge in the form of lectures, case studies as well as excursions and company tours. The latter will provide participants with profound insights into the practical implementations in a Chinese production environment. The module does not only provide state-of-the-art knowledge transfer on-site, but also allows the useful exchange with professionals and executives working in China.

#### Crash Course: Probability and Statistics

We highly recommend all applicants to participate in the course to update the technical knowledge, as it might be the crucial factor for a successful degree at HECTOR School.



## Engineering Modules

EM 1: Fundamentals in Production & Operations Management

Courses: Industrial Services, Information Systems: Fundamentals of Computer Science for Engineers, Operations Research: Decision Making with Linear Models & Networks, Introduction to Industrial Engineering

EM 2: IT Support of Production Systems

Courses: Information Systems: Product Lifecycle Management, Stochastic Models of Manufacturing Systems, Simulation of Production Systems, Operations Research: Decision Making with Discrete & Nonlinear Models

EM 3: Methods of Operations Management

Courses: Production Engineering, Strategic Supply Network Management, Human Factors & Ergonomics, Technologies of Distribution Networks

EM 4: Networks of Supply & Production Systems

Courses: Supply Network Management: Inventory Management in an Uncertain Environment, IT for Logistic Systems, Global Production, Operational & Tactical Supply Network Management

EM 5: Global Production & Distribution Systems

Courses: Smart Manufacturing & Automation with Industry 4.0, Quality Management, Supplier Management



Curriculum may be subject to change.

# Management Modules (MM)

## Economic Know-How for Successful Managers



## Management Modules

### MM 1: Marketing & Information

Courses: Designing and Selling Solutions (incl. Negotiation Training), Information Systems Management, 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, Risk Aware Decisions, Interactive Decisions, Robust and Stochastic Optimization

### MM 4: Innovation & 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.*

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

### 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 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.

# A HECTOR School Master: Leadership Know-How for Demanding Careers.



Stefan Oehmke  
Master in Production & Operations Management  
VP Europe, Business Area Chassis Mounts, TrelleborgVibracoustic

»I have lively memories of my application interview for the HECTOR School and Prof. Kai Furman's promise: „We will make you push your limits.“ An inspiring international environment, people from different industries and working fields, and the link to a state-of-the-art understanding of production and logistic systems provided me with a solid basis for the progression of my professional career. A challenging and enriching experience – promise kept!«



More Alumni Voices

## Academic Calendar

September 2021							October 2021							November 2021							December 2021								
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EM2	12	13	14	15	16	14	15	16	17	18	19	20	14	15	16	17	18	19	20	11	12	13	14	15	16	17			
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MM Management Modules

EM Engineering Modules

Exams

Crash Course

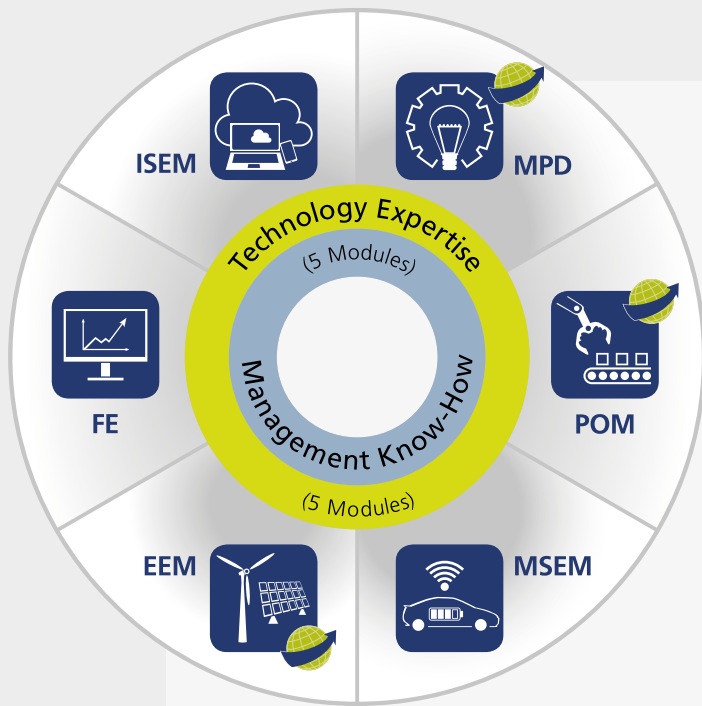
2-day seminar in "Probability and Statistics"

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

Please note: Dates are subject to change.

# More Master Programs



## Six Part-Time Master of Science Programs in



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

Compact further education formats like Certificate Courses and more can be found in the HECTOR School Academy.



= International Module

## HECTOR School of Engineering & Management

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Order your free course guide book with detailed contents of the master program!



## Imprint

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## Meet us

