

**Mobility Systems
Engineering & Management**
Executive Master's Program
**E-Mobility, Autonomous Driving
and Systems Engineering**



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Become a HECTOR School Master

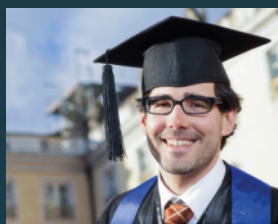
Leadership Know-How for Demanding Careers



»My HECTOR School degree gave me the professional and personal tools to advance in my career. The direct exchange with peers and experts from various fields of technology and management was extremely valuable.«

Sebastian Mangold

Alumnus of Intake 2017



»The five engineering modules offer deep insight into the new challenges of the automotive industry. Highly experienced lecturers show state-of-the-art research on the topics of electro-engines, batteries, but also cognitive systems and embedded systems. This broad variety of subjects combined with the five management modules with a lot of case studies are the perfect fundament for further personnel development. On top, you are still able to continue your current job and to introduce the new methods to your daily business life.«

Alexander Spies

Alumnus of Intake 2011

Voices



More Alumni

Executive Master's Program

Mobility Systems Engineering & Management

SAFETY & SECURITY CYBER PHYSICAL
SYSTEMS BIG DATA HANDLING AUTOMOTIVE
STANDARDS & APPLICATION TESTING 2.0
DATA COMMUNICATION PROCESS MATURITY
LEVEL ASSIGNMENT FINANCE & VALUE ENERGY
SUPPLY, STORAGE & CONVERSION CHARGING
MANAGEMENT IOT & INDUSTRY 4.0 SYSTEMS LIFE
CYCLE PROCESSES STRATEGY & PEOPLE POWER
TRAIN CONCEPTS MODELLING & SIMULATION
INTERNATIONAL PROJECT MANAGEMENT
WORLDWIDE RELEASE & CONFIGURATION
MANAGEMENT CAR-TO-X COMMUNICATION
INNOVATION & PROJECTS AUTOMOTIVE
RADAR TECHNOLOGY DRIVER ASSISTANCE
SYSTEMS VEHICLE TRAFFIC INTERACTION
MARKETING & DATA DECISIONS & RISK



Electronic systems are everywhere. Today, they range from portable devices such as smart phones to large stationary installations such as power plant control systems. The communication - stationary or over-the-air - of these particular systems forms a network to control, sense and influence the environment. These trends have a fundamental impact on industry (Industry 4.0) and mobility, especially on vehicles for automated driving, electric powertrains and car-2-x communication. **As a result, sustainable mobility concepts are increasingly using embedded electronic systems to maximize efficiency, enable automation, and reduce pollution.**

CHALLENGES START WITH NEW PROCESSES

Challenges start with new processes methods and tools of systems engineering that are needed to design and validate these networks of embedded systems. Agile programming (e.g. Scrum) for self-learning functions up to artificial intelligence will find its way into conservative mechanical engineering and enhance the more or less established life cycle models such as the "V". In addition validation will step beyond X-in-the-Loop and demand for data analytics of a large number of sensor data. But what is the right method for the right challenge? Am I using the appropriate tool or am I horribly over-loading the simple task? Assessments will answer these questions, currently we rely on CMMI and SPICE, which will surely be enhanced for the upcoming hypes.

DESIGNED FOR SPECIFIC TASKS

Also electronic systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance

Program Directors



Prof. Dr.-Ing. Eric Sax
Institute for Information
Processing Technologies, KIT



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

Head of Specializations



Prof. Dr.-Ing. Martin Doppelbauer
Institute of Electrical
Engineering, KIT

requirements, allowing the system hardware to be simplified to reduce costs. Standards (e.g. ISO 26262 for functional safety) will influence the design decision process.

THE STORY GOES ON

The story goes on: reducing the size and cost of the product, increasing the reliability and performance of electronic components such as sensors and controllers, enabling more and more digital applications. And it does not end here. As a result, society's demand for innovation and the emergence of new technologies in universities and large research institutions offer tremendous opportunities to overcome "historical" electronic design thinking.

The Master's Program in Mobility Systems Engineering and Management offers a unique combination of courses in emerging technologies, systems engineering knowledge and methods, and management tools tailored to the challenges of mobility: e-drive, auto-drive, communication-over-the-air, and global release and configuration management. Specifications in these areas can be selected within the master's program.

LONG TRADITION

The Karlsruhe Institute of Technology (KIT) offers an ideal environment with its long tradition in mobility, electrical engineering, information and communication. Building on its long-standing reputation for excellence in business engineering, our master's program combines a deep knowledge and understanding of fundamental concepts in business, finance, and management with the latest developments in electronic systems and mobility systems engineering.

This master's program provides students with the tools to advance their careers in this exciting field.

Shape the Future of Mobility Systems

EM 1	Processes, Methods & Tools of Systems Engineering	
	Courses	Fundamentals of Systems Engineering, Modeling & Simulation, Process Models & Associated Assessments, Case Study in Embedded Systems Development (incl. Rapid Prototyping), Big Data Management, Introduction Concept Study
EM 2	Systems Design	
	Courses	Control Systems Development, Embedded Systems Computer Architecture, Electronic Systems Synthesis (Hardware & Software) incl. Case Study, Future Vehicle Concept Study
Specialization Advanced Driver Assistance Systems (ADAS)		Specialization E-Mobility
EM 3	Functions of ADAS	EM 3
	Courses	
EM 4	Components & Technologies of ADAS	EM 4
	Courses	
EM 3	E-Mobility: Political & Technical Framework	EM 4
	Courses	
EM 4	E-Mobility: Components & Technology	EM 5
	Courses	
EM 5	Systems Integration & Validation	
	Courses	Quality Assurance and Cost of QA of Electronic Systems, Testing Automotive Systems (XiL, virtual testing,...) & Case Study, Model-based Systems Engineering for Automotive Systems and Data-Driven Development for Automotive Systems
Crash Course	Selected Topics of Electrical Engineering	
	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 the HECTOR School.	



»Our Master's Program offers a unique combination of courses in emerging technologies & systems engineering. Processes, methods and tools for the challenges of future mobility in e-drive, autonomous driving, communication-over-the-air, and worldwide release

& configuration management are introduced on the engineering as well as on the management side.«

Prof. Dr.-Ing. Eric Sax

Institute for Information Processing Technology,
KIT | Program Director MSEM

EM 1:

Processes, Methods and Tools of Systems Engineering

EM 1 provides an introduction to embedded systems and software engineering. Processes, methods and tools from object-oriented approaches via the V-model to agile methods (e.g. Scrum) are presented. HW/SW co-design and rules to decide which way to go will be explained. How to assess these approaches according to process maturity levels (e.g. SPICE and CMMI) and how to follow the requirements of safety (based on ISO 26262 and ASIL) and security is introduced with a focus on the transportation industry. Sensing and communication data are the basis for almost all upcoming new functions of mobility. The importance and methods of their analysis such as anomaly detection are introduced. A case study based on the implementation of a two-wheeled transportation platform ("Segway") gives a practical impression of the complexity of mechatronic system design.

EM 2:

Systems Design

To realize an embedded system in EM 2, a concrete EE architecture is designed to modularize the complete functionality. Controllers and processors or ASICs and FPGAs will implement the applications and interact with each other. Data communication topologies and technologies (e.g. CAN, Flexray or wireless/car2x, Ethernet) are suitable. The interfaces to the environment are provided by actuators and sensors. All these technologies are explained in this module and the vision of future mobility is described conceptually.

EM 5:

Systems Integration & Validation

Finally, implementation and integration lead to testing of the overall system against the initial requirements. Throughout the engineering process, tests have been prepared and performed to verify maturity. Quality assurance has been performed in simulation and prototyping environments. At the end of these phases, the real system can be tested for the first time to verify user requirements in a hardware-in-the-loop environment or even in real test scenarios..

Your Road to Success

Specialization

ADAS

EM 3: Functions of ADAS

Advanced Driver Assistance Systems help the driver and the vehicle to drive safely, comfortably and efficiently. They cover a wide range from driver information and recommendation systems to fully automated driving without the need for a driver. Vehicles will be able to perceive and understand their environment, interact and negotiate with it, make decisions, act and react autonomously, predict the consequences of these decisions, and learn from experience.

Together with car-to-car and car-to-infrastructure communication, autonomous transport will redefine the automotive world. Especially in combination with sharing concepts, it will lead to disruptive transport solutions. Autonomous, connected and shared driving has the potential to improve traffic flow, reduce congestion and the amount of space needed for transport. And it will enable vehicles powered by renewable energy to realise their full potential to reduce environmental impact. Successful future driver assistance systems and automated vehicles will be designed to be attractive and to meet user needs and expectations.

EM 4: Components & Technologies of ADAS

Modern vehicles are becoming increasingly intelligent. Sensors and cognitive control units sense and communicate with the environment, recognize other vehicles and road users, understand and predict their behavior, and operate the vehicle autonomously. Based on detailed user, vehicle, road, infrastructure, and traffic data, and by using predictive green routing and vehicle operation management, a safe, comfortable, energy- and time-efficient drive is realized.

Intelligent vehicles need detailed information about their own status and their surroundings. This is provided by sensors, often in combination with emitters of electromagnetic waves such as radar and light. From the sensor signals, mobile perception systems derive information about static and moving objects. Automated environment recognition is based not only on sensor data, but also on data perceived through car-to-car, car-to-infrastructure, and car-to-backend communications, as well as on knowledge learned from previous driving. An appropriate system architecture for the vehicle hardware and software will enable fast and reliable data processing. IT safety and security systems ensure that missing, incorrect, or forged information in vehicle communication does not pose a high risk to road users and vehicles. Valid information enables beneficial traffic organization, such as platooning, to reduce traffic space consumption and increase traffic capacity.

Case study based on the implementation of a two wheeled transportation platform ("Segway") gives a first impression on the complexity of mechatronics system design

Specialization

E-Mobility

EM 3: E-Mobility - Political & Technical Framework

Global emissions scenario studies highlight the importance of the transportation sector in mitigating climate change. Powertrain technologies and topologies must be evaluated against the overarching goal of climate and environmental protection. Public policy plays an important role in setting the framework within which markets operate. Transportation markets and their mechanisms, trends in travel demand and the economy, and policy regulations are other topics.

New concepts and infrastructure are needed for the local supply of electrical energy for plug-in and fully electric vehicles. Energy management starts with energy generation and includes issues such as energy storage and distribution, as well as intelligent new charging concepts that take into account momentary electricity production and consumption.

EM 3 provides an overview of the boundary conditions for electric and hybrid electric vehicles, including transport market policies, well-to-wheel climate impact analysis, energy management and distribution.

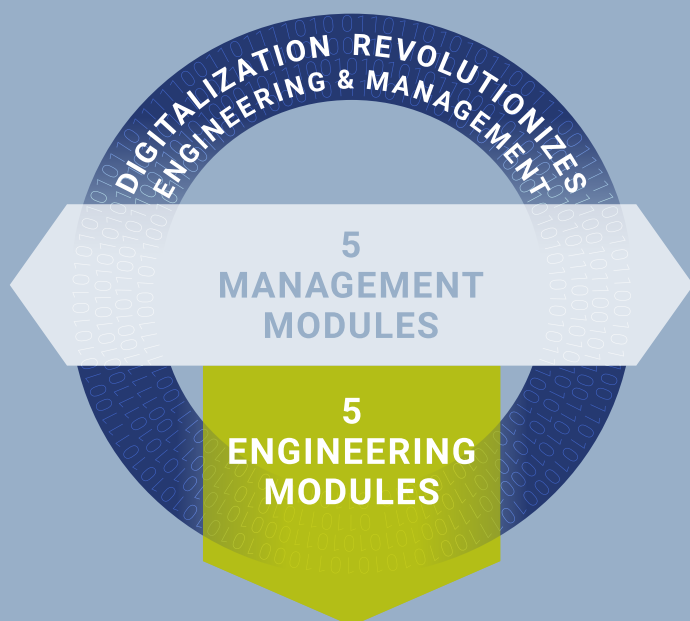
EM 4: E-Mobility - Components & Technology

The electric powertrain is the most innovative and important new part of hybrid and fully electric vehicles compared to conventional internal combustion engine vehicles. High-speed electric motors have become increasingly powerful in recent years with new technologies such as rare-earth magnets and field-weakening operation. The power-to-weight ratio of modern traction motors is more than an order of magnitude better than that of industrial electric machines. EM 4 focuses on the technical components of electric and hybrid powertrains, namely the electric machine, power electronics (hardware and control software), transmissions, traction resistance and energy consumption, and energy storage systems (batteries and fuel cells).



Management Modules (MM)

Economic Know-How for Successful Managers



MM 1

Courses

Marketing & Data Science

Data Driven Marketing, Information Systems Management, Data Analytics, Legal Aspects of Information

MM 2

Courses

Finance & Value

Management Accounting, Sustainability, Strategic Financial Management, Case Studies

MM 3

Courses

Decisions & Risk

Decision Modeling (+Computer Tutorials), Risk Aware Decisions (+Case Studies+Finance), Interactive Decisions, Robust and Stochastic Optimization

MM 4



Courses

Corporate Innovation and Intrapreneurship

Corporate Entrepreneurship, Entrepreneurial Leadership, Strategic Innovation Management, Opportunity Development -Design Thinking, Exploring the Opportunity: Technology and Markets, Pitching Business Ideas, Creating Value through Business Models, New Product Development and Service Innovation, Measuring Innovation: Innovation Balanced Scorecard, Pitching Business Models

MM 5

Courses

Strategy & People

Strategic Management, Managerial Economics, Business Organization and Corporate Law, Strategic Human Resource Management, Leadership and Conflict Management

Curriculum may be subject to change.



**I have been at
ESADE Barcelona**

Big Picture Management Modules

Management is becoming increasingly important in data-driven organizations, while at the same time becoming more complex and interconnected. Engineers and managers need to have a holistic understanding of all areas of the business in order to make the right decisions. This also means that innovation must be viewed and experienced as an integrated system from the perspective of the market, the employees and the company. All of the HECTOR School's Master's programs therefore include five management modules in which the latest theories and methods are taught.

Participants from different industries and international locations can share their expertise, discuss current technological and business challenges from different perspectives, and build a sustainable network of peers.

MM 1: Marketing & Data Science

This module equips participants with the tools to harness data and technology for effective decision-making in marketing and business contexts. It covers techniques for analyzing and transforming data into actionable insights, managing information systems to bridge business and IT, and understanding the legal frameworks for data and privacy protection. Through practical case studies and applied learning, participants gain skills essential for thriving in today's data-driven, digital economy.

MM 2: Finance & Value

Modern corporate governance is based on value creation. This module empowers participants to navigate financial complexities and sustainability challenges. It covers cost analysis, decision-making, and planning tools for effective management while exploring the circular economy and key sustainability indicators. Participants also gain insights into investment valuation, capital budgeting, and corporate finance strategies. A hands-on group project enhances analytical and strategic skills, applying theoretical knowledge to real-world company valuations for informed decision-making.

MM 3: Decisions & Risk

Successful management involves making the right decisions. This module develops participants' ability to make informed decisions under uncertainty. It covers quantitative decision modeling, risk-aware strategies, and robust and stochastic optimization for managing in uncertain environments. Participants also gain a rigorous understanding of game theory and its applications in strategic interactions. Through practical computer tutorials and theoretical frameworks, the module equips participants to model, analyze, and optimize decisions in complex, interconnected systems with confidence and precision.

»I particularly enjoyed the course on value creation given by Luis Vives and the course on innovation given by Xavier Ferràs. Since ESADE has its own innovation hub, we were also able to interview some founders of start-up companies and get an insight into their experiences, which was extremely interesting. The fact that, as a group, we were able to take advantage of the closeness that we shared throughout the Masters course still makes me happy, and there is a lot of feedback that has helped me develop as a person.«

Simon Baettig

Alumnus of Intake 2016



MM 4: Corporate Innovation & Intrapreneurship

Based at the prestigious ESADE Business School in Barcelona, this module immerses participants in the dynamic world of business innovation and entrepreneurship. It covers key topics such as innovation-driven business models, design thinking, strategic innovation management, and opportunity development. Participants will explore new product development, market disruption, and entrepreneurial leadership skills while learning to measure and implement innovation strategies effectively. Practical courses on pitching business ideas and managing technology-market dynamics equip participants to drive impactful ventures, ensuring agility and success in today's rapidly evolving and competitive business landscape.

MM 5: Strategy & People

In today's fast-paced business world, this module prepares participants to tackle strategic challenges while fostering employee engagement and creativity. Combining business strategy, corporate law, and HR development, the module addresses competitive advantage, corporate governance, and global teamwork. Participants explore leadership concepts, digital transformation, and incentive systems, applying evidence-based tools in case studies and practical exercises. Participants will be able to analyse and understand strategic corporate goals in dynamic markets from a human-centred perspective.



Technology & Management Know-How

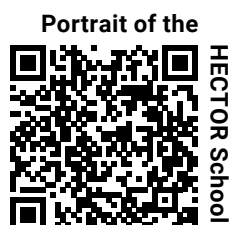
Quality Made by the Karlsruhe Institute of Technology (KIT)

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's mission is to provide working professionals with state-of-the-art technological expertise and management know-how through part-time educational programs. The HECTOR School promotes lifelong learning within the industry. Participants are supported in their career development through executive master's degree programs, certificate courses, and customized partner programs.

The benefits of the executive master's programs are numerous, both for the participants and 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.



World University Ranking 2026

Worldwide
Standing
#98

Among
the best
7%

Ranking
in Germany
#5

Ranking
in Europe
#59

Executive Education @HECTOR School

Technology Transfer & Innovation

from the internationally renowned university - the KIT.

Power of Networks

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

Part-Time Programs

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

Management & Engineering

combined makes our programs unique

and ensures long term sustainability and competitiveness.

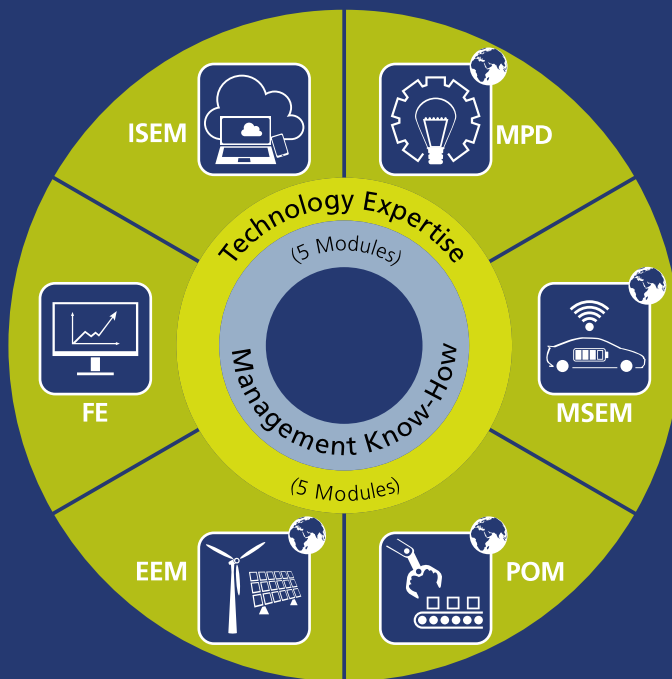
REASONS

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 IELTS 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 2025							October 2025							November 2025							December 2025						
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September 2026							October 2026							November 2026							December 2026							
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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**:

>> 9 months project work **MPD, POM, MSEM, EEM**

>> 6 months project work **ISEM, FE**

Intake
2025

Our Programs



Course Guide Book



Download Timetable



HECTOR SCHOOL

OF ENGINEERING & MANAGEMENT

Do you have questions? We are looking forward to assisting you.

Judith Elsner
Managing Director



Stefan Franck
Team Leader
Operations



Marco Lanza
Head of Business
Development and
Communications



Yaxian Liu
Program
Consultant



Martina Waldner
Senior Program
Consultant



Hanna Meinzer
Manager Operations
Master's Thesis



Song Utz
International Recruiting
and Relations Manager



Stine Ullum
Manager Operations



Lea Skiljo
Manager Operations
HECTOR School
Academy



Jelena Parassidis
Marketing Manager



Janina Gupta
Marketing Manager



Katrin Olbötter
Manager Recruitment and
Admissions



Jolana Lang
Sales Assistant



Temir Vinokhodov
Junior Program
Consultant



Celine Decker
Junior Manager
Operations



Executive Master's Program Mobility Systems Engineering & Management



»Yes, the transformation of the automotive industry has been accelerating for years. And yes, there is no question that this also requires a transformation of the skills required.



To support this need for professional lifelong learning, I have been teaching at the HECTOR School of Engineering and Management in the field of "Testing Automotive Systems" since 2015.

As the Technology Business School of the KIT, it supports the further development of professionals by teaching the latest technological skills and promoting the exchange of students among each other.«

Dr. Christian Mueller

Director Infrastructure & Testing - Global Software Center, ZF Group



»We are experiencing a clear trend in our industry towards larger, more complex projects with significantly more responsibility.

Mastering systems engineering is therefore no longer a desirable skill, but a fundamental requirement to meet our customers' needs.«

Dr. Uwe Reinhardt

Senior Vice President Vehicle Testing & EMC at IAV GmbH

International Department of the Karlsruhe Institute of Technology (KIT) gGmbH

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