Executive Master Program
Electronic Systems Engineering & Management

Technology + Management
The HECTOR School of Engineering & Management offers seven Executive Master Programs. The HECTOR School – named after Dr. Hans-Werner Hector, one of the co-founders of the software company SAP – is the Technology Business School of the Karlsruhe Institute of Technology (KIT).

The Master Programs are more than typical MBA programs, because they combine management with engineering topics. The primary goal is to enable professionals to take a holistic approach when managing highly interdependent processes and to be aware of the latest state of technology in the respected field of expertise.

All programs share five Management Modules, providing the participants with general leadership know how for engineers: knowledge in Finance, Accounting, Marketing, Business Strategy, International Project Management and Intellectual Property Rights. On this basis they can consider commercial implications of business decisions. Workshops and case studies allow ample opportunity to explore the direct application of the know-how, simulating the real business environment.

Essential part of the HECTOR School is the part-time philosophy of its Master Programs. Intermittend periods of lectures are scheduled to allow participants to continue with demanding careers while acquiring new skills & knowledge.
Master Program
Electronic Systems Engineering & Management

Electronic systems are omnipresent. Currently they range from portable devices such as digital watches and smart phones to large stationary installations like traffic lights, factory controllers or the systems controlling power plants.

New energy supply systems strongly depend on the developments in electronic engineering at the interface to information technology. Sustainable mobility concepts integrating electric vehicles and hybrid vehicles are increasingly using embedded electronic systems to maximize efficiency and reduce pollution. Other automotive safety systems are e.g. anti-lock braking systems, electronic stability control, and automatic four-wheel drive. Medical equipment is continuing to advance with more electronic systems for vital signs monitoring, electronic stethoscopes for amplifying sounds, and various medical imaging for non-invasive internal inspections.

Graduates of the Master Program Electronic Systems Engineering & Management (ESEM) are in a position to understand the design of integrated electronic systems and analyze and optimize the challenges and problem statements within these systems out of a holistic approach. They are familiar with central concepts of hardware design, software design and control theory and are capable to implement, amongst others, the optimization of integrated systems, the reduction of component sizes as well as production costs taking into account interdependencies. The graduates also master aspects of reliability and performance elevation of complete systems and are parallel able to identify complexity aspects und technical uncertainty factors and solve them with a methods-oriented approach.

The skills acquired in the master program involve a unique combination of circuit- and systems design, system theory, new materials, as well as optical communication systems and State of the art process signal theories. Those abilities are supported by necessary competences concerning the product development process and the multidisciplinary methods and innovation process knowledge.

Join us to acquire the tools that will guide your career path in this exciting area.

Prof. Dr. rer. nat. Michael Siegel
Program Director Electronic Systems Engineering & Management
Chair of Micro- and Nanoscale Systems, Karlsruhe Institute of Technology (KIT)
Emerging Technologies

New materials and new technologies play a key role for innovations of electronic products and economy. Their applications determine the innovation degree of modern technologies such as the information, energy, mobility, manufacturing, environmental and medical technology.

Many innovations in electrical engineering could only be realized on the basis of new materials, technologies and production engineering. Therefore the development of new materials and their applications in electronic systems as well as the breakthroughs in research of opto- and nano-electronic principles are one of the key fields of industrial technology in the 21st century with outstandingly high strategic importance.

Aims, Methods and Tools of Electronic Systems Development

Electronic product development includes a highly developed theoretical and practical management of all features relevant to the design, development and manufacture of modern compound electronic systems and sub systems.

This module serves to convey theoretical models and methods for systematic product development using applications in electrical engineering and information technology as examples. It is focused on understanding the basic architecture of electronic systems and their description by characteristics and computer-supported systems. Lifecycles are analyzed on the basis of process models and transferred to the target system via quality functions and user specifications. Theoretical models are applied to concrete examples of electronic systems.

Implementation of Methods in Product Development for Electronic Subsystems

This module focuses on the concrete implementation of abstract theoretical models and methods in electronic components and subsystems. Computer-supported methods for the design and optimization of these systems are covered. In particular, design strategies are developed taking into account the optimization of time, costs, and functionality.

Understanding of hardware and software co-design on the system level is of particular importance. Latest algorithms for the automatic synthesis of electronic systems are discussed and applied. In examples, the state of the art of integrated
digital systems is covered. It is focused on modeling, designing, verifying, and testing of electronic systems. Basic conceptions of the setup, structure, and development of technical strategies are developed in the form of roadmaps.

**Communication Technology & Systems**

This module concentrates on the interaction and communication of systems and subsystems. Both electronics and optical communication technologies are covered. Possibilities of optical communication in and between subsystems are discussed and understood.

Participants will understand the interaction of hardware components and the hardware structure with recorded signals and use them for further processing. They will be able to apply new approaches to the communication of systems and subsystems via optical components and methods.

Finally, they will understand communication networks, components, and the protocol level applied in modern on- and off-chip communication as well as in local and global networks.

**Total Quality Management of Electronic Systems**

Electronic Product Development provides an advanced theoretical and practical treatment of all aspects relevant to the design, development and production of modern complex electronic systems and sub-systems.

This module concentrates on the analysis and detailed coverage of electronic product and system development in production and quality assurance. It is focused on issues relating to electronic product development in terms of production, testing, and TQM approaches. Discussion will cover the lectures as well as the examples studied. All topics covered by the ESEM program will be dealt with.

**Overview Engineering Modules (EM)**

**EM 1: Emerging Technologies**
Courses: Materials & Devices, Opto-electronics, Nano-electronics, VLSI-Technology

**EM 2: Aims, Methods and Tools of Electronic Systems Development**
Courses: Integrated Product Development, Systems Engineering, Case Study in Electronic Systems Development

**EM 3: Implementation of Methods in Product Development for Electronic Subsystems**

**EM 4: Communication Technology and Systems**

**EM 5: Total Quality Management of Electronic Systems**
The aim of the 5 Management Modules (MM) is to provide profound knowledge and understanding of the fundamental concepts which are essential for every successful manager.

<table>
<thead>
<tr>
<th>International Project Management</th>
<th>MM1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Courses:</strong> Project Management &amp; Scheduling, Multi-Project Management in an International Setting, Development Management, Intercultural Management</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Finance for Executives</th>
<th>MM2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Courses:</strong> Introduction, Financial Accounting, Fundamentals of Finance</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business Strategy, Marketing &amp; Controlling</th>
<th>MM3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Courses:</strong> Business Strategy, Introduction to Management Accounting, Marketing</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Human Resource Management</th>
<th>MM4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Courses:</strong> Human Resource Management, Leadership &amp; Conflict Management, Management Training</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Law &amp; Contracts</th>
<th>MM5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Courses:</strong> Decisions, Contracts, Markets &amp; Trade, International Law - The Law of Business Organizations, International Intellectual Property Law</td>
<td></td>
</tr>
</tbody>
</table>

**Overview Management Modules (MM)**

**MM 1:** International Project Management  
Courses: Project Management & Scheduling, Multi-Project Management in an International Setting, Development Management, Intercultural Management

**MM 2:** Finance for Executives  
Courses: Introduction, Financial Accounting, Fundamentals of Finance

**MM 3:** Business Strategy, Marketing and Controlling  
Courses: Business Strategy, Introduction to Management Accounting, Marketing

**MM 4:** Human Resource Management  
Courses: Human Resource Management, Leadership & Conflict Management, Management Training

**MM 5:** Law & Contracts  
The academic calendar for the next program starting on October 5, 2015 consists of 10 intensive modules, each with a duration of 10 days. At the end, the Master Program concludes with a Master Thesis. The Master Thesis is set up as a project work in the company, starting after the successful completion of at least nine modules according to the personal study plan.