HECTOR SCHOOL
Technology Business School of the KIT

Karlsruhe Institute of Technology

Executive Master Program
Energy Engineering & Management

Technology + Management

Energy Systems & Technologies for the Future

Master Program in Energy Engineering & Management (EEM)

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 AG.

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
on our YouTube Channel

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
- An academic degree: e.g. Bachelor, Master, or Diploma
- 1-2 years work experience (depending on the level of the first degree, recommended > 3 years)
- TOEFL score of at least 230 or 90 iBT

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

Prof. Dr.-Ing. Hans- Jörg Bauer
Institute of Thermal Turbo Machines, KIT

Prof. Dr.-Ing. Mathias Noe
Institute for Technical Physics, KIT

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

Program Directors EEM

»The energy transition is associated with many challenges, such as an increase in the efficiency of energy conversion systems based on renewable energies and their integration into future energy systems, requiring e.g. the development of capable energy storage systems and an intelligent demand side management. EEM covers all of these aspects and provides the skills to successfully face the challenges.«

Prof. Dr.-Ing. Hans-Jörg Bauer & Prof. Dr.-Ing. Mathias Noe

The master program, Energy Engineering & Management, is focused on professionals working in companies that deal with the generation, transportation, distribution, storage and sale of energy (electrical, thermal, etc.), their suppliers and industrial sectors that rely on energy heavily. Graduates of the program stand out due to an extensive overview on present an future technology for new energy systems. They are able to significantly participate in the successful introduction of new sustainable energy systems and to appraise not only the sustainability but also the aspects of operating efficiency, availability and safety as well and can evaluate them adequately.

Graduates can therefore understand, quantitatively describe, evaluate and optimize the elements of energy systems and their complex interactions. They are able to understand innovation processes and can effectively and successfully apply their knowledge either in existing companies or when founding “start-ups”. Professional, methodical, process and management knowledge is essential for this, as it is imparted in the modules of Energy Engineering & Management.

Additionally, internationalization and mobility are key factors of the master program since the energy sector operates internationally. This is emphasized by the cooperation with the Knowledge Innovation Centre InnoEnergy and therefore supports the aims of the European Union to achieve a climate neutral and sustainable energy supply. Furthermore, one result of the cooperation is an exchange module with the worldwide reknowned business school ESADE in Barcelona/Spain.

In addition to the engineering expertise, Energy Engineering & Managment 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 multi-project management, international law, and human resource management. Therefore, they can consider the commercial implications of project decisions and develop a holistic view.

Engineering Modules (EM)

State-of-the-Art Technology Expertise in Energy Systems & Technologies

EM 1: Renewables

The module starts with a general introduction to the challenges of energy supply, examinig the historic and future developments of global energy requirements as well as existing primary energy sources and reserves. Aside from this, it provides an overview of the energy cascade from the primary energy sources through the various stages of energy conversion, the transportation and distribution of energy to its ultimate use. Technical, ecological and socio-economic aspects are highlighted.

During the presentation of energy systems based on renewable sources of energy, the focus is placed on wind and hydroelectric power as well as geothermal and solar thermal energy. For didactic reasons, systems based on other renewables, such as photovoltaics and biomass, are dealt with in other engineering modules.

For the processes covered in this course, the supply of renewable primary energy provided by nature is first described, before investigating the individual technical features of the power plants. Wind energy plants serve as an example to convey the interdisciplinary nature of energy conversion plants, in which fluid mechanical, static, mechanical, electrical and electronic considerations are all closely linked to systemic and economic aspects.

EM 2: Thermal Energy Conversion

The module provides an overview on thermal processes for power and heat production from fossil and biogenic fuels. The whole range of fuel to energy via thermal processes is covered, starting from the combustion process, coal and gas fired power plants, gas and steam turbines, CO_2 reduction by capture and storage, and finally special aspects of biomass utilization.

Based on a sound knowledge of the technical fundamentals, the module will lead to the understanding of complex energy conversion systems and typical plants. The participants develop and improve their evaluation skills with regards to technology, economy and ecology.

EM 3: Electricity Generation & Energy Storage

In this module, the focus is on the generation of electricity on the one side and energy storage on the other. The most commonly used power generator in electrical power stations is the gas turbine. Understanding and knowledge of critical issues related to synchronous generator operation is provided.

In addition, photovoltaics is one of the most discussed forms of renewable energy generation. It converts solar radiation directly into electrical energy. Participants will understand photovoltaics as an energy source, it's working principle and mechanisms to improve efficiency. This will provide insights into the public as well as scientific discussion and highlights boundary conditions with regard to requirements of energy storage.

Batteries and fuel cells are one way to store the power. The participants will become familiar with the concepts of electrochemical energy storage and the design of efficient batteries. The module discusses the available state-of-the-art fuel cell technologies and their efficiencies as well as the respective opportunities and limitations.

EM 4: Smart Networks & Energy Distribution

This module gives an overview of major power system components, structure and main operation behavior. It starts with an introduction to power systems and basic knowledge of high voltage engineering.

The second part focuses on the main components and describes mainly the function, state-of-the art and their behavior.

The main transmission and distribution aspects are covered in the third part of the module, including network calculation and control. Due to recent and future changes in power systems a strong focus in part four is on smart grids and their performance. Additionally, building performance with respect to energy balance and energy sources is included.

EM 5: Energy Economics

Various peculiarities of the energy market (energy efficiency on the supply and demand side, electric mobility, market opening, regulation, etc.) are analyzed from a techno-economic point of view within this module.

In order to be able to identify optimal strategies within this complex sector, there is an introduction into energy systems analysis at the beginning of the module. Energy systems analysis considers the totality and the interactions of energy systems, among other things, with the commodities industry, the building trade, industry and transport. The integration of energy systems and e-mobility concludes this module.

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

Engineering Modules

EM 1: Renewables
Courses: Introduction and Scope of EEM & Energy Systems | Wind & Water Power | Solar & Geothermal Power

EM 2: Thermal Energy Conversion
Courses: Technical Combustion/ Heat & Mass Transfer | Thermal Power Plants including Coal & Gas Power Plants | Turbo Machinery | Carbon Capture and Storage (CCS) | Energy from Biomass

EM 3: Electricity Generation & Energy Storage
Courses: Power Generators | Batteries & Fuel Cells | Hydrogen Technology | Photovoltaics | Thermal Storage | Power Electronics

EM 4: Smart Networks & Energy Distribution
Courses: Introduction to Power Systems/ High Voltage Engineering | Components of Power Systems | Transmission & Distribution | Smart Grids & Emerging Technologies

EM 5: Energy Economics
Courses: Energy Markets | European Network Regulations | Energy Systems Analysis | Energy Efficiency (Supply & Demand Side) | Integration of Decentralized Energy Systems

Crash Courses: Fluid mechanics, Thermodynamics and Electronic Engineering

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

Management Modules (MM)

Fundamental Economic Know-How for Successful Managers

MM 1: 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 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: MARKETING & INFORMATION. Many of today's most successful businesses excel in satisfying customer needs, because their decisions are based on data instead of gut feeling. This is what this module is about. One week looks at how to use data for designing customer solutions (and get paid according to their value). The other week looks more generally at issues surrounding the use of (big) data for business decision-making.

MM 4: 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.

ESADE Business School

MM 5: 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.

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) in a future and result-oriented manner (INNOVATION & PROJECTS) from the perspective of the market (MARKETING), the employees (PEOPLE & STRATEGY), and the company (FINANCE & VALUE).

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

Marcus Welz
Master in EEM
Head of Global Sales, SIEMENS AG

»KIT provides an intensive, exciting, and focused opportunity to improve every aspect of my business & technology skills. It was an immensely stimulating experience. Every day was intense but extremely rewarding. KIT expanded my mind. After the master program, the world became smaller and my personal and professional goals grew bigger. Networking was valuable from a professional standpoint, but it was my classmates' real-life experiences and diverse backgrounds that broadened my perspective. I developed solid relationships with many of my classmates. We often meet or email each other, and they are becoming something like a personal board of directors whose judgment I trust. This was an inestimable feature of the master program, and it's something I did not expect.«

Alumni Voices
on our YouTube Channel

October 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
MM 1		03	04	05	06	07
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			01	02	03	04
Crash Courses Week						11
EM 1	14	15	16	17	18	
19	20	21	22	23	24	25
26	27	28	29	30		

December 2018

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					01	02
03	04	05	06	07	08	09
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

January 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	01	02	03	04	05	06
EM 2	09	10	11	12	13	
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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11	12	13	14	15	16	17
MM 2	20	21	22	23	24	
25	26	27	28			

March 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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25	26	27	28	29	30	31

April 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
MM 3		03	04	05	06	07
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15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

May 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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06	07	08	09	10	11	12
EM 3	15	16	17	18	19	
20	21	22	23	24	25	26
28	29	29	30	31		

June 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
					01	02
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17	18	19	20	21	22	23
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July 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
EM 4	03	04	05	06	07	
08	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

August 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
			01	02	03	04
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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

September 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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MM 4	11	12	13	14	15	
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

October 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
	01	02	03	04	05	06
07	08	09	10	11	12	13
14	15	16	17	18	19	20
EM 5	23	24	25	26	27	
28	29	30	31			

November 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
				01	02	03
04	05	06	07	08	09	10
11	12	13	14	15	16	17
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25	26	27	28	29	30	

December 2019

Mon	Tue	Wed	Thu	Fri	Sat	Sun
						01
MM 5	04	05	06	07	08	
09	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

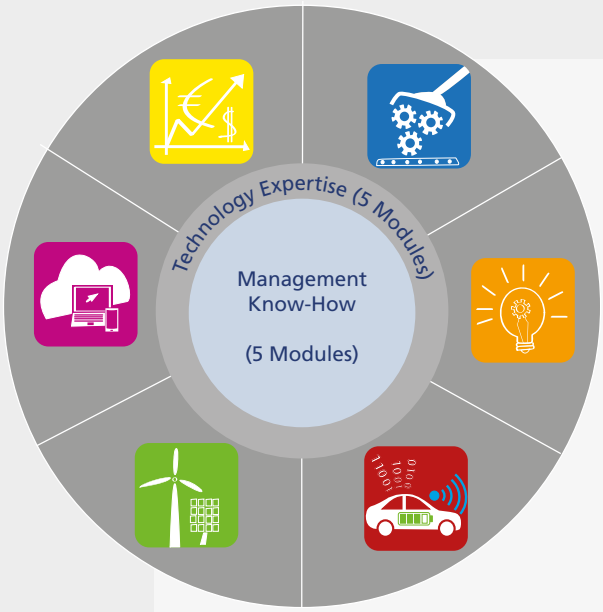
MM Management Modules
EM Engineering Modules
Exams

Crash Courses
9. + 10. November: - Probability and Statistics (2-day seminar)
5. – 9. November: - Electronic Engineering
- Fluid Mechanics and Thermodynamics

Please note: Dates are subject to change.

The academic calendar for each program starting annually in October consists of 10 intensive modules, each with a duration of 10 days. At the end, all programs conclude with a master thesis. >> **Master Thesis:** 9 months project work

More Master Programs



Six Part-time Master Programs

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

In addition to the master programs, the HECTOR School also offers **certificate courses** (3 - 5 day seminars on state-of-the-art technology topics) and **partner programs**.

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Our Social Media Channels

Imprint

Publisher: Marketing Department HECTOR School of Engineering & Management
Edition: 7/2018
Photos: International Department gGmbH, fotolia.com, iStockphoto.com Karlsruhe Institute of Technology (KIT); Barcodes generated with TEC-IT Barcode Software