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
Energy Engineering & Management

The executive Master Program Energy Engineering & Management targets to pave the way for a new thinking in independent energy systems assuring a climate neutral and sustainable energy supply.

Energy Engineering & Management is focused on people working in companies which are dealing with the generation, transportation, distribution, storage and sales of energy (electrical, thermal, etc.), their suppliers and energy-intense industrial sectors. Graduates of the program stand out due to an extensive overview on present and future technology for new energy systems. They are capable to significantly participate in the successful introduction of new sustainable energy systems and to rate not only the sustainability but as well aspects of operating efficiency, availability and safety and consider them in an adequate way.

Graduates can therefore understand, quantitatively describe, evaluate and optimize the elements of energy systems in particular and their complex interactions. They are able to understand innovation processes and can effectively and successfully apply their knowledge either in existing companies or in the foundation of “start-ups”. Thereto, professional, methodical, process and management knowledge is essential, as interceded in the modules of Energy Engineering & Management (EEM).

On top of this, internationalization and mobility are key factors of the Master Program, since the energy sector is acting internationally. This is underlined 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 renowned business school ESADE in Barcelona/Spain.

Meet us, to explore the future of Energy Engineering at the Karlsruhe Institute of Technology (KIT). Join us, to acquire the tools that will guide your career path in this exciting area.

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Renewables

The module starts with a general introduction to the challenges of energy supply, examining the historic and future developments of global energy requirements and 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.

Within the presentation of energy systems based on renewable sources of energy the focus is laid 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.

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 in the module, 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.

From 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 competence concerning aspects of technology, economy and ecology.

Electricity Generation & Energy Storage

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

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, its working principle and mechanisms to improve the 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 efficiently working batteries. The module discusses the available, state-of-the-art fuel cell technologies and their efficiencies as well as the involved opportunities and limitations.

In order to be able to identify optimal strategies within this complex sector an introduction into energy systems analysis is 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. Integration of energy systems and e-mobility concludes this module.

**Smart Networks & Energy Distribution**

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

The second part focuses on the main components and describes mainly the function, the 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 is in part four on smart grids and their performance. Additionally building performance with respect to energy balance and energy sources is included.

**Energy Economics**

Within this module different 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.

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**Overview Engineering Modules (EM)**

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

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

**EM 3**: Electricity Generation and Energy Storage  
Courses: Power Generators • Batteries & Fuel Cells • Hydrogen Technology • Photovoltaics • Thermal Energy Storage

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

**EM 5**: Energy Economics  
Courses: Energy Systems Analysis • Energy Markets • European Network Regulations • Energy Efficiency • Integration of Energy Systems & e-Mobility
Management Modules - Topics

The aim of the five Management Modules (MM) is to provide profound knowledge and understanding of the fundamental concepts which are essential for every successful manager.

International Project Management (MM1)
International Project Management is a key to the world of business. Participants will get familiar with objectives of project management and scheduling, analysing planned projects and controlling project execution. Particular attention is paid to the construction of project networks and Gantt charts, heuristic solution procedures and rescheduling. Modelling, planning and scheduling, which arise in a great variety of practical situations, are also emphasized.

Finance for Executives (MM2)
Finance for Executives provides participants with an understanding of the key financial statements and its underlying accounting principles. The course gives an overview of investment rules and financial decisions.

Business Strategy, Marketing & Controlling (MM3)
This module comprises three important challenges in companies: Business Strategy, Marketing & Controlling. Particular emphasis is placed upon the process of strategic management containing strategic analysis, formulation and evaluation based on competitive advantage, and portfolio strategy. In addition to these concepts approaches of modern marketing that show a strong reference to business strategy are presented.

Corporate Innovation & Entrepreneurship (MM4)
The module provides knowledge on strategies how to manage innovation within the company and how to apply tools, models and processes that are necessary to bring innovative ideas. It focuses on issues like corporate innovation, corporate entrepreneurship, measuring innovation and innovation in practice. Participants shall acquire competences as understanding the organizational context, managing change, decision making and innovation. It takes place at the ESADE Business School in Barcelona/Spain.

Law & Contracts (MM5)
This module comprises both economics and legal sections. In the economics section, a groundwork is laid through introducing decision theory, expected utility, risk and ambiguity, bargaining and basic incentive theory. In addition, fundamental problems regarding world economics are discussed, e.g. stagnation and economic growth, unemployment and international division of labor, and harmonization of the international monetary system. The legal section is divided into lectures about the law of business organizations about international patent, trademark and copyright law.
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.

Legend:
- **MM**: Management Modules
- **EM**: Engineering Modules