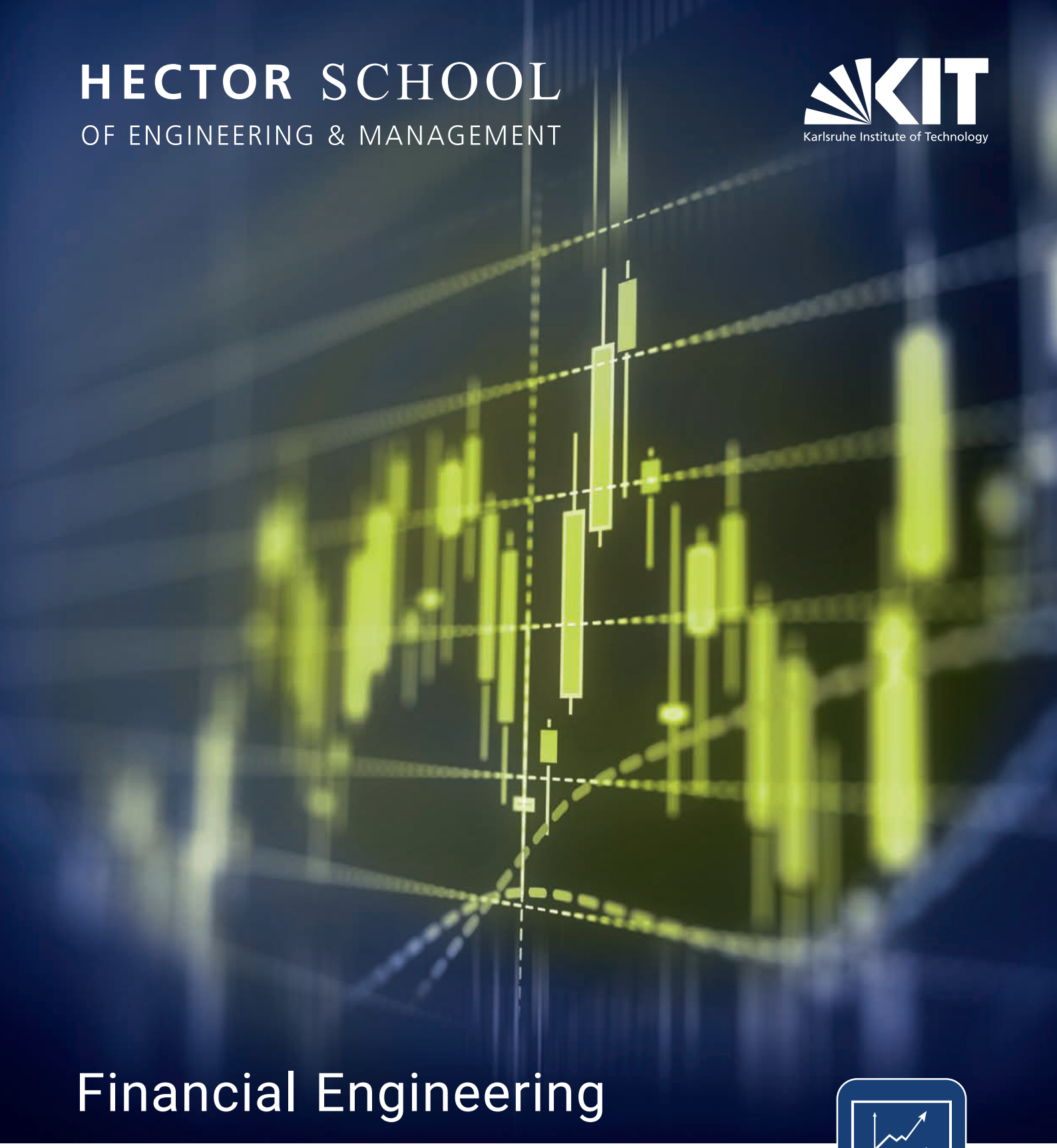
HECTOR SCHOOL
OF ENGINEERING & MANAGEMENT

Karlsruhe Institute of Technology



Financial Engineering

Executive Master's Program

Data Science, Machine Learning and Predictive Analytics

Become a HECTOR School Master

Leadership Know-How for Demanding Careers

»HECTOR School is the school of life. You rise coping with the challenges and each module is the next step of your progress.«

Ekaterina N. Sereda
Alumna of Intake 2007

»I was very satisfied with the study. The courses are sufficient in terms of content and professors are one of the best in the areas. We could also meet students from totally different cultures backgrounds which made the study much more interesting. It became very important to learn how to cope with multicultural people and now I realized how helpful it was for my job now.«

Quan Ai Liang
Alumna of Intake 2010

Voices
More Alumni

Executive Master's Program

Financial Engineering

DATA SCIENCE MACHINE LEARNING FOR BUSINESS AND FINANCE **INNOVATIONS** DATA-DRIVEN DECISION MAKING **PYTHON CODING FOR MANAGERS** ALTERNATIVE DATA AND NATURAL LANGUAGE PROCESSING WITH PYTHON **PATTERN RECOGNITION WITH PYTHON** DIGITAL FINANCIAL MARKETS WITH BLOCK-CHAIN AND CRYPTO-COMPUTATIONAL QUANT FINANCE **FINANCIAL AND RISK MANAGEMENT WITH PYTHON** PREDICTIVE ANALYTICS FOR DATA-DRIVEN MANAGERS **DATA-DRIVEN FINANCIAL ENGINEERING**

Program Directors

Prof. Dr. Maxim Ulrich
Chair of Financial Economics and Risk Mangement, KIT

Prof. Dr. Martin E. Ruckes
Institute of Finance, Banking, and Insurance, KIT

We are living in an unprecedented era of rapidly growing data and computational power. Businesses across the globe adopt technology at an increasing rate. Individuals and institutions that are able to combine data, modeling, programming and decision-making encounter tremendous opportunities to add value to themselves, their institutions and society at large. We see modern Financial Engineering as the science of data-driven decision making in business environments.

Building more accurate models reduces uncertainty around future events and paths the way to better decision making. Learning from data, using classical statistical concepts and novel concepts from machine learning help businesses across industries and geography to solve predictive data analytics and valuation problems. Today's predictive learning schemes perform tasks that were previously only solvable by a limited group of experts. Advances in predictive analytics and learning will affect all business models and industries. Financial tasks in particular, will be transformed at an astonishing fast pace. Vast amount of data, paired with the individuals and institutions desire to plan ahead to meet future obligations and investments make financial decision making in its broadest sense an especially appealing application of predictive analytics and learning schemes.

Our Master's program in Financial Engineering with a special focus on Data Science, Machine Learning and Predictive Analytics prepares decision makers to model and understand data across a variety of business fields and problems.

The first two engineering modules teach fundamentals of finance, financial economics, data science and Python and pairs these with novel developments in the field of digital business models, allowing our students to grasp the status-quo and business opportunities that arise in this lucrative business field. The third and fourth engineering modules introduce business decision makers to machine learning and engineering aspects to ground data-driven decision-making in hard science. The last engineering module is devoted to teach how alternative data, for example in the form of text data, and advances in machine learning can be used to innovate in tomorrow's business world. Most of these engineering modules are divided into a conceptual and into a hands-on computational part to allow our Master students to understand and work with predictive analytics and learning schemes in a variety of decision-making contexts.

For the Master thesis, we encourage our students to aim high and to solve a data problem for individuals, institutions or society at large, using financial engineering and predictive analytics tools and modern software. We believe there is no better time to start your own data driven technology adventure than during your Master thesis. The vibrant technology environment of the KIT, together with the numerous businesses in the area of Karlsruhe, offer a rich pool of problems that wait to be solved.

The Financial Engineering Program shares five management modules with the other master programs. This fosters cross industry networking and provides the participants with cutting-edge knowledge in technology-driven innovation, strategy, data-driven marketing, international multi-project management, as well as international law, human resource management, people analytics, and different leadership approaches.

Engineering Modules (EM)

Data-Driven Decision Making in Business Environments

»We see modern Financial Engineering as the science of data-driven decision making in business environments. Building more accurate models reduces uncertainty around future events and paths the way to better decision making. It is a mix of broad decision-making applications, sound data and modeling work, paired with an entrepreneurial drive to solve innovation challenges using modern software and financial thinking, that makes our Master's Program in Financial Engineering a unique experience.«

Prof. Dr. Maxim Ulrich, Program Director FE

EM 1	**Digital Financial Markets**	
	Courses	Global Financial Markets, Introduction to Python, Blockchain Technology, Digital Currencies and Business Models
EM 2	**Financial Economics for Data Scientists**	
	Courses	Financial Economics, Fundamentals of Financial Data Science
EM 3	**Machine Learning for Data-Driven Decision Making**	
	Courses	Machine Learning for Decision Makers, Fundamentals of Financial Machine Learning, Kernel and Bayesian Methods in Machine Learning
EM 4	**Engineering Aspects of Financial Markets**	
	Courses	Fundamentals of Financial Engineering, Derivatives and the Value of Optionality
EM 5	**Alternative Data and Machine Learning for Business Applications**	
	Courses	Text Mining and Natural Language Processing, Advances in Machine Learning and Pattern Recognition

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 the HECTOR School.

EM 1: Digital Financial Markets

The business world is changing rapidly as a result of unprecedented data and computational power. There are tremendous business opportunities for innovators who combine data, modeling and decision making. This module teaches a deeper understanding of financial markets and the business opportunities they offer. The module also covers topics of digitalization, blockchain, crypto currencies and Python programming.

EM 2: Financial Economics for Data Scientists

Data is crucial in modern business and finance applications. Data science tools are powerful in detecting patterns. Yet, data scientists need domain knowledge in financial economics. Setting-up the data experiment, interpreting data findings and distinguishing informative signals from noise in data requires a sound understanding of financial economics. The first aim of this module, is therefore, to teach participants the fundamentals and advances of modern financial economics, containing topics from corporate finance, strategic finance, ethics in finance and the theory of value. The second aim is to teach students to view data science through a data and an algorithmic lens.

EM 3: Machine Learning for Data-Driven Decision Making

This module teaches participants how machine learning can be used to result in better decision making and to untap hidden value in data. Machine learning concepts are first introduced to general business application and then circled in to finance problems. Cutting-edge machine learning tools are used to conduct more informed risk management, asset management and financial engineering.

EM 4: Engineering Aspects of Financial Markets

Analytics from engineering has had a substantial impact on finance, especially in the fields of risk management, asset management and the pricing and hedging of derivatives. Engineering tools can help to extract meaning of complex finance data to support machines when aiming to detect patterns and relationships in sophisticated asset markets such as futures and derivatives markets. This module teaches the foundation of engineering tools that allow financial economics to move into financial engineering. Using these tools, students also learn about important no-arbitrage restrictions in futures and derivatives markets and how to exploit these with modern machine and data science approaches.

Curriculum may be subject to change.

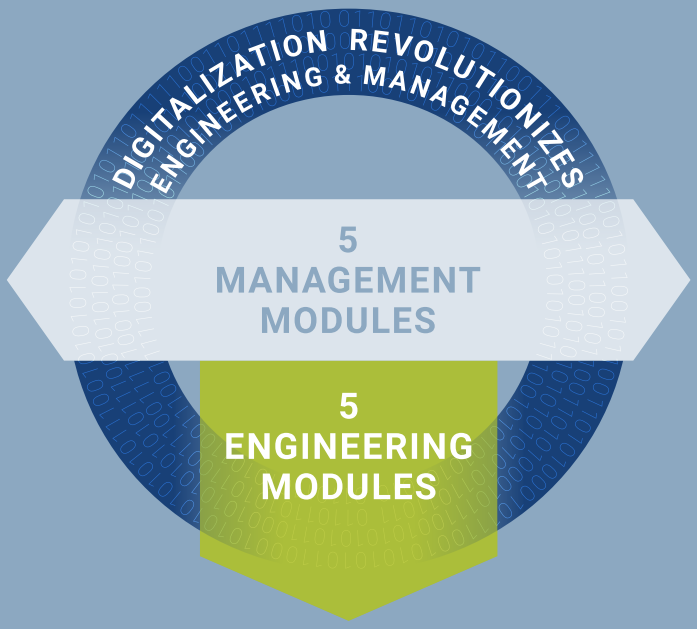
Modeling and Understanding Data to Untap Hidden Value

EM 5: Alternative Data and Machine Learning for Business Applications

This module teaches how to work with alternative data and new advances in predictive data analytics and machine learning to contribute to future business and finance innovations. This module teaches current innovations that went from a niche to mainstream, such as Text as Data, Natural Language Processing and Deep Learning. This module teaches the theory of these approaches and provides business applications to highlight how these methods resulted in better decision making and value added for corporations and individuals.

Management Modules (MM)

Economic Know-How for Successful Managers



MM 1	Courses	**Marketing & Information** Designing and Selling Solutions (incl. Negotiation Training), Information Systems Design, Big Data Methods, Legal Aspects of Information
MM 2	Courses	**Finance & Value** Management Accounting, Financial Accounting, 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	**Innovation & Projects** Technology Driven Innovation, International Intellectual Property Law, Project Management, Multi-Project Management in an International Setting
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.

Big Picture 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), see innovation as an integrated system (CORPORATE INNOVATION & INTRAPRENEURSHIP) from the perspective of the market (MARKETING), the employees (STRATEGY & PEOPLE), and the company (FINANCE & VALUE).

All Master´s Programs share five management modules conveying the latest theories and methods in management. Participants from different branches and international locations can exchange their expertise, discuss current technological and commerical challenges from different viewpoints and build up a sustainable network of peers.

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.

»It's been an incredible journey, right from the start of my Master in Financial Engineering at HECTOR School in Karlsruhe till working on the top floor of Skyline building in Frankfurt. Looking retrospectively, my master played such an important role to achieve my professional goals and where I am right now. Especially the curriculum which is a perfect blend of Finance, Management and Technology topics because I needed it to have the knowledge and skillset to grow in the current Global Financial Market.«

Omprakash Wakharkar

HECTOR School Intake 2014,
Data Analyst by Spectrum Finance
for Zurich Versicherung AG
in Frankfurt

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 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's degree programs, certificate courses, and customized partner programs.

The benefits of the executive Master's 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

QS Employability Ranking 2022

#1 Germany

#10 Europe

#46 Worldwide

Executive Education @HECTOR School

1 Technology Transfer & Innovation

from the internationally renowned university - the KIT.

2 Power of Networks

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

3 Part-Time Programs

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

4 Management & Engineering

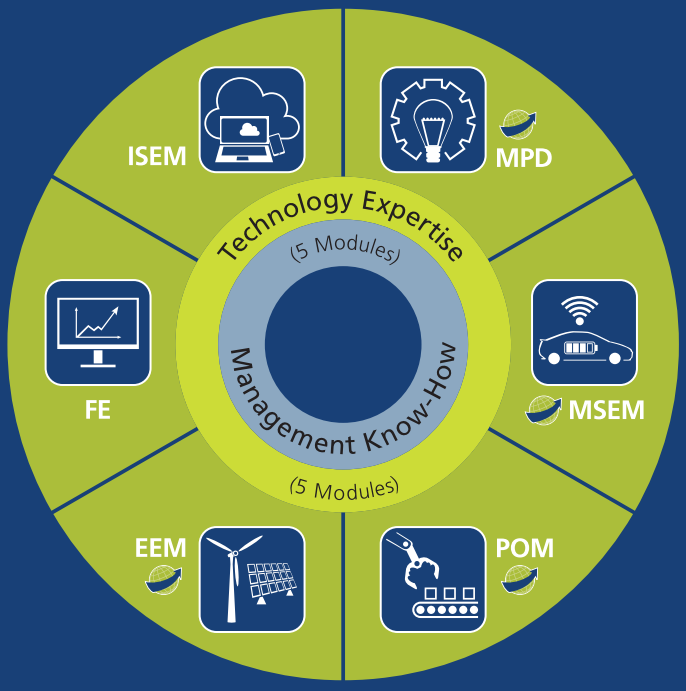
combined makes our programs unique and ensures long term sustainability and competitiveness.

4 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 2022

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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12	13	14	15	16	17	18
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26	27	28	29	30		

October 2022

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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MM1		05	06	07	08	09
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31						

November 2022

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EM1		16	17	18	19	20
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December 2022

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January 2023

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EM2		11	12	13	14	15
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February 2023

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MM2						

March 2023

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April 2023

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MM3		19	20	21	22	23
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May 2023

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June 2023

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EM3		14	15	16	17	18
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July 2023

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EM4		19	20	21	22	23
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August 2023

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September 2023

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MM4		13	14	15	16	17
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October 2023

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EM5		25	26	27	28	29
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November 2023

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December 2023

Mon	Tue	Wed	Thu	Fri	Sat	Sun
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MM5		06	07	08	09	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
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Welcome Event
MM Management Modules
EM Engineering Modules
Exams

Please note: Dates are subject to change.

Crash Course
2-day seminar in "Probability and Statistics"

The academic calender 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:** 6 months project work

Our Programs
More About

Course Guide Book
Order Your Free

Timetable
Download

HECTOR SCHOOL
OF ENGINEERING & MANAGEMENT

Do You Have Questions? We are looking forward to assisting you.















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More about our Services

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Our Social Media Channels