

Financial Engineering

Executive Master's Program

Data Science, Machine Learning and Predictive Analytics



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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**



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.

Program Directors



Prof. Dr. Maxim Ulrich

Chair of Financial Economics and Risk Management, KIT



Prof. Dr. Martin E. Ruckes

Institute of Finance, Banking, and Insurance, KIT

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, Blockchain Technology, Digital Currencies and Business Models, Introduction to Python
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 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.

Modeling and Understanding Data to Untap Hidden Value

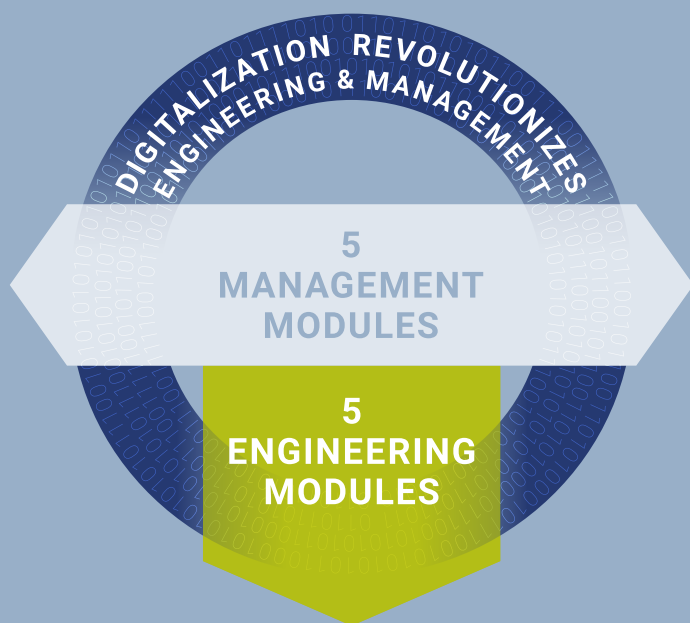
EM 5: Alternative Data and Machine Learning for Business Applications

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	Marketing & Data Science
Courses	Data Driven Marketing, Information Systems Management, Data Analytics, Legal Aspects of Information
MM 2	Finance & Value
Courses	Management Accounting, Sustainability, Strategic Financial Management, Case Studies
MM 3	Decisions & Risk
Courses	Decision Modeling (+Computer Tutorials), Risk Aware Decisions (+Case Studies+Finance), Interactive Decisions, Robust and Stochastic Optimization
MM 4	Innovation & Projects
Courses	Technology Driven Innovation, International Intellectual Property Law, Project Management, Multi-Project Management in an International Setting
MM 5	Strategy & People
Courses	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 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 requires 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.

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

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.

»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

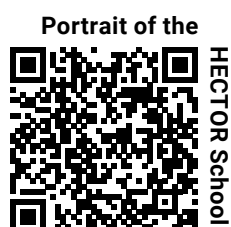
Quality Made by the Karlsruhe Institute of Technology (KIT)

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'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 2024

Worldwide
Standing

#102

Among
the best

7%

Ranking
in Germany

#6

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 companies.

Management & Engineering

combined makes our programs unique

and ensures long term sustainability and competitiveness.

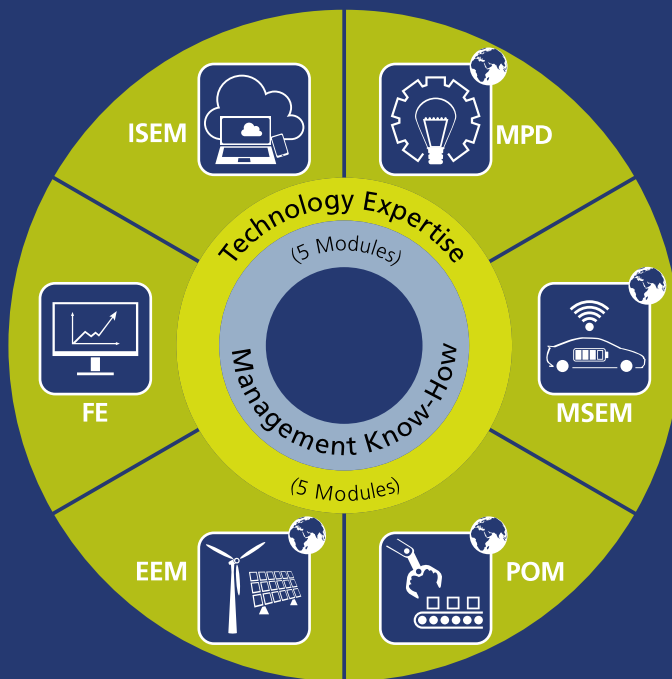
REASONS

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						
Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
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08	09	10	11	12	13	14	06	07	08	09	10	11	12	03	04	05	06	07	08	09	08	09	10	11	12	13	14
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22	23	24	25	26	27	28	20	21	22	23	24	25	26	17	18	19	20	21	22	23	22	23	24	25	26	27	28
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January 2026							February 2026							March 2026							April 2026						
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MM2	13	14	15	16	17	18	09	10	11	12	13	14	15	09	10	11	12	13	14	15	MM3	14	15	16	17	18	19
19	20	21	22	23	24	25	16	17	18	19	20	21	22	16	17	18	19	20	21	22	20	21	22	23	24	25	26
26	27	28	29	30	31		EM2	24	25	26	27	28		23	24	25	26	27	28	29	27	28	29	30			
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May 2026							June 2026							July 2026							August 2026						
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18	19	20	21	22	23	24	22	23	24	25	26	27	28	20	21	22	23	24	25	26	17	18	19	20	21	22	23
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September 2026							October 2026							November 2026							December 2026							
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MM4	15	16	17	18	19	20	12	13	14	15	16	17	18	09	10	11	12	13	14	15	14	15	16	17	18	19	20	
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28	29	30					EM5	27	28	29	30	31		23	24	25	26	27	28	29	28	29	30	31				

	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



Marco Lanza
Head of Business Development and
Communications



Stefan Franck
Team Leader Operations



Martina Waldner
Senior Program Consultant



Yaxian Liu
Program Consultant



Miriam Heinrich
Manager Operations Examinations



Hanna Meinzer
Manager Operations Master's Thesis



Lea Skiljo
Manager Operations



Sabrina Wunderlich
Manager Operations



Janina Guptill
Marketing Manager



Jelena Parassidis
Marketing Manager



Katrin Olböter
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Recruitment and Admissions



Jolana Lang
Sales Assistant



Temir Vinokhodov
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More about



**our
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