Master in Management and Engineering (M.Sc.)

in Data and Decision Science

Welcome to Aachen

Algorithm Economy, Data-Driven Decision Making, Industry 4.0, Deep Learning, Artificial Intelligence, Optimization, Data Science, Decision Science – these are just some of the phrases that we read in the headlines with increasing frequency. The world is on the brink of a new industrial revolution, one in which data, algorithms and analytical thinking will be the key ingredients of value creation; ingredients that global leaders now recognize as their most valuable assets.

Enterprises tackling the challenges of tomorrow need to develop new data-centric strategies and leadership, and crucially, must ensure that they attract the most qualified personnel at all levels in the organization; personnel who have the skills to put data-driven approaches into practice and create value for the business from data.

Innovation springs from the brightest minds – become a leader of tomorrow by joining our new Master in Management and Engineering in Data and Decision Science. The MME-DDS is positioned at the intersection of Data Science and Operations Research. Our courses bring together expertise from a wide range of fields; machine learning, artificial intelligence, mathematical optimization, heuristic algorithm design and simulation. Electives and domain specializations will give you a competitive advantage in your chosen field.

RWTH Aachen University is one of the leading integrated universities of technology in Europe and a place where the future of our industrialized world is thought out. You will enjoy a unique learning experience where theory and practice go hand in hand and where you will quickly apply your new knowledge to real-world challenges.

We look forward to welcoming you to the program and the MME community!

Prof. Dr. Michael Schneider

Academic Director MME-DDS and
Head of Deutsche Post Chair -
Optimization of Distribution Networks at
RWTH Aachen University

Dr. Ulrich Kerzel

VP Data Science
RWTH Aachen Business School GmbH

Discover the MME-DDS advantage

Designed for professionals with a STEM (science, technology, engineering, mathematics) background, the MME-DDS begins with the fundamentals and takes you right up to the cutting-edge of machine learning, artificial intelligence and exact and heuristic optimization. Projects in data science and optimization will give you hands-on experience tackling real-world problems. Electives and specialization will allow you to develop comprehensive domain knowledge and subject matter expertise in engineering and a range of application areas and industry sectors.

The program is offered by RWTH Aachen University, one of the leading integrated universities of technology in Europe, with close to 150 years of expertise in teaching and research.

Through this program, you will learn how to leverage machine learning, optimization and data-driven decision making to develop profitable and sustainable business models that allow you to lead the technological transformation in your industry rather than just following it.

The MME in Data and Decision Science has been carefully designed to equip ambitious professionals with a distinct set of skills needed to succeed in a digitized and globalized economy. Data-driven decision-making has become critical to success in an increasingly wide range of sectors. Many professions will face disruptive change, and in the future even relatively simple tasks will require specialized knowledge in Data and Decision Science.

The M.Sc. degree granted by RWTH Aachen University in Germany will also enable you to pursue an academic career and continue studying towards a PhD in fields such as Data Science, Operations Research, or Engineering.

Whichever path you choose after graduation, our dedicated team of experts in the career and entrepreneurship centers will accompany you on that journey and help you decide how to best realize your ambitions. We seek to place our graduates in global technology blue chips, hidden technology champions, leading technology consultancies, and fast-growing technology ventures. The Entrepreneurship Center at RWTH Aachen University also has a long track record of supporting innovative startups by our graduates – between 70 to 100 every year.

"Tomorrow's leaders will drive business growth using data-driven decisions. Machine learning can harness the information captured in data. Decision Science and Prescriptive Analytics transform this information into optimized actions."

Prof. Dr. Marco Lübbecke
Chair of Operations Research
RWTH Aachen University

"Understanding algorithms is essential in creating digital products that are both innovative and socially sustainable."

Prof. Dr. Britta Peis
Chair of Management Science
RWTH Aachen University

Benefit from five key strengths

Enrolling in the MME-DDS will help you to prepare for a career in the data-driven economy. Benefit from the key strengths of the program:

#1   **Excellent reputation**
RWTH Aachen University enjoys an excellent reputation across the world for world-leading research in engineering and technology and is synonymous with German engineering.

#2   **Interdisciplinary thinking**
Our courses are designed to combine deep knowledge in Data and Decision Science with domain-specific knowledge from engineering and a wide range of application areas and industry sectors. This interdisciplinary profile is highly sought after in global enterprises and SMEs alike.

#3   **Networking focus**
We place a strong focus on communication amongst participants and lecturers, thus building the foundations of a successful career, enhanced by an international network. This is enhanced by industry internships and the opportunity to study abroad, which are offered to our students as part of the program.

#4   **A varied approach to teaching**
The program uses a wide range of learning styles and teaching methods. Lectures, case studies, applied projects, group work, topical debates and lab sessions provide a varied and lively learning experience.

#5   **Excellent career perspectives**
Develop into one of tomorrow's "unicorns" and become a leader with the skills required for the algorithm economy. At RWTH Aachen University you will gain in-depth theoretical knowledge and develop the tools and the skills to put cutting-edge knowledge into practice.

"Diving deep into details and data allows us to drive for the best decision on behalf of our customers. And to quote our founder, Jeff Bezos: 'The great thing about fact-based decisions is that they overrule the hierarchy.' "

Dr. Tilo Bobel
Senior Manager
EU Operational Excellence, Amazon EU S.a.r.L.
Member of the Scientific Advisory Board, BVL

Explore RWTH Aachen University

RWTH Aachen University is one of Europe's leading universities, where the future of our industrialized world is shaped and innovative answers to global challenges are developed. With its 260 institutes in nine faculties, RWTH Aachen University is among the leading European scientific and research institutions. With 44,517 students in 152 courses of study registered for the winter semester of 2016/17, including 8,556 international students from 128 countries, RWTH Aachen University is one of Germany's largest universities and with staff and students drawn from a diverse range of cultures and backgrounds.

RWTH Aachen University is one of only eleven Universities of Excellence in Germany, a recognition of our world-leading research and teaching. The Excellence Initiative of the German federal and state governments has allowed the University to boost its profile in the international research community. Visible evidence of this is the RWTH Aachen Campus, which is being developed in close cooperation with industry and which will become one of the largest research parks in Europe.

Enrolling in the MME-DDS program will immerse you in this stimulating research environment with courses offered by a broad set of institutes. Examples include the research area Operations Research and Management run by the School of Business and Economy, a leading research hub in optimization and decision science, the Laboratory for Machine Tools and Production Engineering, a world-leading center of excellence in production engineering, and the internationally-renowned Fraunhofer Institute for Laser Technology.

"Teaching at RWTH Aachen University is first and foremost application-oriented. Graduates are highly sought after as junior executives and leaders in business and industry."

National rankings and international assessments attest to RWTH graduates' marked ability to handle complex tasks, to solve problems constructively as part of a team and to take on leadership roles. It is not surprising that many board members of German corporate groups studied at RWTH Aachen University.

Learn from the best

RWTH Aachen University regularly appears at the top of international rankings. In 2015, the Times Higher Education (THE) World University Ranking placed RWTH Aachen University among the top 30 universities worldwide in engineering and technology; while the QS World University Ranking ranked RWTH Aachen University among the top 12 worldwide in mechanical, aeronautical and manufacturing engineering.

The School of Business and Economics is accredited by the AACSB (Association to Advance Collegiate Schools of Business) – considered around the world to be the most renowned international accreditation organization for business education. Less than 5 percent of the more than 16,000 schools granting business degrees worldwide have earned AACSB Accreditation. The School is a leader in digitized learning and state-of-the-art research in Operations Research and Technology and Innovation Management.

AACSB Accreditation
is known, worldwide, as the longest standing, most recognized form of specialized/professional accreditation an institution and its business programs can earn.

RWTH Aachen University in national and international university rankings

#1

Winner in category
"Management + Engineering"
WiWo Employer Ranking 2015

#1

Winner in category
"Mechanical Engineering"
WiWo Employer Ranking 2015

#1

National Winner in the category
"Mechanical Engineering" (#12 Worldwide)
QS Ranking 2016

Enjoy a unique learning experience

The MME-DDS program offers you a unique learning experience, where leading academic experts share their theoretical expertise and practical experience.

RWTH is one of Germany's most advanced and highly-ranked universities, and the combination of Business School and an internationally renowned university provides an ideal ecosystem to prepare for the challenges of the next digital revolution. The program combines the strengths of a business school, innovative research and domain-specific knowledge from the world's leading experts.

Hands-on experience
Courses in machine learning, artificial intelligence, exact and heuristic optimization are complemented with hands-on exercises and projects. This gives you experience in tackling real-world challenges and realistic use-cases. The industrial internship, which can be selected in the second semester, further enhances this skill set.

Interdisciplinary mindset
The MME-DDS program is positioned at the intersection of Data Science and Operations Research. Combined with electives and specializations in engineering and a range of other application areas, participants in this program are equipped with the skills needed to lead technological change in the businesses of tomorrow.

Intercultural teams
Working in multicultural teams is a given in today's world, and our courses feature group projects where you solve real-world challenges in culturally diverse teams. A study-abroad phase can also be selected in the second semester as an alternative to the industrial internship, in which you further increase your intercultural experience.

Participant-centered learning
All courses take a participant-centered approach that emphasizes interaction between lecturers and students through case discussions, group presentations, debates and lab sessions.

Soft-skills
Our experts will help you prepare for your next challenge, be it in a global enterprise, SME or a PhD program, with a wide range of support including CV and cover letter training and simulated job interviews. Benefit from our free German language course, which will give you the language skills needed to succeed in the German job market.

Your learning experience

The MME in Data and Decision Science offers a comprehensive program of cutting-edge courses in machine learning and artificial intelligence, mathematical optimization and data-driven decision making.

Our Master program is designed as a full-time experience over 2 years (4 semesters). Your own research towards the master thesis will be done in the 4th semester. In addition, you may enroll in German language courses at no extra cost.

DDS Essentials (10 CP)

The "DDS Essentials" consist of two courses that cover and refresh relevant essentials in mathematics, statistics, algorithms and data structures. These modules equip you for success in the core courses in Data and Decision Science, as well as in some of the application areas and specializations. If you can provide proof that you are proficient in the topics covered in these courses, you may apply to exchange these modules with two of the following four modules: Technology and Innovation Management, Strategic Management, Marketing Management and Entrepreneurial Management.

Data Science (15 CP)

The block "Data Science" consists of three modules. "Predictive Modeling" covers the fundamentals of data handling and data quality, predictive modeling and validation of business- and use-cases, as well as the evaluation of predictions. The course "Machine Learning and Artificial Intelligence" builds from the fundamentals of machine learning right up to cutting-edge developments. The third module is a practical exercise that complements the two lectures.

Decision Science and Optimization Technologies (20 CP)

This block consists of four modules: "Exact Optimization: Modeling" introduces concepts to formulate state-of-the-art decision models that capture the combinatorial explosion of options, including networks, linear programs and integer programs. "Exact Optimization: Algorithms" focuses on modern methods to solve these optimization models. The course covers algorithms for solving deterministic problems as well as techniques from robust optimization and algorithmic game theory, which handle uncertainty in the decision making process. "Heuristic Optimization" covers the fundamentals of metaheuristics and the challenges encountered when designing high-performance heuristics for complex planning tasks in different domains. The fourth module is a practical exercise that complements the three lectures.
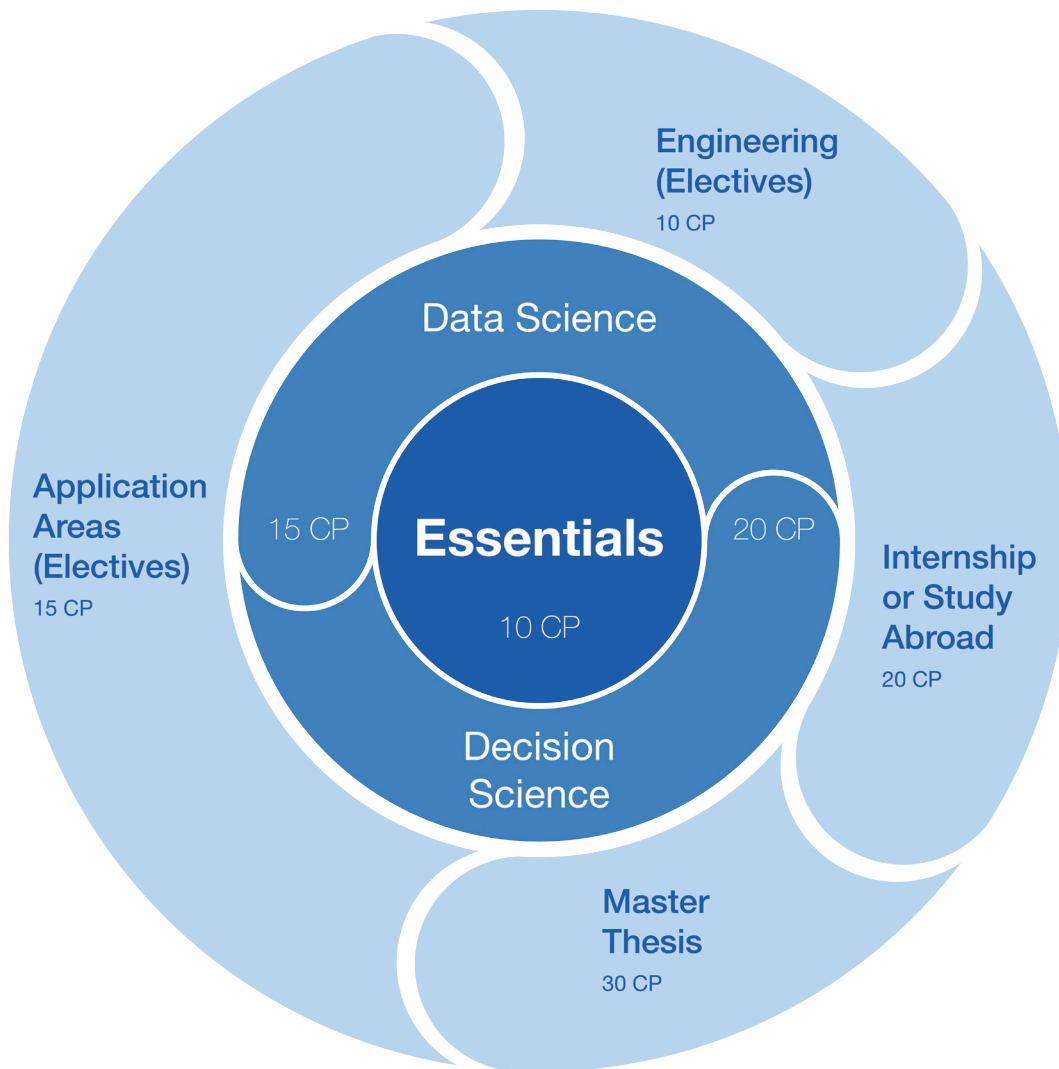
Internship or Study Abroad (20 CP)

Apply your skills during a placement at global enterprises such as Deutsche Post DHL, PTV Group and others, or deepen your knowledge by studying at an international university, or participating in summer schools or online courses.

Master Thesis (30 CP)

By writing a master thesis at the end of the program, you demonstrate your ability to solve a methodological or analytic problem, applying the knowledge acquired during the program and scientific research methods.

German Language Courses (two courses)

Learning another language is an important part of a successful career. Becoming proficient in German is also an essential precondition for succeeding in the German job market, both for an internship during your studies or a permanent position thereafter. As part of the program, we offer the option to complete two intensive German language courses in semesters 1 and 3, which broaden your understanding of German and enhance your career options. You may be able to enroll in further language courses in semester 2 and 4 at your own convenience. A Student Counsellor will help you get in touch with the relevant contacts.

Engineering (Electives) 10 CP

Data Science

15 CP

Essentials

20 CP

10 CP

Application Areas (Electives) 15 CP

Internship or Study Abroad 20 CP

Decision Science

Master Thesis 30 CP

SEMESTER 1

DDS Essentials
10 CP

- Statistics and Mathematics
- Algorithms and Data Structures

Decision Science
10 CP

- Exact Optimization: Modeling
- Exact Optimization: Algorithms

Data Science
10 CP

- Predictive Modeling
- Machine Learning

SEMESTER 2

Internship or Study Abroad
20 CP

Decision Science
5 CP

- Heuristic Optimization

Data Science
5 CP

- Data Science Project

SEMESTER 3

SEMESTER 4

Application Areas (Electives)
15 CP, 3 out of 4

- Advanced Planning Systems in Manufacturing and Supply Chains
- Optimization of Logistics Systems
- Data-Driven Business Models
- Energy and Climate

Decision Science
5 CP

- Optimization Project

Engineering (Electives)
10 CP

Master Thesis

30 CP

Get to know your MME community

"A truly global community"

Classes 2013 - 2016

31	Nationalities	**17.4%**	Female
25	Average age	**2 years**	Average work experience

"Choosing the MME program at RWTH Aachen University was the best decision I could have made. RWTH Aachen University has an excellent reputation and the program helped me prepare for the numerous demands and challenges in the business world."

Shreyas Satish, Class of 2013, Procter & Gamble

Graduates from the MME programs offered by the RWTH Aachen Business School are highly sought after on the European job market

and 3 out of 4 graduates find positions in leading companies such as:

BASF   BAYER   BOSCH   CARL ZEISS   CONTINENTAL   FIAT   FORD PROCTER & GAMBLE   ROLLS ROYCE   SIEMENS   TOYOTA   VOLKSWAGEN

"The MME program was an intense, yet very satisfying learning experience. The program's focus on the intersection of management and technology is truly unique and sets it apart from the rest. Also, the caliber of instruction was superior."

Arjun Menon, Class of 2013, Carl Zeiss Meditec AG

Benefit from personalized career services

Helping our students plan and build their future careers is one of our greatest strengths. Our goal at the RWTH Business School is to empower students to achieve a smooth entry into the job market and to further develop their career after their studies.

"MME-DDS graduates develop fundamental and cutting-edge knowledge in machine learning, artificial intelligence, operations research, and decision making."

- CV and cover letter training
- Job interview training
- Field trips
- Company presentations and lectures on campus
- Networking and recruiting events

Discover Aachen – a great place to live

Aachen's position in the far West of Germany, has contributed to the city's rich history and makes it an ideal place for people from different cultures to meet and interact on a daily basis. Aachen is located in one of the most innovative regions in Europe, connecting Germany, the Netherlands and Belgium and is in close proximity to the cities of Cologne, Maastricht, and Brussels.

"Aachen's emergence as one of Europe's major high-tech locations is a result of cooperation between the universities, research institutions, companies and the city's administration."

Aachen's science-base has attracted famous international enterprises and research institutions including Ericsson, Ford, Philips, Takeda Pharma and Microsoft, and made it an ideal location for up-and-coming technology companies. Aachen's colleges and universities develop advanced technologies for the sunrise industries, including information and telecommunication engineering, plastics engineering, computer science, materials science and biotechnology.

Outside of work, Aachen offers a great quality of life. The city's culture is shaped by the more than 50,000 students who attend Aachen's universities. The student population provides Aachen with a vibrant culture, replete with restaurants, cafés, museums and clubs. The increasing number of students who decide to enroll at RWTH Aachen University provides further proof that Aachen is an enjoyable and charming place to live in.

Quick Facts MME-DDS

Title: Master in Management and Engineering in Data and Decision Science

Degree: Master of Science (M.Sc.)

Focus: Machine Learning, Artificial Intelligence, Operations Research, Decision Making

Target Group: Young professionals with a STEM (science, technology, engineering and mathematics) background

Duration: 4 semesters full-time, including 1 semester Master Thesis

Location: On campus in Aachen

Credit Points: 120 ECTS

Teaching: Highly interactive on-campus experiences

Tuition Fees: Refer to our website (the QR tag can be found on the back of this brochure)

Academic Director: Professor Dr. Michael Schneider

Admission Requirements:
- First Degree: Bachelor of Engineering or Bachelor of Science degree in STEM fields (science, technology, engineering and mathematics)
- Minimum of 125 Credit Points in the fields of mathematics and natural science (e.g. in chemistry and/or physics

and/or computer science and/or engineering).
- Minimum of 25 Credit Points in the fields of higher mathematics or statistics, database and information systems, programming, algorithms and data structures, complexity theory, quantitative methods/operations research.
- Proof of English language proficiency
- At least 12 months of professional work experience

Application Process:
1. Check our online checklist for which documents are required.
2. Create an online application account at our online portal: online.rwth-aachen.de/RWTHonline

The application portal will remain open until 1st of March every year for applicants from outside Europe (Non-EU) and until 15th of July for European (EU) applicants.
3. Follow the online application process and upload the required documents.
4. Complete the online application by pressing "send" at the end.
5. Await the final decision about admission to the MME-DDS program.

We strongly encourage you to apply as early as possible, as applications are reviewed on a rolling basis.

BUSINESS SCHOOL | RWTHAACHEN UNIVERSITY

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12/2017

Thinking the Future
Zukunft denken