



M. Sc. Data Science

Introductory Meeting

Program Coordination

Head of program

- Prof. Dr. Torsten Kuhlen



Academic advisor

- Timo Gersing & Isaak Lim
- email: data-science@cs.rwth-aachen.de
- website: sc.informatik.rwth-aachen.de/en/studium/master/master-data-science



Outline

1. Program Structure

Foundational (Core) Area (44 - 64 CP)	Computer Science (at least 18 CP) <i>Introduction to Data Science (6 CP) + further CS courses</i>			
	Mathematics (at least 18 CP) <i>Mathematics of Data Science (9 CP) + further Math courses</i>			
	Data Science Ethics <i>Ethics, Technology, and Data (4 CP)</i>			
S/P (12 CP)	Seminar (5 CP), Practical Course (7 CP)			
Specialisation Area (14 - 22 CP)	Computer Science (CS)	Mathematics (M)	Computer Science and Mathematics	Application Area (BA, CLS, CSS or P)
	Lecture courses from respective catalogues			
Master's Thesis (30 CP)	Master's thesis			
Additional Competences (0 - 12 CP)	Language course, non-technical courses from universities' program,...			

2. Planning your Studies

Start in winter semester:									
		1. (WS)	→30	2. (SS)	→30	3. (WS)	→30	4. (SS)	→30
Add. Comp. 0-12		Add. Comp. 1	4			Add. Comp. 2	4		
Core Area 44 - 64	Maths	≥ 18	Mathematics of Data Science	9	Elective (Maths)	9			
	CS	≥ 18	Introduction to Data Science	6	Elective (CS)	6			
			2 Elective (CS)	10 (2)					
P/S 12	Block	4			Ethics, Technology, and Data	4			
	Seminar	5							
	Practical C.	7			Practical Course				
Specialisation 14-22					Elective from Computer Science	9-12			
	CS				Modules from other Specialisations	≤ 6			
					Elective from Mathematics	≤ 3			
	M				Modules from other Specialisations	≤ 6			
					Elective from Computer Science	≤ 6			
	CSM				Elective from Mathematics	≤ 3			
					Elective from Business Analytics	≤ 3			
	BA				Elective from Computational Life Science	≤ 3			
	CLS				Elective from Computational Social Science	≤ 3			
	CSS				Elective from CS oder Math	≤ 3			
	P				Elective from Physics	≤ 3			

Program Structure

Where to find information:

- Official Documents (only available in German):
 - “Übergreifende Prüfungsordnung” (general rules for all programs)
 - “Fachspezifische Prüfungsordnung” (subject specific rules)
- Slides from this meeting (will be published on the web)
- Descriptions under
sc.informatik.rwth-aachen.de/en/studium/master/master-data-science/program-structure/

Program Structure

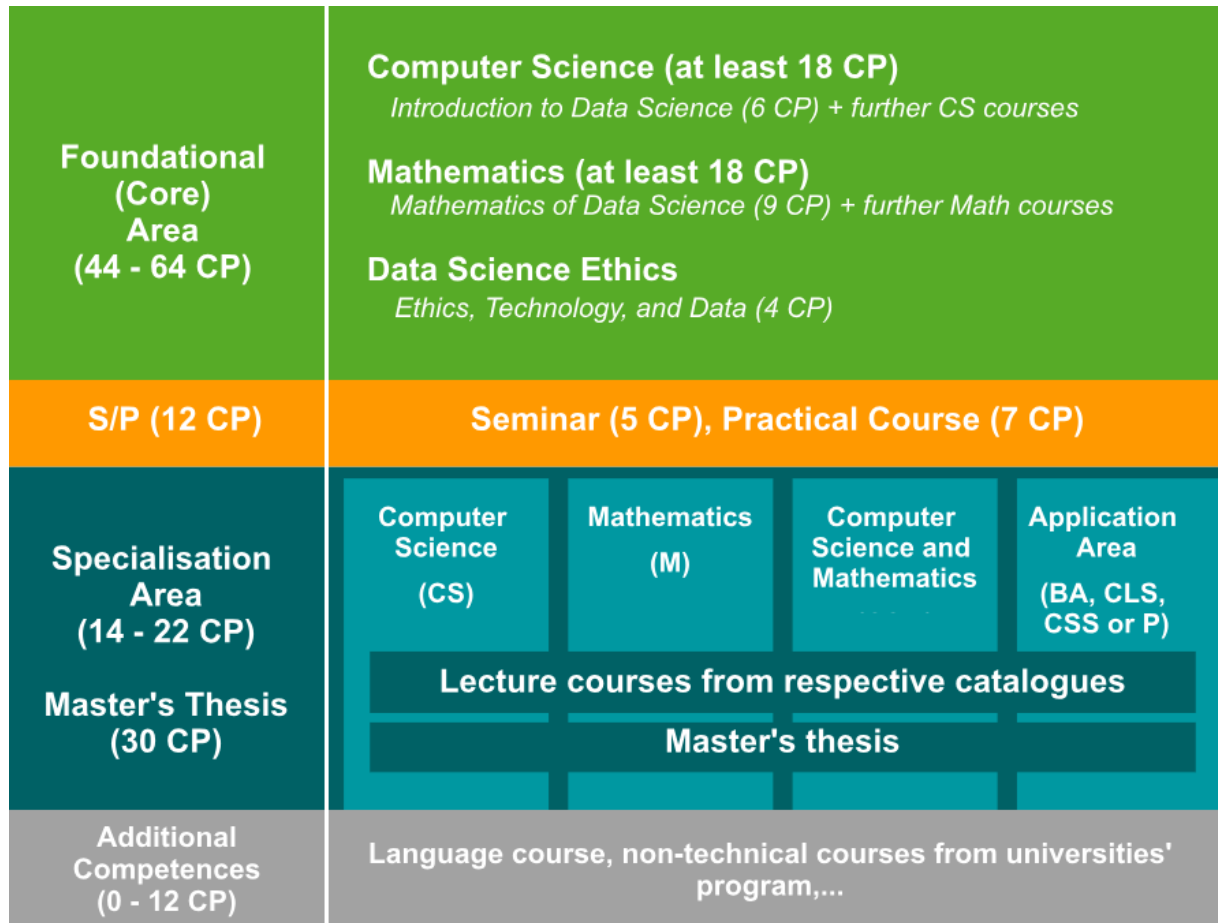
Where to find information:

- Official Documents (only available in German):
 - “Übergreifende Prüfungsordnung” (general rules for all programs)
 - “Fachspezifische Prüfungsordnung” (subject specific rules)
- Slides from this meeting (will be published on the web)
- Descriptions under
sc.informatik.rwth-aachen.de/en/studium/master/master-data-science/program-structure/

General Structure:

- You need to complete 120 CP (credit points = ECTS) for your degree.
- Master thesis counts for 30 CP.
- You have to choose and complete courses for 90 CP in total from different areas according to some rules, as explained in the following.

Program Structure



+ “Scientific Integrity”

Foundational (or Core) Area (44-64 CP)

Mandatory Courses

Introduction to Data Science (6 CP)

- Prof. Dr. Wil van der Aalst
- this semester



Mathematics of Data Science (9 CP)

- Prof. Dr. Erhard Cramer
- this semester



Ethics, Technology, and Data (4 CP)

- Prof. Dr. Sakia Nagel
- next semester



Foundational (or Core) Area (44-64 CP)

Elective Courses

Computer Science (at least 12 CP)

- Machine Learning **this semester** (6 CP)
- Data Analysis and Visualization **this semester** (4 CP)
- Probabilistic Programming **this semester** (6 CP)
- Privacy Enhancing Technologies for Data Science (4 CP)
- Algorithmic Foundations of Data Science **this semester** (6 CP)
- Concepts and Models for Parallel and Data-Centric Computation (6 CP)
- Semantic Web **this semester** (4 CP)

Mathematics (at least 9 CP)

- Applied Data Analysis (9 CP)
- Nonlinear Optimization *Optimierung A* (9 CP)
- Combinatorial Optimization *Optimierung B* **this semester** (9 CP)
- Mathematical Methods of Signal and Image Processing **this semester** (9 CP)
- Mathematical Foundations of Machine Learning **this semester** (9 CP)

Seminar and Lab Course (5+7 CP)

Seminar: oral presentation and written report on a subject assigned to you

Lab course (practical course): software project in a team

- Each semester, there is a variety of seminars and lab courses offered by the department.
- Registration and distribution of places outside of RWTHOnline in a separate system **already at the end of the previous semester**.
- You will be informed via the mailing list when the process starts.

Specialisation Area (14 - 22 CP)

- Elective courses of 14-22 CP from one of the following areas:
 - Computer Science
 - Mathematics
 - Computer Science and Mathematics
 - Business Analytics
 - Computational Life Science
 - ~~Computational Social Science~~
 - Physics (only for Students with a Bachelor's Degree in Physics)
- For each area there is a catalogue of courses (see RWTHOnline)
- Formal election of specialisation area together with the registration of Master's Thesis (at the latest)

Specialisation Area (14 - 22 CP)

- Elective courses of 14-22 CP from one of the following areas:
 - Computer Science
 - Mathematics
 - Computer Science and Mathematics
 - Business Analytics
 - Computational Life Science
 - ~~Computational Social Science~~
 - Physics (only for Students with a Bachelor's Degree in Physics)
- For each area there is a catalogue of courses (see RWTHOnline)
- Formal election of specialisation area together with the registration of Master's Thesis (at the latest)

Rule for upper credit limit: One course “overflowing” the 22 CP is allowed.

Example:

- 4 courses with 6 CP (= 24 CP) would be fully counted.
- 5 courses with 6 CP are too many, one of them would not be counted.

Specialisation Area (14 - 22 CP)

Rules for Specialization

Business Analytics, Computational Life Science, Physics:

- at least 20 CP from the courses of the respective area

Computer Science, Mathematics, Computer Science and Mathematics:

- at least 10 CP from the courses of the respective area
- at most 6 CP of courses from any other specialization area

Specialisation Area – Master's Thesis (30 CP)

- Requirements for registration
 - at least 60 CP
 - completed course “Scientific Integrity”
 - specialization “Business Analytics”: at least one of “Combinatorial Optimization” or “Operations Research I”
 - **always recommended**: completed the mandatory courses “Introduction to Data Science”, “Mathematics of Data Science”, “Ethics, Technology and Data”

Specialisation Area – Master's Thesis (30 CP)

- Requirements for registration
 - at least 60 CP
 - completed course “Scientific Integrity”
 - specialization “Business Analytics”: at least one of “Combinatorial Optimization” or “Operations Research I”
 - **always recommended**: completed the mandatory courses “Introduction to Data Science”, “Mathematics of Data Science”, “Ethics, Technology and Data”
- topic from specialisation area; there is no central list of topics, you have to directly contact the research groups
- thesis (27 CP) + oral presentation (3 CP)
- 6 Months duration, max 100 pages
- first reviewer from the specialisation area, second reviewer from CS or math department
- written within RWTH with a professor from your specialization area; external theses are an exception and should be coordinated with a research group from your specialization

Additional Competences (0-12 CP)

This area is optional!

Twofold purpose:

- Opportunity to broaden your knowledge on non-technical subjects:
 - language course at **RWTH language center** (up to 4 CP): **register today for this semester!**
 - “non-technical” courses offered at RWTH Aachen (up to 6 CP)
(philosophy, history, social sciences, economics, ...)
- You join with background on CS, maths, or physics. You can attend basic courses from CS or maths if this is not your background:
 - bridge courses (blended learning modules):
 - with background maths or physics:** Algorithms and Data Structures, Databases (every semester)
 - with background CS or physics:** Stochastics II (winter)
 - or corresponding courses from CS/math bachelor (in German)

Grades of courses in additional competences do not count for the final grade (but the credits do count).

Additional Competences (0-12 CP)

This area is optional!

Twofold purpose:

- Opportunity to broaden your knowledge on non-technical subjects:
 - language course at **RWTH language center** (up to 4 CP): **register today for this semester!**
 - “non-technical” courses offered at RWTH Aachen (up to 6 CP)
(philosophy, history, social sciences, economics, ...)
- You join with background on CS, maths, or physics. You can attend basic courses from CS or maths if this is not your background:
 - bridge courses (blended learning modules):
 - with background maths or physics:** Algorithms and Data Structures, Databases (every semester)
 - with background CS or physics:** Stochastics II (winter)
 - or corresponding courses from CS/math bachelor (in German)

Grades of courses in additional competences do not count for the final grade (but the credits do count).

Approval needed: Except for the language course, your choices for additional competences currently need to be approved by the academic advisor.

Scientific Integrity

- Online Course about good scientific practice (offered each semester)
- Mandatory for all master students of RWTH Aachen since winter 2020.
- Exam as so-called homework via Dynexite (offered twice per semester)
- No credits for this course
- More information: [Web page for course Scientific Integrity](#)

Program Structure – Summary

See also descriptions on the website sc.informatik.rwth-aachen.de/en/studium/master/master-data-science/program-structure/

Foundational (Core) Area (44 - 64 CP)	Computer Science (at least 18 CP) <i>Introduction to Data Science (6 CP) + further CS courses</i> Mathematics (at least 18 CP) <i>Mathematics of Data Science (9 CP) + further Math courses</i> Data Science Ethics <i>Ethics, Technology, and Data (4 CP)</i>			
S/P (12 CP)	Seminar (5 CP), Practical Course (7 CP)			
Specialisation Area (14 - 22 CP) Master's Thesis (30 CP)	Computer Science (CS)	Mathematics (M)	Computer Science and Mathematics	Application Area (BA, CLS, CSS or P)
	Lecture courses from respective catalogues			
	Master's thesis			
Additional Competences (0 - 12 CP)	Language course, non-technical courses from universities' program,...			

+ “Scientific Integrity”

Outline

1. Program Structure

Foundational (Core) Area (44 - 64 CP)	Computer Science (at least 18 CP) <i>Introduction to Data Science (6 CP) + further CS courses</i>			
	Mathematics (at least 18 CP) <i>Mathematics of Data Science (9 CP) + further Math courses</i>			
	Data Science Ethics <i>Ethics, Technology, and Data (4 CP)</i>			
S/P (12 CP)	Seminar (5 CP), Practical Course (7 CP)			
Specialisation Area (14 - 22 CP)	Computer Science (CS)	Mathematics (M)	Computer Science and Mathematics	Application Area (BA, CLS, CSS or P)
	Lecture courses from respective catalogues			
Master's Thesis (30 CP)	Master's thesis			
Additional Competences (0 - 12 CP)	Language course, non-technical courses from universities' program,...			

2. Planning your Studies

Start in winter semester:							
	1. (WS)		2. (SS)	3. (WS)		4. (SS)	
Core Area	0-12		Adm. Comp. 1		Adm. Comp. 2		
		Maths	≥ 18	Mathematics of Data Science	9	Electives (Maths)	9
		CS	≥ 18	Introduction to Data Science	6	Electives (CS)	6
				2 Electives (CS)	10 (2)		
Specialisation	12-14-22	Ethics	4	Ethics, Technology and Data	4		
		Seminar	5	Seminar			
		Practical C.	7	Practical Course	7		
		CS		Elective from Computer Science	0-12		
Master's Thesis	14-22	M		Modules from other Specialisations	0-6		
		CSM		Elective from Mathematics	0-10		
		BA		Modules from other Specialisations	0-6		
		CLS		Elective from Computer Science	0-6		
		CSS		Elective from Mathematics	0-6		
		P		Elective from Business Analytics	0-20		
				Elective from Computational Life Science	0-20		
				Elective from Computational Social Science	0-10		
		Elective from CS oder Maths	0-8				
		Elective from Physics	0-20				

Planning your Studies

Example for a first semester:

- Introduction to Data Science (6 CP, mandatory CS, core area)
- Mathematics of Data Science (9 CP, mandatory Math, core area)
- Two lectures from core area (CP vary)
- Language course (4 CP, additional competences)

Planning your Studies

Example for a first semester:

- Introduction to Data Science (6 CP, mandatory CS, core area)
- Mathematics of Data Science (9 CP, mandatory Math, core area)
- Two lectures from core area (CP vary)
- Language course (4 CP, additional competences)

Example for a second semester:

- Ethics, Technology, and Data (4 CP, mandatory, core area)
- Two or three lectures from core area (CP vary)
- One or two lectures from specialization area (CP vary)

Planning your Studies

Example for a third semester:

- Seminar (5 CP)
- Software Lab (7 CP)
- One or two lectures in specialization (CP vary)
- Remaining CP in core/specialization/additional competences (reach ≥ 90 CP)

Planning your Studies

Example for a third semester:

- Seminar (5 CP)
- Software Lab (7 CP)
- One or two lectures in specialization (CP vary)
- Remaining CP in core/specialization/additional competences (reach ≥ 90 CP)

Fourth semester: Master thesis (30 CP)

Planning your Studies

Example for a third semester:

- Seminar (5 CP)
- Software Lab (7 CP)
- One or two lectures in specialization (CP vary)
- Remaining CP in core/specialization/additional competences (reach ≥ 90 CP)

Fourth semester: Master thesis (30 CP)

Remarks:

- This is just an example, you may deviate from this structure. There is no guarantee that (core area) courses are offered every year. [Plan ahead](#) to obtain all necessary CP.
- Some courses might be overlapping. But for almost all courses, a lot of digital material is provided, such that studying overlapping courses is possible.
- It is also possible to do courses in parallel with the thesis.

Finding and Choosing Courses

- Catalogue of courses generally offered in the data science program in RWTHOnline
- See also [FAQ on sc.informatik.rwth-aachen.de](#)
Question: “Where can I get information on the curriculum?”
- Before a semester starts, you can check in RWTHOnline which courses are offered in that semester
- Elective courses of the computer science department (in general, not specific to data science) are usually presented at the beginning of the semester:
[Webpage for elective courses of CS department for this semester](#)
- Teaching is done in English. Ask the lecturers if not.

Registration:

- Register in RWTHOnline at beginning of semester (see there for deadlines, usually until a few weeks after start of semester)
- Registration does not imply that you actually have to take the course

Exams

- Details on the exams (written, oral, or other components) are announced in the courses.
- In some courses you need to do weekly exercises to get an admission for the exam.
- For the courses of a semester, usually two written exams are offered after the teaching period.
- If you fail the first attempt, you can register for the second one. You can also skip the first one and only take the second one.
- You have three attempts to pass the exam of a course. If you fail the two attempts of one semester, you have to wait until the course is offered again (or choose another course in case of electives).
- Register in RWTHOnline once you have decided which courses to take.
- Current uniform registration deadlines (can vary for some courses):
 - First exam: November 15 – January 15
 - Second exam: until one week before exam
- You can deregister from an exam until three working days before the exam.
- See webpage with [information on exams: \(de\)registration, withdrawal due to illness,...](#)

Who is Doing What?

Individual research groups:

- offer courses and corresponding exams (look at the webpages of the individual research groups to find out more about their research and teaching)
- set up and administer registration for courses and exams

ZPA (central examination office):

- administration of your academic record

Academic advisor:

- answer questions, give advice, approve additional competences, ...

The End

Contact: data-science@cs.rwth-aachen.de

Office hours via zoom: see section “Contact” for M.Sc. Data Science on sc.informatik.rwth-aachen.de