

## Data Science (M.Sc., Master Degree Program)

Study plan | Start in winter term

Version: 07.11.2022

Note: The following overview offers a non-binding overview of the structure and composition of the modules. The legally binding criteria is available in the examination regulations.

Module code	Module title (Compulsory/Elective)	Sem.	CP	Type	hours	Course title	Assessment	Module Convenor	Comment/ Language
<b>1. Semester (Wi)</b>									
■ MA4DSC008	Elements of Mathematics (P)	Wi	10	V	4	Elements of Mathematics	Exam (120 min.)	Schulz	English
				Ü	2	Elements of Mathematics			
■ MA4DSC009	Elements of Computer Science (P)	Wi	10	EL	1	Elements of Computer Science	Exam (120 min.) and exam (90 min.)	Schenkel	English
				Ü	3	Elements of Computer Science			
■ MA4DSC010	Elements of Statistics (P)	Wi	5	V+	2	Elements of Statistics	Exam (120 min.)	Münnich	English
				Ü					
■ MA4DSC1004	Statistical Programming with R (P)	Wi	5	V+	2	Statistical Programming with R	Portfolio examination	Münnich	English
				Ü					

2. Semester (Su)									
■ MA4DSC002	Numerical Optimization for Data Science (P)	Su	10	V	4	Numerical Optimization		Schulz	English
				Ü	2	Numerical Optimization			
				Oral exam (20-30 Min.) or exam (105 min.)					
■ MA4DSC003	Statistical Methods of Data Science (P)	Su	10	V	2	Statistical Methods of Data Science		Münnich	English
					2	Statistical Methods of Data Science (Presentation)			
				Exam (90 min.)					
■ MA4DSC004	Data Mining (P)	Su	5	V	2	Datamining		Bergmann	English
				Ü	1	Datamining			
				Exam (90 min.)					
■ MA4DSC005	Big Data Analytics (P)	Su	5	V	2	Big Data Analytics		Schenkel	English
				Ü	1	Big Data Analytics			
				Oral exam (20-30 min.) or Exam (90 min.)					
3. Semester (Wi)									
■ MA4DSC006	Research Case Studies (P)	Wi	10	PRO	2	Research Case Studies		Münnich, Schenkel	English
				Portfolio examination					
■	Compulsory elective Modules (WP)	Wi	20	<i>20 credit points to fulfill according to the conditions of the elective focus.</i>					
4. Semester (Su)									
■ MA4DSC007	Master's Thesis (P)	Su	30		2	Master's Thesis		Münnich, Schenkel	English
				Presentation of intermediate results, Thesis					

Compulsory elective Modules (WP): Simulation Studies (20 CP to be chosen)									
■ MA4DSC011	Modeling and Simulation (WP)	Su	5	V	2	Modeling and Simulation		Timm	English Two of three modules are to be chosen.
				Ü	1	Modeling and Simulation			
				Oral exam (15-30 Min.)					
■ MA4DSC012	Agent-Based Modeling (WP)	Su	5	V	2	Agent-Based Modeling		Timm	
				Ü	1	Agent-Based Modeling			
				Portfolio examination					
■ MA4DSC013	Distributed Artificial Intelligence (WP)	Su	5	V	2	Distributed Artificial Intelligence		Timm	
				Ü	1	Distributed Artificial Intelligence			
				Exam (90 Min.)					
■ MA4DSC014	Monte-Carlo Simulation Methods (WP)	Wi	5	V	2	Monte-Carlo Simulation Methods		Münnich	English Both modules are to be completed.
				Ü	1	Monte-Carlo Simulation Methods			
				Poster presentation					
■ MA4DSC015	Microsimulation Methods (WP)	Wi	5	V	2	Microsimulation Methods		Münnich	
				Ü	1	Microsimulation Methods			
				Poster presentation					

**Compulsory elective Modules (WP): Data and Knowledge Systems (20 CP to be chosen)**

■ <b>MA4DSC1012</b>	Agent-Based Modeling (WP)	Su	5	V	2	Agent-Based Modeling		Timm	English Four of the modules are to be completed.
				Ü	1	Agent-Based Modeling			
				Portfolio examination					
■ <b>MA4DSC016</b>	Digital Libraries and Foundations of Information Retrieval (WP)	Wi	5	V	2	Digital Libraries		Schenkel	
				Ü	1	Digital Libraries			
				Exam (120 min.) or oral exam (15-30 Min.)					
■ <b>MA4DSC017</b>	Distributed Databases (WP)	Wi	5	V	2	Distributed Databases		Schenkel	
				Ü	1	Distributed Databases			
				Exam (120 min.) or oral exam (15-30 Min.)					
■ <b>MA4DSC018</b>	Experience-based Systems (WP)	Wi	5	V	2	Experience-based Systems		Bergmann	
				Ü	1	Experience-based Systems			
				Exam (90 Min.)					
■ <b>MA4DSC019</b>	Semantic Technologies (WP)	Su	5	V	2	Semantic Technologies		Bergmann	
				Ü	1	Semantic Technologies			
				Portfolio examination					
■ <b>MA4DSC013</b>	Distributed Artificial Intelligence (WP)	Wi	5	V	2	Distributed Artificial Intelligence		Timm	
				Ü	1	Distributed Artificial Intelligence			
				Exam (90 Min.)					
■ <b>MA4DSC020</b>	Information Visualization (WP)	Su	5	V	2	Information Visualization		Diehl	
				Ü	1	Information Visualization			
				Exam (120 min.) or oral exam (15-30 Min.)					

Compulsory elective Modules (WP): Algorithmic Optimization (20 CP to be chosen)									
■ MA4DSC021	Advanced Course in Algorithmic Optimization (WP)	Wi/ Su	10	V	4	Lecture from the range of courses in the module		Schulz	English
				Ü	2	Practical course from the range of courses in the module			
				Oral exam (20-30 Min.) or exam (105 min.)					
■ MA4DSC022	Special Topics in Algorithmic Optimization (WP)	Wi/ Su	10	V	4	Lecture from the range of courses in the module		Schulz	English
				Ü	2	Practical course from the range of courses in the module			
				Oral exam (20-30 Min.) or exam (105 min.)					
Compulsory elective Modules (WP): Applied Statistics (25 CP to be chosen)									
■ MA4AST1009	Specialisation Module – Survey Statistics #1 (WP)	Wi/ Su	5	V+Ü /V	2	Lecture and practical course respective lecture from the range of courses in the module		Schulz	English
				Exam (90–120 min.) or oral exam (15–30 min.); or according to the examination regulations of the external partner					
■ MA4AST1010	Specialisation Module – Survey Statistics #2 (WP)	Wi/ Su	5	V+Ü /V	2	Lecture and practical course respective lecture from the range of courses in the module		Schulz	English
				Exam (90–120 min.) or oral exam (15–30 min.); or according to the examination regulations of the external partner					
■ MA4AST1008	Survey Sampling (WP)	Wi	5	V	2	Survey Sampling		Münnich	English
				Ü	1	Survey Sampling			
				Exam (90-120 Min.)					
■ MA4AST1003	General Statistics #1 (WP)	Su	10	V+Ü /V	4	Lecture and practical course respective lecture from the range of courses in the module.		Münnich	English
				Exam-relevant academic achievement: Oral exam (15–30 min.) Term paper					

Compulsory elective Modules (WP): Financial Economics (20 CP to be chosen)									
■ MA4DSC023	Quantitative Trading with R (WP)	Wi	10	V	2	Quantitative Trading with R		Bauer	English
				Ü	2	Quantitative Trading with R			
				Term paper or exam (90 min.)					
■ MA4DSC024	Applied Time Series and Financial Econometrics (WP)	Wi	10	V	2	Applied Financial Econometrics		Neuenkirch	English
				Exam (60 Min.)					

Compulsory elective Modules (WP): Geoinformatics (20 CP to be chosen)									
■ MA4DSC025	Fundamentals of Environmental Remote Sensing (WP)	Wi	5	V	2	Fundamentals of Environmental Remote Sensing		Hill	English Both modules are to be completed.
				LAB	2	Fundamentals of Environmental Remote Sensing			
				Exam (60 min.)					
■ MA4DSC026	Introduction to Geoinformatics (WP)	Wi	5	LAB	2	Introduction to Geoinformatics		Udelhoven	
				EL	1	Introduction to Geoinformatics			
				Exam (60 min.)					
■ MA4DSC027	Geostatistics (WP)	Wi	5	V	2	Geostatistics		Udelhoven	English Two of three modules are to be chosen.
				LAB	2	Geostatistics			
				Portfolio examination					
■ MA4DSC028	Advanced Remote Sensing Data Processing and Interpretation (WP)	Su	5	LAB	3	Advanced Remote Sensing Data Processing and Interpretation		Udelhoven	
				K	1	Advanced Remote Sensing Data Processing and Interpretation			
				Term paper					
■ MA4DSC029	Time series analysis (WP)	Su	5	V	2	Pattern Recognition in long term global satellite archives		Udelhoven	
				LAB	2	Pattern Recognition in long term global satellite archives			
				Term paper					

**Compulsory elective Modules (WP): Natural Language Processing (20 CP to be chosen)**

■ <b>MA2NLP1001</b>	Machine Learning for Natural Language Understanding (WP)	Wi	10	V	2	Machine Learning for Natural Language Understanding		Rettinger	English
				Ü	1	Machine Learning for Natural Language Understanding			
				S	2	Trends in Machine Learning			
				Written paper					
■ <b>MA2NLP1002</b>	Natural Language Processing (WP)	Su	10	V	2	Natural Language Processing		Naumann	English
				Ü	1	Natural Language Processing			
				S	2	Trends in Natural Language Processing			
				Written paper					



**Compulsory elective Modules (WP): (20 CP to be chosen)**

■ MA4DSC030	Advanced Course in Mathematics (WP)	Wi/ Su	10	V	4	Lecture from the range of courses in the module		Schulz	English
				K	2	Course from the range of courses in the module			
				Oral exam <i>or</i> exam (105 min.)					
■ MA4DSC031	Special Topics in Mathematics (WP)	Wi/ Su	10	V	4	Lecture from the range of courses in the module		Schulz	English
				K	2	Course from the range of courses in the module			
				Oral exam <i>or</i> exam (105 min.)					
■ MA4DSC032	Seminar Mathematics A (WP)	Wi	5	S	2	Seminar from the range of courses in the module		Schulz	English
				Ü	1	Seminar from the range of courses in the module			
				Poster presentation					
■ MA4DSC033	Seminar Mathematics B (WP)	Wi	5	S	2	Seminar from the range of courses in the module		Schulz	English
				Ü	1	Seminar from the range of courses in the module			
				Poster presentation					

## List of abbreviations

### *Compulsory attendance courses*

EX	Field trip/Day Field trip	LAB	Lab/lab course	PRS	Practice-oriented seminar
GÜ	Field exercise	PRA	Internship	PRÜ	Practical course
KOS	Colloquium seminar	PRO	Project seminar	SPÜ	Language course

### *Non-compulsory attendance courses*

EL	E-Learning-Course	LK	Reading course	TUT	Tutorium
FK	Specialized Course	OS	Advanced seminar	Ü	Practical course
HS	Master's-level seminar	PRP	Preparatory course	V	Lecture
KOL	Colloquium	PS	Bachelor's-level seminar	V+Ü	Lecture with practical course
K	Course	S	Seminar		

### *Other abbreviations*

LP	Credit Points	SWS	Hours	WP	Elective module or course
P	Compulsory module	So	Summer term		
Sem	Semester	Wi	Winter term		