Subject-specific regulations for the Master course in Data Science of 6 April 2018 in conjunction with the amendments of 1 July 2019, 2 March 2020, and 21 March 2023 (study model 2011)

– Reading version –
The versions published in the Bielefeld University Gazette – Official Announcements – shall be binding.

Based on §§ 2 (4) and 64 (1) of the Higher Education Act of the State of North Rhine-Westphalia (Higher Education Act – HG of 16 September 2014 (GV. NRW. p. 547), last amended by Article 1 of the Act of 12 July 2019 (GV. NRW. p. 425, corr. p. 593), the Faculty of Business Administration and Economics and the Faculty of Technology, in conjunction with the examination and study regulations for the Master course (MPO fw. – Study Model 2011) at Bielefeld University of 1 September 2015 (Bielefeld University Gazette – Official Announcements – yr. 44 no. 15 p. 424), last amended on 15 December 2016 (Bielefeld University Gazette – Official Announcements – yr. 45 no. 18 p. 427) enacted these subject-specific regulations (annex to § 1 (1) MPO fw.):

1. Master's degree (§ 3 MPO fw.)

The Faculty of Business Administration and Economics and the Faculty of Technology jointly offer – subject to the organisational responsibility of the Faculty of Business Administration and Economics – the Data Science degree programme with the degree of "Master of Science" (M.Sc.).

2. Further access requirements (§ 4 (1) – 4 MPO fw.)

The subject-specific regulations govern further access requirements in addition to the requirements resulting from § 49 of the NRW Higher Education Act and § 4 MPO fw. Applicants shall receive access if they meet all requirements; applicants shall not receive access if they do not meet all requirements.

(1) Further access requirements are proof of a previous qualified degree (§ 49 (6) sent. 2 HG NRW) in accordance with paragraph 2 and language skills in English at level B2 of the European Framework of Reference for Languages in accordance with the guidelines of Bielefeld University. German language skills are recommended for the general success of the study programme, but they are not mandatory.

(2) A degree shall be qualified if all of the following subject requirements are proven by academic achievements, i.e., at least one point is achieved in each case and a total of 6 of the 9 points are achieved.

Notice: Any further knowledge and qualifications acquired outside of the curriculum of the qualified degree may be considered when awarding points if this compensates for missing competences within the meaning of the criteria listed below.

Knowledge of computer science:
- 0 points: No required competences.
- 1 point: Advanced programming skills.
- 2 points: Additional user knowledge in at least two areas of computer science

Knowledge of mathematics:
- 0 points: No required competences.
- 1 point: Basic understanding of calculus and linear algebra

Knowledge of statistics:
- 0 points: No required competences.
- 1 point: Basic understanding of inferential statistics (specification, estimation & verification of statistical models; cf. module 31-M3 Statistics)
- 2 points: Understanding of advanced classical statistical analysis methods (e.g., time series analysis, Bayesian statistics, non-parametric statistics, econometrics, ...).

(Preliminary) final grade of the qualified degree from 1.00 to 1.59: 4 points

(Preliminary) final grade of the qualified degree from 1.60 to 2.59: 3 points

(Preliminary) final grade of the qualified degree from 2.60 to 3.59: 2 points

(Preliminary) final grade of the qualified degree from 3.60 to 4.00: 1 point

The benchmark for the necessary knowledge and skills for the Master course shall be the mathematical and statistical competences taught in the 1-subject Bachelor course in Economics at Bielefeld University (Data Science profile) as well as the competences in Computer Science taught in a Bachelor course at the Faculty of Computer Science at Bielefeld University, since the Master course concept is built on these.

Points are awarded for competences under consideration of the requirements for crediting (§ 21 of the examination regulations of Bielefeld University of 18 December 2020) and the associated applicable standards and guidelines, including those of the European Area of Recognition Project (http://ear.enic-naric.net/manual/) in accordance with the following criteria:

- Quality of the university or the degree (accreditation)

- Level of competences acquired (qualifications framework)
- Workload
- Profile / alignment of the completed degree
- Specific learning outcomes under consideration of learning objective taxonomies

(3) Examination of the requirements and prerequisites for both the access and the admission procedure shall be performed based on the following documents, to be uploaded and entered into the corresponding application portal of Bielefeld University in time:

a) Final certificate of a previous qualified degree and the corresponding final documents (transcript, transcript of records, diploma supplement, or similar) or provisional final certificate showing a provisional final grade.
b) Module Guide or module descriptions for the completed modules

If no diploma supplement, transcript, or Module Guide or no module descriptions are available, corresponding descriptions that provide information on the completed degree programme, the competences acquired, the academic achievements and their evaluations, and on the individual subject profile of the completed degree programme are to be uploaded.
In addition, information on the criteria in accordance with paragraph 2 being met and on language skills shall be provided in the application portal.
Only pdf files will be accepted in the application portal. They should be searchable as far as possible.
Documents submitted following the deadline for applications or by any other means will not be considered.

(4) Access shall be evaluated from case to case by an authorised examiner. Applicants shall be informed about the result of the access procedure in an electronic notice. If the applicant raises an objection to the evaluation, including reasons, within one week, the decision shall be reviewed; two further authorised examiners shall be involved for this. The evaluation shall be corrected if necessary. Irrespective of this, legal protection shall be available. It will be communicated in the instruction on the legal right to appeal the notice.

(5) The competent body in accordance with § 14 MPO fw. shall decide on whether the access requirements are met; it shall also stipulate any further details of the procedure, appoint the authorised examiners, set the deadlines for applications, and make all decisions in connection with the access procedure.

3. Admission procedure (§ 4 (4) MPO fw.)

(1) After determining whether the access requirements have been met, it will be determined whether the number of applicants who are granted access in accordance with item 2 exceeds the number of available places for Master courses with restricted admission. If this is not the case, all of these applicants will be admitted.

(2) If the number of applicants granted access in accordance with section 2 exceeds the number of available places, the study places shall be allocated in the order of the total number of points achieved in the procedure in accordance with item 2 paragraph 2 (i.e., points from the competences and the preliminary final grade). If there is a tie, the number of points achieved in the subject-related criteria (item 2, paragraph 2) shall be solely decisive; the points of the previous final grade shall not be considered. If this does not result in a clear ranking, the (preliminary) final grade of the degree qualifying for the Master course shall be decisive. If there is no clear ranking, lots shall be cast.

(3) Admission shall be granted by the Studierendensekretariat [Student Office] based on the ranking in accordance with paragraph 2. Paragraphs 2 and 3 shall apply accordingly if there is any further follow-up procedure.

(4) Applicants shall be informed about the result of the admission procedure in an electronic notice from the Student Office.

4. Starting a study programme before acquiring the access requirements (§ 4 (5) MPO fw.)

– not applicable –

5. Course start (§ 5 (1) MPO fw.)

The study programme can only be taken up in the winter semester.

6. Curriculum (§ 7 MPO fw.)

The modules shall be held in English.

a. Base phase

There are two different versions of the course of study in the base phase due to the interdisciplinary alignment of the degree programme and the associated different first degrees acquired. The decision on the base phase to be studied shall be made under consideration of the first qualified degree within the scope of the access procedure (item 2, paragraph 8).
Version 1 shall generally be aimed at students with a Bachelor's degree from the field of economics/statistics or comparable degree programmes.
Version 2 shall generally be aimed at students with a Bachelor's degree from the field of computer science or comparable degree programmes.

aa. Version 1

Abbreviation	Module title	Recommended academic semester, start	CP	Necessary prerequisites
24-M-FStat	Foundations of Statistics	1	7	
39-Inf-ML	Machine Learning Basics	1	5	
39-Inf-AOpt	Applied Optimisation	1	5	
39-Inf-Pro	Programming	1	5	
39-Inf-BDA	Big Data Analytics	2	5	
Subtotal			**27**	

bb. Version 2

Abbreviation	Module title	Recommended academic semester, start	CP	Necessary prerequisites
24-M-FStat	Foundations of Statistics	1	7	
31-M-ISDA	Introduction to Statistical Data Analysis	1	8	
39-Inf-AOpt	Applied Optimisation	1	5	
31-M-Ectr1	Econometrics 1	2	7	
Subtotal			**27**	

b. Profile phase

Abbreviation	Module title	Recommended academic semester, start	CP	Necessary prerequisites
	Compulsory optional subject area I			
Modules at a scope of 10 CP from the module pool "Advanced Machine Learning" must be studied.		1 or 2 or 3	10	
	Compulsory area			
31-SW-StaFo	Statistics research	3	5	
31-SW-StiP	Statistics in practice	3	7	
39-Inf-ELSI	Ethical, Legal and Social Impacts	3	5	
31-M-Thesis	Master's Thesis	4	30	
	Compulsory optional subject area II			
31-M-ASM1	Advanced Statistical Methods I	1	8	
	or			
31-M-INT1	International Courses in Data Science 1	1	8	Stay at a foreign university
31-M-ASM2	Advanced Statistical Methods II	2	8	
	or			
31-M-INT2	International Courses in Data Science 2	2	8	Stay at a foreign university
	Compulsory optional subject area III			
Modules at a scope of 20 CP from the module pool "Compulsory optional subject computer science" must be studied.		2 or 3	20	
Total			**120**	

Further module information can be found in the module structure table (7.) and in the module descriptions.

Module pool "Compulsory optional subject Advanced Machine Learning"

Abbreviation	Module title	CP	Necessary prerequisites	Last offer
39-Inf-AKS	Applications of cognitive systems	5		
39-M-Inf-ABDA_a	Advanced Big Data Analytics / Big Data Machine Learning	5		
39-M-Inf-ADA	Advanced Data Analysis	5		
39-M-Inf-VDM	Specialisation data mining	5		
39-M-Inf-VML	Specialisation machine learning	5		
39-M-Inf-VKIa	Specialisation artificial intelligence (5 CP)	5		
39-Inf-SNLP	Statistical Natural Language Processing	10		

Module pool "Compulsory optional subject computer science"
Modules not yet studied must be selected.

Abbreviation	Module title	CP	Necessary prerequisites	Last offer
39-Inf-AIAI	Ambient Intelligence and Auditory Interfaces	5		
39-Inf-AKS	Applications of cognitive systems	5		
39-Inf-BDS	Biomedical Data Science for Modern Healthcare Technology	10		
39-Inf-CG	Basics of computer graphics	10		WiSe 2019/20
39-Inf-DI	Data Integration	5		
39-Inf-BDA [1]	Big Data Analytics	5		
39-Inf-SNLP	Statistical Natural Language Processing	10		
39-M-Inf-ADA	Advanced Data Analysis	5		
39-M-Inf-ADS	Auditory Data Science	5		
39-M-Inf-ASE	Autonomous Systems Engineering	10		
39-M-Inf-CA	Computer Animation	5		SuSe 2020
39-M-Inf-DL	Deep Learning	5		
39-M-Inf-GMP	Geometric modelling with polygon meshes	5		WiSe 2019/20
39-M-Inf-MBP	Multimodal Behavior Processing	5		
39-M-Inf-RDM	Research Data Management	5		
39-M-Inf-SSV	Speech signal processing	10		
39-M-Inf-SW	Semantic Web	5		
39-M-Inf-VHC_a	Virtual Humans and Conversational Agents	10		
39-M-INT1	International Courses in Data Science 1	5	Stay at a foreign university	
39-M-INT2	International Courses in Data Science 2	5	Stay at a foreign university	
39-M-INT3	International Courses in Data Science 3	5	Stay at a foreign university	
39-M-INT4	International Courses in Data Science 4	5	Stay at a foreign university	
39-M-INT5	International Courses in Data Science 5	10	Stay at a foreign university	
39-M-INT6	International Courses in Data Science 6	10	Stay at a foreign university	

The modules from the module pool "Compulsory optional subject computer science" can only be included if they have not already been included in the previous degree. Modules from other universities that match the subject matter and content can also be credited, provided that such modules do not correspond to any module from the module pool in terms of content.

[1] Module 39-Inf-BDA is compulsory for students of version 1 (Economics/Statistics), but a compulsory optional subject for students of version 2 (Computer Science).

7. Module structure table

Abbreviation	Title	CP	Necessary prerequisites	Number of study requirements	Number of graded (partial) module	Weighting of partial module examination	Number of ungraded (partial) module	Last offer
24-M-FStat	Foundations of Statistics	7			1			
31-M-ASM1	Advanced Statistical Methods I	8			1			
31-M-ASM2	Advanced Statistical Methods II	8			2	1:1		

31-M-Ectr1	Econometrics 1	7			1			
31-M-INT1	International Courses in Data Science 1	8	Stay at a foreign university [1]		1			
31-M-INT2	International Courses in Data Science 2	8	Stay at a foreign university [1]		1			
31-M-ISDA	Introduction to Statistical Data Analysis	8			1			
31-M-Thesis	Master's Thesis	30			1			
31-SW-StaFo	Statistics research	5		1	1			
31-SW-StiP	Statistics in practice	7		1	1			
39-Inf-AIAI	Ambient Intelligence and Auditory Interfaces	5			1			
39-Inf-AKS	Applications of cognitive systems	5			1			
39-Inf-AOpt	Applied Optimisation	5			1			
39-Inf-BDA	Big Data Analytics	5			1			
39-Inf-BDS	Biomedical Data Science for Modern Healthcare Technology	10		1	1			
39-Inf-CG	Basics of computer graphics	10			1			WiSe 2019/20
39-Inf-DI	Data Integration	5			1			
39-Inf-ELSI	Ethical, Legal and Social Impacts	5			1			
39-Inf-ML	Machine Learning Basics	5			1			
39-Inf-Pro	Programming	5			1			
39-Inf-SNLP	Statistical Natural Language Processing	10			1			
39-M-Inf-ABDA_a	Advanced Big Data Analytics / Big Data Machine Learning	5			1			
39-M-Inf-ADA	Advanced Data Analysis	5			1			
39-M-Inf-ADS	Auditory Data Science	5			1			
39-M-Inf-CA	Computer Animation	5			1			SuSe 2020
39-M-Inf-DL	Deep Learning	5			1			
39-M-Inf-GMP	Geometric modelling with polygon meshes	5			1			WiSe 2019/20
39-M-Inf-MBP	Multimodal Behavior Processing	5			1			
39-M-Inf-RDM	Research Data Management	5			1			
39-M-Inf-SSV	Speech signal processing	10		1	1			
39-M-Inf-SW	Semantic Web	5			1			
39-M-Inf-VDM	Specialisation data mining	5			1			
39-M-Inf-VHC_a	Virtual Humans and Conversational Agents	10		2	2	1:1		
39-M-Inf-VML	Specialisation machine learning	5			1			
39-M-Inf-VKIa	Specialisation artificial intelligence (5 CP)	5			1			
39-M-INT1	International Courses in Data Science 1	5	Stay at a foreign university [1]		1			
39-M-INT2	International Courses in Data Science 2	5	Stay at a foreign university [1]		1			
39-M-INT3	International Courses in Data Science 3	5	Stay at a foreign university [1]		1			
39-M-INT4	International Courses in Data Science 4	5	Stay at a foreign university [1]		1			
39-M-INT5	International Courses in Data Science 5	10	Stay at a foreign university [1]		1			

39-M-INT6	International Courses in Data Science 6	10	Stay at a foreign university [1]		1			

[1] A stay abroad at a foreign university shall be a prerequisite for participation in this module. Prior agreement between the student and the universities involved in the exchange by means of a "Learning Agreement for Studies" shall be mandatory for the academic achievements acquired in the context of a study abroad programme.

8. Further information on module examinations, partial module examinations, and study requirements as well as the Master's thesis (§§ 10, 11, 13 MPO fw.)

(1) Module examinations or partial module examinations shall be taken in one of the following forms:
- Written exam at a scope of 30 – 60 minutes, 60 – 90 minutes, or 90 – 120 minutes,
- Oral exam at a scope of 15 – 25 minutes,
- Seminar paper at a scope of 5 – 10 pages,
- Oral presentation at a scope of 30 – 45 minutes with a written paper at a scope of 10 – 12 pages,
- Oral presentation at a scope of 10 – 15, 20 – 30, or 30 – 45 minutes with a written paper at a scope of 5 – 15 pages,
- Oral presentation at a scope of 20 – 30 minutes with a written paper at a scope of 15 – 20 pages,
- Portfolio comprising two to three exercises or programming tasks (workload 10 – 15 working hours each), set during the course, or one to two exercises or programming tasks (workload 10 – 15 working hours each), set during the course, and a (group) project (workload 20 – 30 working hours),
- Portfolio from Midterm and Final (each 90-minute written exam or 20-minute oral exam),
- Portfolio of academic achievements completed at a foreign university based on a learning agreement,
- "Portfolio with final exam": Portfolio of exercises or programming tasks related to the course (pass mark 50% of the achievable points) and final exam (with a time frame of 60 – 120 minutes) or oral final exam (with a time frame of 15 – 30 minutes).
  Review of the exercise tasks shall also include direct questions on the solution approaches, which the students have to answer in the exercises. The organiser may require individual explanation and demonstration of tasks or replace part of the exercises with classroom exercises.
  The portfolio exercises shall usually be handed out on a weekly basis.
  Further details, in particular regarding the time frame of the final exam, shall be given in the module description.
- Presentation usually at a scope of 20 – 45 minutes,
- Project with elaboration: Final report or a written paper (usually between 5 and 15 pages) on the project performed as well as a presentation (usually between 20 and 45 minutes) on the results of the project performed.

Other forms, in particular those for the demonstration of interdisciplinary competences including media competence, are possible. The workload and qualification requirements must be comparable. Further details can be found in the module descriptions.

(2) Study requirements in the Data Science degree programme are to ensure the acquisition of competences and knowledge in the respective modules as well as to practise and apply the acquired theoretical and methodological knowledge to concrete problems and to document the results achieved in summary form. Furthermore, they may serve communicative (written and/or oral) practice and learning of the competence to be acquired with a focus on the interaction situation of a seminar. The following may be considered as study requirements:
- Presentation (30 – 45 minutes) with elaboration (5 – 10 pages or 15 – 20 pages),
- Short elaboration,
- Internship report (usually between 3 and 5 pages) or written paper (usually between 10 and 15 pages) on the contents of the theory-in-practice course.

Other forms are possible. When choosing other forms, the aim of the study requirements and the specified scope must be considered. Further details can be found in the module descriptions.

(3) The Master's thesis shall be a written paper. The processing time shall be six months. The date of issue shall be recorded. The length of the thesis shall usually be between 40 and 80 pages. The subject and assignment must be such that it can be completed within the intended workload of 30 credit points (900 hours). The thesis being submitted in triplicate to the examination office of the Faculty of Business Administration and Economics in time shall be a prerequisite for a positive evaluation. The Master's thesis cannot be completed as a group work.

9. Entering into effect and scope of application

These subject-specific regulations shall enter into effect on 1 October 2018. They shall apply to all students enrolling in the Master course Data Science from the winter semester 2018/2019 onwards.