Study and Examination Regulations for the Joint Master's Degree Program in Data Science of the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin

Preamble

Based on Sec. 14 (1), first sentence, No. 2 of the Partial Basic Rules and Regulations (Teilgrundordnung) (test model) of Freie Universität Berlin dated October 27, 1998 (Freie Universität Official Announcements No. 24/1998), the Joint Commission for the joint master's degree program in Data Science of the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin (Data Science Joint Commission) issued the following study and examination regulations for the joint master's degree program in Data Science of the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin on April 18, 2019.*

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* These regulations were confirmed by the Executive Board of Freie Universität Berlin on May 16, 2019.

Sec. 1
Scope

(1) These regulations stipulate the objectives, content and structure of the joint master's degree program in Data Science of the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin (master's degree program), and, by way of supplement to the framework study and examination regulations of Freie Universität Berlin of Freie Universität Berlin (RSPO), the requirements and procedures for completion of studies and examinations (academic coursework) in the master's degree program. The party responsible for organizing the teaching activities and the study program is the Data Science Joint Commission.

(2) This is a consecutive master's degree program in accordance with Sec. 23 (3) No. 1 a) of the Act on Higher Education in the State of Berlin (Berlin Higher Education Act – BerlHG) of July 26, 2011 (Law and Regulatory Gazette p. 378), last amended on February 2, 2018 (Law and Regulatory Gazette p. 160).

Sec. 2
Qualification objectives

(1) Graduates of this master's degree program are familiar with the essential methods used in modern data science as well as the relevant mathematical and subject-specific principles and principles of computer science. They are capable of independent analysis of problems in data science, comparison of different approach methodologies and assessment of the advantages and drawbacks of these methodologies. Graduates can formalize newly emerging problems in data analysis in mathematical terms, develop methods for solving them, apply these methods in a manner geared toward application and interpret them appropriately. Beyond that, they are familiar with problems and solutions relating to the handling of data from an ethical, legal and security-related perspective, and they are familiar with the limits and risks of data science methods.

(2) Alongside their subject-specific qualifications, graduates possess teamwork, communication and transference skills and are familiar with aspects relating to gender and diversity. They master techniques of scientific research, reading and composing scientific and scholarly texts in English, and delivering talks and presentations.

(3) Graduates are prepared to hold positions of leadership in subject-specific terms in a wide range of different fields of activity relating to collection, management, preparation, analysis and interpretation of digital data.

These include, for example, the areas of Internet economy, health or Industry 4.0 or corresponding facilities and institutions in the industrial, research and administrative sectors. A further academic qualification can also be acquired within the framework of a doctorate.

Sec. 3
Study content

(1) This master's degree program imparts skills that are necessary in order to handle the advancing digitization of many areas of society and the physical and life sciences. This concerns, for example, the collection, processing, analysis and interpretation of large digital data sets. To this end, the master's degree program conveys the key aspects of modern data science, which is characterized by a blending of the central fields of mathematics, statistics, computer science and machine learning, taking application-related issues into account. With in-depth education in the corresponding branches of mathematics, statistics and computer science as well as in the relevant application fields of the physical and life sciences, social sciences and humanities that engage in quantitative work, this program imparts the skills needed to recognize the relevant problems in data analysis, develop and apply appropriate mathematical or computer science solutions and correctly interpret the results within the specific application context.

(2) The students are familiarized with the content and methods of fields of study related to ongoing research. In addition to subject-specific skills in selected data-intensive fields of application, they acquire interdisciplinary competence and key qualifications with a view to future research work or managerial functions.

Sec. 4
Academic and departmental advising

(1) General student advising is provided by the Center for Academic Advising and Psychological Counseling at Freie Universität Berlin.

(2) Departmental advice relating to the program and the subject is provided by the instructors who offer courses in the master's degree program during regular office hours. In addition, at least one student assistant is also available in an advisory capacity. It is also recommended that the suitability of the student's individual program plans should be discussed with the relevant examinations office.

(3) An advisory meeting with the chair or deputy chair of the examining board within the first two weeks of the first semester within the subject is urgently recommended. During the meeting, students can obtain advice on their individual program plans and the profile area. A sufficient number of dates and times will be offered for this, announced in an appropriate form with adequate lead time.

Sec. 5
Examining board

The examining board established by the Data Science Joint Commission for the master's degree program is responsible for organizing the examinations and for the other tasks mentioned in the RSPO.

Sec. 6
Standard study period

The standard study period is four semesters.

Sec. 7
Structure and outline; scope of performance

(1) The master's degree program comprises 120 credits split between modules totaling 90 credits and the master's thesis with accompanying colloquium, which comprises 30 credits. The master's degree program is divided into a fundamental area comprising 30 credits and a profile area comprising 60 credits.

(2) The following modules must be completed as part of the fundamental area comprising 30 credits:

– Module: Introduction to Profile Areas (5 credits),

– Module: Statistics for Data Science (10 credits),

– Module: Machine Learning for Data Science (10 credits) and

– Module: Programming for Data Science (5 credits).

(3) Three profiles are offered in the profile area: "Data Science in the Social Sciences," "Data Science in the Life Sciences" and "Data Science Technologies." Students are required to choose and complete one of these profiles. Students choose the profile area by taking the relevant required modules. The modules chosen as part of the elective area for the profile area must not be the same as modules that the student has already taken as part of the bachelor's degree program. In case of doubt, the examining board decides whether this is the case; clarification should take place before the module in question is chosen. The three profiles within the scope of the profile area are offered as follows:

1. Profile area with the profile "Data Science in Social Sciences" comprising 60 credits:

   a) Mandatory area comprising 30 credits: The following modules must be completed:

– Module: Data Science in the Social Sciences (15 credits),

– Module: Ethical Foundations of Data Science (5 credits) and

– Module: Research Practice (10 credits).

b) Elective area comprising 30 credits:

aa) Modules comprising 15 credits in total must be chosen and completed from among the following modules in the "Data Science in Social Sciences" profile:

– Module: Neurocognitive Methods and Programming for Data Science (10 credits)

– Module: Cognitive Neuroscience for Data Science A (10 credits)

– Module: Cognitive Neuroscience for Data Science B (10 credits)

– Module: Differential Psychology Approaches in the Data Sciences (10 credits)

– Module: Natural Language Processing (10 credits)

– Module: Introduction to Psychoinformatics (5 credits)

– Module: Mobile Mental Health (5 credits)

– Module: Development of Online Psychological Interventions (10 credits)

– Module: Selected Topics in Data Science in the Social Sciences (5 credits)

– Module: Special Aspects of Data Science in the Social Sciences (5 credits)

bb) Modules comprising 15 credits in total must be chosen and completed from among the following modules in the other profiles:

– Module: Data Science in the Life Sciences (15 credits)

– Module: Special Aspects of Data Science in the Life Sciences (5 credits)

– Module: Selected Topics in Data Science in the Life Sciences (10 credits)

– Module: Special Aspects of Data Science Technologies (5 credits)

– Module: Current Research Topics in Data Science Technologies (5 credits)

– Module: Selected Topics in Data Science Technologies (10 credits)

– Module: Machine Learning in Bioinformatics (5 credits)

– Module: Analysis of Large Data Sets in Bioinformatics (5 credits)

– Module: Network Analysis (10 credits)

– Module: Data Science Database Systems (5 credits)

– Module: Distributed Systems (5 credits)

– Module: Mobile Communication (5 credits)

– Module: Telematics (10 credits)

– Module: Higher Algorithmics (10 credits)

– Module: Computer Security (10 credits)

– Module: Pattern Recognition (5 credits)

– Module: Network-Based Information Systems (5 credits)

– Module: Artificial Intelligence (5 credits)

– Module: Special Aspects of Data Management (5 credits)

2. Profile area with the profile "Data Science in Life Sciences" comprising 60 credits:

a) Mandatory area comprising 30 credits: The following modules must be completed:

– Module: Data Science in the Life Sciences (15 credits),

– Module: Research Practice (10 credits) and

– Module: Ethical Foundations of Data Science (5 credits).

b) Elective area comprising 30 credits:

aa) Modules comprising 15 credits in total must be chosen and completed from among the following modules in the "Data Science in Life Sciences" profile:

– Module: Special Aspects of Data Science in the Life Sciences (5 credits)

– Module: Selected Topics in Data Science in the Life Sciences (10 credits)

– Module: Machine Learning in Bioinformatics (5 credits)

– Module: Analysis of Large Data Sets in Bioinformatics (5 credits)

– Module: Network Analysis (10 credits)

bb) Modules comprising 15 credits in total must be chosen and completed from among the following modules in the other profiles:

– Module: Data Science in the Social Sciences (15 credits)

– Module: Selected Topics in Data Science in the Social Sciences (5 credits)

– Module: Special Aspects of Data Science in the Social Sciences (5 credits)

– Module: Special Aspects of Data Science Technologies (5 credits)

– Module: Current Research Topics in Data Science Technologies (5 credits)

– Module: Selected Topics in Data Science Technologies (10 credits)

– Module: Neurocognitive Methods and Programming for Data Science (10 credits)

– Module: Cognitive Neuroscience for Data Science A (10 credits)

– Module: Cognitive Neuroscience for Data Science B (10 credits)

– Module: Natural Language Processing (10 credits)

– Module: Differential Psychology Approaches in the Data Sciences (10 credits)

– Module: Introduction to Psychoinformatics (5 credits)

– Module: Mobile Mental Health (5 credits)

– Module: Development of Online Psychological Interventions (10 credits)

– Module: Data Science Database Systems (5 credits)

– Module: Distributed Systems (5 credits)

– Module: Mobile Communication (5 credits)

– Module: Telematics (10 credits)

– Module: Higher Algorithmics (10 credits)

– Module: Computer Security (10 credits)

– Module: Pattern Recognition (5 credits)

– Module: Network-Based Information Systems (5 credits)

– Module: Artificial Intelligence (5 credits)

– Module: Special Aspects of Data Management (5 credits)

3. Profile area with the profile "Data Science Technologies" comprising 60 credits:

a) Mandatory area comprising 15 credits: The following modules must be completed:

– Module: Data Science Software Project (10 credits) and

– Module: Ethical Foundations of Data Science (5 credits).

b) Elective area comprising 45 credits:

aa) Modules comprising 30 credits in total must be chosen and completed from among the following modules in the "Data Science Technologies" profile:

– Module: Special Aspects of Data Science Technologies (5 credits)

– Module: Current Research Topics in Data Science Technologies (5 credits)

– Module: Selected Topics in Data Science Technologies (10 credits)

– Module: Data Science Database Systems (5 credits)

– Module: Distributed Systems (5 credits)

– Module: Mobile Communication (5 credits)

– Module: Telematics (10 credits)

– Module: Higher Algorithmics (10 credits)

– Module: Computer Security (10 credits)

– Module: Pattern Recognition (5 credits)

– Module: Network-Based Information Systems (5 credits)

– Module: Artificial Intelligence (5 credits)

– Module: Special Aspects of Data Management (5 credits)

bb) Modules comprising 15 credits in total must be chosen and completed from among the following modules in the other profiles:

– Module: Data Science in the Social Sciences (15 credits)

– Module: Special Aspects of Data Science in the Social Sciences (5 credits)

– Module: Selected Topics in Data Science in the Social Sciences (5 credits)

– Module: Data Science in the Life Sciences (15 credits)

– Module: Special Aspects of Data Science in the Life Sciences (5 credits)

– Module: Selected Topics in Data Science in the Life Sciences (10 credits)

– Module: Neurocognitive Methods and Programming for Data Science (10 credits)

– Module: Cognitive Neuroscience for Data Science A (10 credits)

– Module: Cognitive Neuroscience for Data Science B (10 credits)

– Module: Differential Psychology Approaches in the Data Sciences (10 credits)

– Module: Natural Language Processing (10 credits)

– Module: Introduction to Psychoinformatics (5 credits)

– Module: Mobile Mental Health (5 credits)

– Module: Development of Online Psychological Interventions (10 credits)

– Module: Machine Learning in Bioinformatics (5 credits)

– Module: Analysis of Large Data Sets in Bioinformatics (5 credits)

– Module: Network Analysis (10 credits)

(4) The module descriptions in Annex 1 provide information for the modules of the master's degree program regarding admission requirements, content and qualification objectives, forms of teaching and learning, time requirements, forms of active participation, examination work required alongside studies, obligations regarding regular participation in the forms of teaching and learning, the credits assigned to the relevant modules, the standard duration and the frequency with which the modules are offered.

For the following three modules, please see the study and examination regulations for the master's degree in Bioinformatics of the Departments of Biology, Chemistry and Pharmacy, Mathematics and Computer Science of Freie Universität Berlin and Charité – Universitätsmedizin Berlin:

- Module: Machine Learning in Bioinformatics (5 credits),
- Module: Analysis of Large Data Sets in Bioinformatics (5 credits),
- Module: Network Analysis (10 credits).

For the following nine modules, please see the study and examination regulations for the master's degree program in Computer Science of the Department of Mathematics and Computer Science of Freie Universität Berlin:

- Module: Distributed Systems (5 credits),
- Module: Mobile Communication (5 credits),
- Module: Telematics (10 credits),
- Module: Higher Algorithmics (10 credits),
- Module: Computer Security (10 credits),
- Module: Pattern Recognition (5 credits),
- Module: Network-Based Information Systems (5 credits),
- Module: Artificial Intelligence (5 credits),
- Module: Special Aspects of Data Management (5 credits).

(5) The sample study plan in Annex 2 provides information on the recommended sequence of studies in the master's degree program.

Sec. 8
Forms of teaching and learning

(1) The following forms of teaching and learning are offered as part of the courses in the master's degree program:

1. In lectures (V), the content of each course is presented and explained by the instructor. The instructors impart teaching content accompanied by references to specialized literature and encourage students to work independently and think critically.

2. Exercises (Ü) typically take place in small groups to accompany a lecture. In the groups, the lecture content is repeated in outline, and students apply the material learned in practice based on assigned exercises.

3. Seminars (S) serve the purpose of exemplary familiarization with content, theories and methods of areas of specialization within bioinformatics based on clearly defined thematic areas. In the seminars, students formulate, present and discuss teaching content under the guidance of an instructor and based on specialized literature and empirical findings.

4. In practical seminars (PraxS), students work under supervision, alone or in small groups, on substantial practical or scientific problems. The focus of project work is on the process of finding a solution, meaning practical application of suitable techniques and processes using scientific findings and methods. Interdisciplinary qualifications such as teamwork, communication and transference skills are also acquired, and responsible and gender-sensitive conduct is practiced.

5. In project seminars (ProjS), students carry out a large task and solve it using techniques and methods that have typically been learned in an accompanying or previous course. This includes formal specification of problems, breaking them down into subproblems, establishing interfaces and using project management methods. Students report regularly on their progress in self-organized groups. Well-documented executable programs and a summary project report showing the individual work performed should be submitted at the conclusion of the project. A project seminar is also useful for enhancing knowledge of cooperative work techniques and gender and diversity competence, alongside acquisition of skills for independent application of learned skills and problem-solving methods within computer science to a specific task.

6. Seminar-style instruction (sU) is used to convey application-oriented knowledge of a specific delineated subject area; participants work on a task independently, with the results being demonstrated by the students, followed by critical discussion as a group.

7. External internships (P) are used to acquire skills and to successfully use problem-solving methods within the field of data science based on several practical tasks. This includes specification of problems and breaking them down into subproblems. Students are generally tasked with demonstrating suggestions for solutions and results and with working these out in writing and presenting them. The purpose of these internships is to have a secure grasp of the knowledge acquired.

8. Lecture series (RV): Lecture series convey a broad spectrum of disciplinary cultures or ways of approaching a topic or discipline, making them a special form of lecture. In the orientation lecture series, various instructors from a wide range of profile areas and disciplines introduce themselves and their subjects. This includes discussion elements.

9. Advanced seminars (VS) offer an opportunity for thorough consideration of sample topic areas and practice with independent scientific work. The main forms of coursework are seminar discussions based on instructional materials, readings of specialized literature and source materials that students are asked to prepare, written and/or oral assignments, and group work.

(2) The forms of teaching and learning pursuant to paragraph 1 can be used in blended learning arrangements. In these arrangements, on-campus studies are combined with electronic Internet-based media (e-learning). In this

case, selected teaching and learning activities are offered via the central e-learning applications of Freie Universität Berlin and carried out by students individually or in groups, either on their own or with supervision. Blended learning can be used in the execution phase (exchange and discussion of learning objects, solving tasks, intensification of communication between student and instructor), or in the follow-up phase (monitoring learning outcomes, transfer support).

Sec. 9
Master's thesis

(1) The goal of the master's thesis is to demonstrate that the student is able to work independently on an advanced task from the field of data science using scientific methods and to present and evaluate the results obtained in writing and orally in an appropriate manner.

(2) Students will be admitted to work on a master's thesis upon application if they can prove at the time of application that they

1. were most recently enrolled at Freie Universität Berlin within the master's degree program and

2. have successfully completed modules totaling at least 60 credits within the scope of the master's degree program.

(3) The application for admission to the master's thesis must be accompanied by evidence of the prerequisites in accordance with paragraph 2, as well as confirmation from an instructor who is entitled to administer exams that he or she is willing and able to act as supervisor for the master's thesis. The examining board decides on the application. If no confirmation of intent to supervise the master's thesis as per the first sentence above is submitted, the examining board will appoint a supervisor accordingly. Students are given the opportunity to propose their own topics, but are not entitled to have these proposals accepted.

(4) The master's thesis should be approximately 70 pages in length.

(5) The examining board assigns the topic of the master's thesis in consultation with the supervisor. The topic and task must be designed in such a way as to ensure the work can be completed before the deadline. The assignment and submission of the master's thesis must be recorded and the information kept on file. When the thesis is submitted, the student must affirm in writing that he or she has written the paper independently, using only the sources and aids listed.

(6) The assigned period for the thesis work is 23 weeks. The assigned period begins on the date on which the topic is assigned by the examining board. The topic can be returned once within the first four weeks and is then considered not to have been assigned. The examining board decides on the application in consultation with the supervisor of the master's thesis.

(7) The master's thesis must be written in English. In response to a well-founded application, the examining board may also permit the master's thesis to be written in German. If a student has been unable to work on the thesis for a period of more than eight weeks for a valid reason, the examining board will decide whether the master's thesis must be begun afresh. The examination with regard to the master's thesis is deemed not to have been taken if the examining board requires the thesis to be resubmitted.

(8) The master's thesis is accompanied by a colloquium, which generally takes place within the assigned working group. Students are expected to give a one-time presentation lasting approximately 30 minutes on the progress of their master's thesis.

(9) If approved by the examining board, the work on the master's thesis can also be done externally at a suitable business or scientific or research institution, as long as scientific and scholarly supervision by an examiner for the master's thesis is ensured.

(10) The master's thesis must be evaluated by two instructors entitled to administer examinations as assigned by the examining board. One of these two instructors should be the supervisor of the master's thesis. At least one of the two examiners must be involved in teaching in the master's degree program and simultaneously be an instructor at the Department of Mathematics and Computer Science of Freie Universität Berlin or the Department of Education and Psychology of Freie Universität Berlin.

(11) The grade for the master's thesis is calculated as the arithmetic mean of the individual grades awarded by the two examiners. If one of the examiners issues a grade of "insufficient" (5.0) or if both individual grades from the examiners differ by 2.0 or more, then the examining board commissions a third examiner to evaluate the master's thesis.

In this case, the grade for the master's thesis is calculated as the arithmetic mean of the individual grades awarded by all three examiners. The student is deemed to have received a passing grade on the master's thesis if the grade awarded for the thesis is at least "sufficient" (4.0).

(12) Students are permitted to have coursework counted toward the master's thesis; an application must be submitted to the examining board for this purpose. It is a prerequisite for coursework to be counted toward the thesis in this way that the examination conditions and the assignment for the coursework being submitted must not differ substantially in terms of quality, level, learning outcomes, scope, and/or profile from the examination conditions and the assignment involved in a master's thesis that is to be prepared within the master's degree program and shapes the qualification profile for the master's degree program in a particular manner.

Sec. 10
Multiple choice test

(1) Multiple choice test questions must be administered by two examiners.

(2) If, during assessment of the student's performance on multiple choice tests, it becomes apparent that there is a noticeable concentration of errors in answering individual questions, one of the examiners is required to forward the full exam documentation to the examining board without delay and before the examination results are announced. The examining board then reviews the examination tasks to ensure that they are geared toward the qualification objectives of the relevant module and allows for reliable examination results. If the review establishes that individual examination tasks are flawed, these tasks are left outside consideration when determining the results. The number of examination tasks to be taken into account when determining the examination result is reduced accordingly. Reducing the number of examination tasks must not be to a student's detriment. If the examination tasks to be eliminated account for more than 15% of the total evaluation points achievable, the entire examination must be repeated.

(3) An examination in the form of a multiple choice test is deemed to have been passed if the student has achieved at least 50% of the achievable total of points (absolute pass limit) or if the number of points achieved by the student is not more than 10% lower than what participants in the examination have achieved on average (relative pass limit). If the relative pass limit applies, the student is still required to have achieved at least 40% of the achievable evaluation points in order to be considered to have passed the exam.

(4) Examinations taken in multiple choice form are graded as follows:

If the student has achieved the minimum point score required to pass the examination pursuant to paragraph 3 above, then the grade is

– very good, if he or she achieves at least 75%,

– good, if he or she achieves at least 50 but less than 75%,

– satisfactory, if he or she achieves at least 25 but less than 50%, and

– sufficient, if he or she achieves zero or less than 25%

of the points achievable beyond the minimum point scores required pursuant to paragraph 3 above; in all other respects, the RSPO applies to the grades used.

(5) The evaluation specifications pursuant to paragraphs 3 and 4 above do not apply if

1. the instructors entitled to administer exams who assigned the examination tasks pursuant to paragraph 1 above are identical to those who evaluate the student's performance on the multiple choice test

or

2. the achievable points on the examination tasks in multiple choice form do not exceed 25% of a written exam that is administered only partly in multiple choice form.

Sec. 11
Electronic examinations

(1) Electronic examinations are administered and evaluated using digital technologies.

(2) Before an examination where digital technologies are used, the suitability of these technologies with regard to the intended examination tasks and the administration of the electronic examination must be verified by two examiners.

(3) The authenticity of the author and the integrity of examination results must be safeguarded. To this end, unique identifiers are assigned to the examination results in the form of electronic data, and these are associated uniquely and permanently with the student. It must be ensured that electronic data remain unchanged and complete for purposes of assessment and later verification.

(4) An automatically generated assessment of examination performance must be checked by an examiner if requested by the student in question.

Sec. 12
Repetition of examinations

(1) If the student does not pass, the master's thesis can be repeated one time and other examinations that accompany the student's study program can be repeated three times.

(2) If the first potential examination date is immediately after the end of the associated course, an examination on which the student earns the grade of "sufficient" (4.0) or better within the scope of a module may be repeated one time for the purpose of improving a grade. This must take place at the latest at the start of the following semester. The better grade will be taken into account in this case. An improvement in the grade is not possible in case of a repeated exam.

Sec. 13
Study abroad

(1) It is recommended that students participate in study abroad. Within the scope of study abroad, students are urged to complete coursework that can be applied toward the master's degree program.

(2) Study abroad must be preceded by conclusion of an agreement between the student, the chair of the examining board and the appropriate body at the relevant foreign academic institution regarding the duration of study abroad, the academic work expected during study abroad, which must be equivalent to the academic work undertaken in the master's degree program, and the credits awarded for this academic work. Academic work completed as per the agreement is then credited accordingly.

(3) The second or third subject-specific semester within the master's degree program is recommended as a suitable time for study abroad.

Sec. 14
Completion of studies

(1) To complete the program, students must have completed the academic work required pursuant to Sec. 7 and 9 hereof.

(2) The degree will not be awarded if the student has failed to complete academic work on a final basis or failed exams without the option to retake or is currently involved in a pending examination procedure at any higher education institution in the same study program or in a module that is identical or comparable to one of the modules that must be completed within the master's degree program and must be taken into account in determining the overall grade.

(3) The application for determining the awarding of the degree must be accompanied by evidence that the prerequisites as detailed in paragraph 1 above are met and by an affirmation that none of the cases enumerated in paragraph 2 above applies to the applicant. The relevant examining board decides on the application.

(4) On the basis of the passed examination, the university degree of Master of Science (M.Sc.) is awarded. The student will receive a grade report and degree certificate (Annexes 3 and 4), as well as a diploma supplement (English and German versions). Furthermore, a supplement to the grade report detailing individual modules and their components (transcript) will also be issued. English versions of the grade report and degree certificate are also issued upon request.

Sec. 15
Entry into force

These Regulations enter into force on the day after publication hereof in the Official Announcements (Official Register of Freie Universität Berlin).

Annex 1: Module descriptions

Explanations:

Except where reference is made to other regulations, the module descriptions that follow designate the following for each module of the master's degree program:

- the module name,
- the person(s) responsible for the module,
- the requirements for admission to the specific module,
- the content and qualification objectives of the module,
- the teaching and learning forms involved in the module,
- the estimated student workload requirement to successfully complete the module,
- forms of active participation,
- the examination forms,
- the obligation to participate regularly,
- the credits assigned to the modules,
- the standard duration of the module,
- the frequency with which the module is offered, and
- the applicability of the module.

The information on the amount of time involved in the student workload takes the following into account in particular:

- active participation in on-campus studies,
- the time required for completion of minor tasks related to on-campus study,
- the time required for independent preparation and follow-up,
- the time directly required to prepare for examinations, and
- the examination time itself.

The information on time requirements for self-study (including preparation and follow-up, examination preparation, etc.) is provided for guidance purposes to help students organize the time required for their module-related work. The information on the workload involved corresponds to the number of credits assigned to each module as the unit of measure for student workload as an approximation of the work required to successfully complete the module. One credit is equivalent to 30 hours.

Where an obligation of regular participation is stipulated for the individual teaching and learning forms in question, this obligation, alongside active participation in the teaching and learning forms and successful completion of the examinations for a module, is a prerequisite for earning the credits assigned to the respective module. Participation is deemed to be regular if the student has attended at least 85% of the on-campus study time scheduled in the teaching and learning forms for a module. Even if there is no obligation of regular participation in a particular teaching and learning form for a module, it is strongly recommended nonetheless. The relevant instructor cannot establish attendance obligations for teaching and learning forms for which the text that follows merely recommends participation. In modules in which alternative forms of active participation are stipulated, the forms of active participation, which must be determined in accordance with the student workload, for the relevant semester must be determined by the instructor responsible no later than at the first course meeting.

The relevant module exam – where stipulated – must be taken for each module. Graded modules are completed with only one examination (module exam). The module exam must reflect the qualification objectives of the module. It tests whether the objectives of the module have been reached based on an exemplary sampling. The scope of the examination is limited to what is required to achieve this. In modules for which alternative examination forms are stipulated, the examination form for each semester must be determined by the instructor responsible no later than at the first course meeting.

Active and – where stipulated – regular participation in the teaching and learning forms as well as successful completion of the examination requirements for a module are the prerequisites for earning the credits assigned to that module. In modules with no module examination, active participation and regular participation in the teaching and learning forms are the prerequisites for earning the credits assigned to that module.

1. Fundamental area

Module: Introduction to Profile Areas	
Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology and Mathematics and Computer Science/Psychology, Mathematics and Computer Science	
Persons responsible for module: Instructors for the module	
Admission requirements: None	

Qualification objectives:

The students are familiar with sample issues and potential approaches to arriving at solutions from the three profile areas in relation to specific topics and are able to apply these issues and approaches in a manner geared toward problem solving. They recognize where which skills and abilities are needed and are able to analyze a problem specific to a certain area. Students can develop and compare differences and commonalities involved in working across the three different profile areas. They can find suitable literature on specific topics and are able to work on practical problems from the relevant areas.

Content:

This module presents sample issues and potential approaches to arriving at solutions from the profile areas of "Data Science in the Social Sciences," "Data Science in the Life Sciences," and "Data Science Technologies" on an interdisciplinary basis in relation to specific topics. In the area of project work, teams of students work together on specific tasks on selected topics from the profile areas. They develop and implement specific proposals for solutions to problems geared toward real-world practice and present the results.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture series	2	Recapitulation of material presented during instruction, working on projects	On-campus time, RV	30
			Preparation and follow-up, RV	30
Project seminar	2		On-campus time, ProjS	30
			Preparation and follow-up, ProjS	60

Module exam:	None	
Module language:	English	
Mandatory regular participation:	Yes	
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester	
Frequency of offering:	Each winter semester	
Applicability:	Master's degree program in Data Science	

Module: Statistics for Data Science

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Computational Cognitive Neuroscience lab

Admission requirements: None

Qualification objectives:

Students have acquired a deeper understanding of advanced mathematical concepts and methods in the area of statistical data analysis. They are able to formulate customary data analysis methods based on probability theory in mathematical terms and to implement them in algorithm form.

Content:

Fundamentals of measurement and probability theory and statistical modeling, using generalized linear models, Fischer inference, and maximum likelihood estimation as examples (analytical and numerical methods, estimator properties, hypothesis tests), Bayesian inference (parameter estimation and model inference, prior distributions, approximative inference, Markov chain Monte Carlo methodology), probabilistic inference (expectation maximization, Kalman filter and data assimilation, empirical Bayes, variational inference).

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	30
			Preparation and follow-up, V	70
			On-campus time, Ü	30
Exercise	2	Work on assigned exercises	Preparation and follow-up, Ü	70
			Examination preparation and examination	100

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
	This module exam is not evaluated separately.

Module language:	English
Mandatory regular participation:	Lecture: Participation recommended, exercise: Yes
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester
Frequency of offering:	Each winter semester
Applicability:	Master's degree program in Data Science

Module: Machine Learning for Data Science

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science

Persons responsible for module: Instructors for the module

Admission requirements: None

Qualification objectives:

The students have an understanding of fundamental applications, concepts, and analytical techniques in the area of machine learning for data sciences. They are able to design suitable experiments for complex issues and to collect, tap into, store, process, and analyze data. They know what results can be derived from the relevant data and can execute and evaluate computer-aided procedures appropriately within the field of application and in the relevant scientific context.

Content:

Topics from the following areas are considered:

- Experiment design
- Sampling techniques
- Data cleansing
- Storage of large data sets
- Data visualization and graphs
- Probabilistic data analysis
- Prediction methods
- Knowledge discovery
- Neural networks
- Support vector machines
- Reinforcement learning and agent models.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	4	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	60
			Preparation and follow-up, V	60
			On-campus time, Ü	30
Exercise	2	Exercise assignments	Preparation and follow-up, Ü	90
			Examination preparation and examination	60

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
Module language:	English
Mandatory regular participation:	Lecture: Participation recommended, exercise: Yes
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester
Frequency of offering:	Each winter semester
Applicability:	Master's degree program in Data Science

Module: Programming for Data Science				
Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Mathematics				
Persons responsible for module: Instructors for the module				
Admission requirements: None				
Qualification objectives:				
The students have an in-depth understanding of concepts in programming with a higher programming language (such as C/C++, Java, or Python).				
Content:				
Introduction to various types of programming techniques.				

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Practical seminar	2	Working on assignments, short presentations with discussion, discussion of literature and examples of application	On-campus time	60
			Preparation and follow-up	90

Module exam:	None	
Module language:	English	
Mandatory regular participation:	Yes	
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester	
Frequency of offering:	Each winter semester	
Applicability:	Master's degree program in Data Science	

2. Profile area

Module: Data Science in the Social Sciences

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Methods and Evaluation Division

Admission requirements: None

Qualification objectives:

Students have acquired a deeper understanding of advanced concepts and data analysis methods in the area of empirical quantitative social sciences. Based on their knowledge, they are able to evaluate and plan empirical studies in the social sciences and use standard methods to analyze them. They can reflect critically on legal and ethical aspects of empirical social research.

Content:

Theory and analysis of psychological tests (e.g. quality criteria and test development, item analysis, reliability, validity, generalized linear item response theory), theory and analysis of survey data, theory and analysis of panel data (e.g. panel design, indicators, regression, path, and structural equation models), data law and data ethics in the case of studies in the social sciences.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar 1	2	Short oral presentations or presentation and interpretation of examples of data analysis	On-campus time, S1	30
			Preparation and follow-up, S1	75
Seminar 2	2		On-campus time, S2	30
			Preparation and follow-up, S2	75
Seminar 3	2		On-campus time, S3	30
			Preparation and follow-up, S3	75
			Examination preparation and examination	135

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
Module language:	English
Mandatory regular participation:	Yes
Total working time requirement:	450 hours	15 credits
Duration of module:	Two semesters
Frequency of offering:	Each summer semester
Applicability:	Master's degree program in Data Science

Module: Ethical Foundations of Data Science

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science

Persons responsible for module: Instructors

Admission requirements: None

Qualification objectives:

The students are familiar with the fundamental value and norm systems of ethical and legal bases and overall conditions. They are able to use their existing knowledge for expertise that is bound by ethical and legal principles in typical fields of action in data sciences and recognize ethical issues and dilemmas. They are able to analyze ethical and legal issues relating to professional practice on a targeted basis based on suitable methods and sources and to bring about a reasonable and well founded solution. The students reflect on their own core moral and ethical stance and how it affects their personal attitudes and actions.

Content:

Explanation and discussion of fundamental terms such as norms, values, morals, and ethics from an interdisciplinary and disciplinary standpoint, social impact of one's own actions, algorithmic bias ("discriminatory algorithms"), fundamentals of ethical discourses, ethics in the data sciences

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Practical seminar	4	Work on assigned tasks, presentation of results	On-campus time	60
			Preparation and follow-up	90

Module exam:	None
Module language:	English
Mandatory regular participation:	Yes
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester
Frequency of offering:	Each winter semester
Applicability:	Master's degree program in Data Science

Module: Research Practice			
Higher education institution/department//teaching unit: Freie Universität Berlin/Education and Psychology/Psychology and Mathematics and Computer Science/Mathematics and Mathematics and Computer Science/Computer Science			
Persons responsible for module: Instructors			
Admission requirements: None			
Qualification objectives:			
The students have gained practical research experience in the area of data science and can apply instructional content learned in their study program to research practice. They have experience in project coordination and implementation and have teamwork skills.			
Content:			
Current research topics from the field of data science in the physical and life sciences, social sciences, and humanities.			
Forms of teaching and learning	**On-campus studies** (weekly credit hours = SWS)	**Forms of active participation**	**Workload** (hours)
External internship	270 hours	Internship report and final presentation, supervisory meeting	On-campus time 270 Preparation and follow-up 30
Module exam:	None		
Module language:	English		
Mandatory regular participation:	Yes		
Total working time requirement:	300 hours		10 credits
Duration of module:	One semester		
Frequency of offering:	Each semester		
Applicability:	Master's degree program in Data Science		

Module: Neurocognitive Methods and Programming for Data Science

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Computational Cognitive Neuroscience lab

Admission requirements: None

Qualification objectives:

The students have gained essential theoretical background knowledge for the practical implementation and evaluation of experimental studies in the cognitive neurosciences. The students are able to reflect critically on the possibilities and limitations of neurocognitive methods (magneto-/electroencephalography and functional magnetic resonance imaging) and have also gained practical knowledge and experience in imperative programming, specifically provision of experimental paradigms.

Content:

Four general topical areas are covered.

1. Introduction to electroencephalography (EEG). Based on the book titled *An Introduction to the Event-Related Potential Technique* (2014) by Steven J. Luck and further readings, basal aspects of neurophysiology and EEG signal generation, recording, and analysis are taught.

2. Introduction to functional magnetic resonance imaging (fMRI). Based on the book titled *Functional Magnetic Resonance Imaging, Second Edition* (2009) by Scott Huettel et al., basal aspects of fMRI signal generation, recording, and analysis are discussed.

3. Introduction to imperative programming with Matlab. In this topical area, essential programming skills are introduced and practiced within the scope of sample tasks.

4. Introduction to programming of neurocognitive paradigms. Using the "Cogent" Matlab toolbox, programming of cognitive paradigms in theory and practice is discussed and practiced by means of a sample project.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Programming exercises, presentation and written summary	On-campus time, V	30
			Preparation and follow-up, V	70
			On-campus time, Ü	30
Exercise	2		Preparation and follow-up, Ü	80
			Examination preparation and examination	90

Module exam:	Oral exam (approx. 20 minutes)
Module language:	English
Mandatory regular participation:	Exercise: Yes, lecture: Participation recommended
Total workload:	300 hours 10 credits
Duration of module:	Two semesters
Frequency of offering:	Once per academic year
Applicability:	Master's degree program in Data Science

Module: Cognitive Neuroscience for Data Science A

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Experimental and Cognitive Neuropsychology Division

Admission requirements: None

Qualification objectives:

The students have advanced knowledge of neurocognitive psychology. They are familiar with key theoretical concepts, empirical findings, and practical possibilities for application of cognitive (and neurocognitive) methods in the areas of cognitive and affective neurosciences. Using this knowledge as a basis, they are able to develop specific questions (such as questions relating to research on reading and dyslexia) and link these questions with selected cognitive (and neurocognitive) methods (e.g. ratings, response time measurement, oculometry and pupillometry, EEG, fMRI, fNIRS, non-invasive neuromodulation methods/tDCS/rTMS) according to the principle that methods must fit the questions. The students master the evaluation and interpretation of empirical studies. They are able to present and discuss empirical research results scientifically on an individual basis and within a team.

Content:

Based on selected examples, students learn theoretical bases and important empirical findings from the cognitive and affective neurosciences and fundamental subjects associated with these fields (such as general and biological psychology). The students gain an overview of the cross-pollinating use of selected cognitive (and neurocognitive) methods in conjunction with process models (computational process models) and the practical possibilities for application thereof.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar I	2	Discussion and presentation of relevant literature, group work	On-campus time, S I	30
			Preparation and follow-up, S I	70
			On-campus time, S II	30
Seminar II	2		Preparation and follow-up, S II	80
			Examination preparation and examination	90

Module exam:	Paper (approx. 15 pages)
	or
	Presentation (approx. 20 minutes) with written summation (approx. 8 pages)
Module language:	English
Mandatory regular participation:	Yes
Total workload:	300 hours	10 credits
Duration of module:	Two semesters
Frequency of offering:	Once per academic year
Applicability:	Master's degree program in Data Science

Module: Cognitive Neuroscience for Data Science B

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Biological Psychology and Cognitive Neuroscience Division

Admission requirements: None

Qualification objectives:

The students have expanded their basic knowledge from the fields of general and neurocognitive psychology, especially in relation to processes of learning and memory. They have theoretical and methodological knowledge relating to the study of processes involved in learning and memory, especially with an eye to their role in decision making. This includes, in particular, computer simulation models and neurocognitive methods. They can also utilize these methods in various research contexts and can interpret results and present them in scientific discussions.

Content:

This module uses selected examples to provide more advanced coverage of the theoretical fundamentals and practical application possibilities associated with neurocognitive methods in the areas of perception, learning, memory, and decision making and of the use of neurocognitive methods for research questions in the area of memory research and decision making, with particular attention to aspects relating to gender and diversity.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar I	2	Discussion, group work, presentation	On-campus time, S I	30
			Preparation and follow-up, S I	70
			On-campus time, S II	30
Seminar II	2		Preparation and follow-up, S II	80
			Examination preparation and examination	90

Module exam:	Paper (approx. 15 pages) or Presentation (approx. 20 minutes) with written summation (approx. 8 pages)
Module language:	English
Mandatory regular participation:	Yes
Total workload:	300 hours — 10 credits
Duration of module:	Two semesters
Frequency of offering:	Once per academic year
Applicability:	Master's degree program in Data Science

Module: Differential Psychology Approaches in the Data Sciences
Higher education institution/department: Freie Universität Berlin/Education and Psychology/Psychology
Persons responsible for module: Head of the Methods and Evaluation/Quality Assurance Division Head of the Personality Psychology and Psychological Assessment Division
Admission requirements: None

Qualification objectives:

The students have a deeper understanding of differential psychology approaches in psychology in relation to characteristics that differ between people, and they are familiarized with theories, methods, and approaches for capturing these characteristics through data sciences and, on that basis, answering differential psychology questions, including the potential and risk associated with the use of these additional data sources.

Content:

One specific question in terms of content is covered in each of two parallel seminars. In contrast to data-driven approaches, this work focuses on a differential psychology theory or question that is initially developed in terms of content (e.g. on personality, capability, or response behavior). On that basis, students work out methods of working on the question (e.g. single value decomposition, modeling of log data) and apply them to concrete data sets.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar I	2	Work on assigned exercises	On-campus time, S I	30
			Preparation and follow-up, S I	85
			On-campus time, S II	30
Seminar II	2	Work on assigned exercises	Preparation and follow-up, S II	85
			Examination preparation and examination	70

Module exam:	Written summary (approx. 8 pages)	
Module language:	English	
Mandatory regular participation:	Yes	
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester	
Frequency of offering:	Once per academic year	
Applicability:	Master's degree program in Data Science	

Module: Natural Language Processing

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Experimental and Cognitive Neuropsychology Division

Admission requirements: None

Qualification objectives:

The students have a deeper understanding of language theory and of advanced concepts and methods in the area of quantitative narrative analysis (QNA) of texts. They are able to formulate standard QNA methods such as latent semantic analysis and sentiment analysis in conceptual terms, implement them in algorithmic form, and apply them in combination with methods drawn from the field of machine learning (e.g. support vector machines, neural networks, extreme random trees) on empirical data (e.g. ratings, fMRI data) in a predictive modeling approach.

Content:

Language theory and computational linguistics, digital humanities and literary reading, conceptual and mathematical-algorithmic fundamentals of QNA, predictive modeling as an alternative to the conventional approach of the generalized linear model/standard inference statistics, nonlinear dynamic system theory and machine learning, neural networks, latent semantic analysis, sentiment analysis, support vector machines, extreme random trees.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	30
			Preparation and follow-up, V	70
			On-campus time, Ü	30
Exercise	2	Work on assigned exercises	Preparation and follow-up, Ü	70
			Examination preparation and examination	100

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
Module language:	English
Mandatory regular participation:	Lecture: Participation recommended, exercise: Yes
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester
Frequency of offering:	Each summer semester
Applicability:	Master's degree program in Data Science

Module: Introduction to Psychoinformatics	
Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology	
Persons responsible for module: Head of the Division of Clinical Psychological Intervention	
Admission requirements: None	

Qualification objectives:

The students are familiar with the basics of psychoinformatics as an application field in data science. They are able to build a bridge between data science that is geared toward fundamentals and psychological application, in dialogue with experts in the field of clinical psychology.

Content:

This module imparts fundamental theoretical and practical content where psychology and information technology intersect. Selected topics in clinical psychology serve here as examples and points of entry into application fields in psychoinformatics that are visualized by guests from real-world practice at appropriate points. Practical exercises and trying out computer and smartphone-based options round out this seminar. Areas of focus in topical terms include e-mental health, online psychotherapy, self-help forums, the quantified self, smartphone sensors/wearables, and psychotherapy in virtual reality.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Advanced seminar	2	Group work	On-campus time	30
			Preparation and follow-up	60
			Examination preparation and examination	60
Module exam:		Oral presentation (approx. 45 minutes) with written summation (approx. 10 pages)		
Module language:		English		
Mandatory regular participation:		Yes		
Total working time requirement:		150 hours	5 credits	
Duration of module:		One semester		
Frequency of offering:		Each summer semester		
Applicability:		Master's degree program in Data Science		

Module: Mobile Mental Health	
Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology	
Persons responsible for module: Head of the Division of Clinical Psychological Intervention	
Admission requirements: None	

Qualification objectives:

The students are familiar with the basics of mobile mental health as an application field in data science. They are able to build a bridge between data science that is geared toward fundamentals and psychological application, in dialogue with experts in the field of clinical psychology.

Content:

This module offers a practical introduction to the diverse application scenarios involving smartphones and apps in the field of clinical psychology. The focus is on insight into processes of adaptation and prototyping of mobile health interventions on the basis of established treatment approaches in clinical psychology. In addition, students learn how to implement ecologically valid collection of data on mental health using apps and subsequently apply this. Current software solutions are used for this in each case, with students having the opportunity to gain experience working with them as part of smaller projects.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Advanced seminar	2	Group work	On-campus time	30
			Preparation and follow-up	60
			Examination preparation and examination	60

Module exam:	Oral presentation (approx. 45 minutes) with written summation (approx. 10 pages)	
Module language:	English	
Mandatory regular participation:	Yes	
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester	
Frequency of offering:	Each summer semester	
Applicability:	Master's degree program in Data Science	

Module: Development of Online Psychological Interventions	
Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology	
Persons responsible for module: Head of the Division of Clinical Psychological Intervention	
Admission requirements: None	

Qualification objectives:

The students are aware of the theoretical grounding, conceptualization, and implementation of online psychological interventions (e.g. therapy, self-help). They are aware of the importance of online interventions in research on clinical psychology and are familiar with the types of data that arise within the scope of online interventions. In particular, they are aware of the special ethical aspects that become relevant within the scope of a quantitative analysis of online intervention data.

Content:

Knowledge of online intervention is initially imparted on the basis of a case study (e.g. that of aggressive antisocial behavior during childhood and adolescence). After that, students choose a clinical psychological syndrome, develop modules for working on it within the scope of an online intervention, and finally develop and implement strategies for quantitative evaluation of intervention data.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar	2	Discussion and presentation, group work, oral presentation	On-campus time, S	30
			Preparation and follow-up, S	90
			On-campus time, S	30
Seminar	2		Preparation and follow-up, S	90
			Examination preparation and examination	60

Module exam:	Written presentation (6 to 8 pages)	
Module language:	English	
Mandatory regular participation:	Yes	
Total workload:	300 hours	10 credits
Duration of module:	One semester	
Frequency of offering:	Each summer semester	
Applicability:	Master's degree program in Data Science	

Module: Selected Topics in Data Science in the Social Sciences

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Computational Cognitive Neuroscience lab

Admission requirements: None

Qualification objectives:

The students know the fundamentals in a specific area or application field of data science in the social sciences. They are able to apply what they have learned proficiently.

Content:

Rotating content, e.g. advanced aspects of probabilistic modeling, analysis of functional brain imaging data, or variational inference.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar	2	Discussion and presentation	On-campus time	30
			Preparation and follow-up	60
			Examination preparation and examination	60

Module exam:	Written presentation (6 to 8 pages)
Module language:	English
Mandatory regular participation:	Participation recommended
Total working time requirement:	150 hours 5 credits
Duration of module:	One semester
Frequency of offering:	Irregular
Applicability:	Master's degree program in Data Science

Module: Special Aspects of Data Science in the Social Sciences

Higher education institution/department/teaching unit: Freie Universität Berlin/Education and Psychology/Psychology

Persons responsible for module: Head of the Methods and Evaluation/Quality Assurance Division

Admission requirements: None

Qualification objectives:

The students are familiar with key theories and analytical methods from a selected field of data sciences in the social sciences and are able to apply these to specific cases.

Content:

Rotating content, e.g. advanced aspects of causal inference, advanced psychometric modeling, handling missing values, analysis of log data

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Seminar	2	Discussion and presentation	On-campus time	30
			Preparation and follow-up	60
			Examination preparation and examination	60

Module exam:	Written presentation (6 to 8 pages)
Module language:	English
Mandatory regular participation:	Yes

Total working time requirement:	150 hours	5 credits

Duration of module:	One semester
Frequency of offering:	Irregular
Applicability:	Master's degree program in Data Science

Module: Data Science in the Life Sciences

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Mathematics

Persons responsible for module: Instructors for the module

Admission requirements: None

Qualification objectives:

Students have acquired a deeper understanding of advanced concepts and data analysis methods in the area of life sciences. Based on their knowledge, they are able to evaluate and plan studies in the life sciences and use standard methods to perform them.

Content:

Introduction to various types of data in the life sciences (e.g. omics technologies), especially in the acquisition and pre-processing of data; exploratory analysis techniques for data from the life sciences; concepts and tools for reproducible research; theory and practice for methods and models for analysis of data from the life sciences (statistical inference, regression models, methods of machine learning); introduction to methods of big data analysis.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Tuition in seminars	4	Specialized discussion, answering discussion questions, discussion of application problems	On-campus time, sU	60
			Preparation and follow-up, sU	140
			On-campus time, ProjS	60
Project seminar	4	Working on assignments, short presentations with discussion, discussion of literature and examples of application	Preparation and follow-up, ProjS	140
			Examination preparation and examination	50

Module exam:	Written summation (approx. 5,000 words) with presentation of the results (approx. 20 minutes)
	This module exam can also be taken as a group exam.
Module language:	English
Mandatory regular participation:	Yes
Total working time requirement:	450 hours	15 credits
Duration of module:	One semester
Frequency of offering:	Each summer semester
Applicability:	Master's degree program in Data Science

Module: Special Aspects of Data Science in the Life Sciences				
Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Mathematics				
Persons responsible for module: Module instructors				
Admission requirements: None				
Qualification objectives:				
Students can apply the main terminology and results of a selected field of data sciences in the life sciences.				
Content:				
This module provides insight into a selected field of data science in the life sciences, for example programming methods for large data volumes from the area of biomedicine. In addition, it also covers research questions and application areas.				

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	30
			Preparation and follow-up, V	30
			On-campus time, Ü	30
Exercise	2	Work on assigned exercises	Preparation and follow-up, Ü	30
			Examination preparation and examination	30

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam. or Oral exam (approx. 20 minutes)	
Module language:	English	
Mandatory regular participation:	Participation recommended	
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester	
Frequency of offering:	Irregular	
Applicability:	Master's degree program in Data Science	

Module: Selected Topics in Data Science in the Life Sciences

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Mathematics

Persons responsible for module: Module instructors

Admission requirements: None

Qualification objectives:

The students know the fundamentals in a specific area or application field of data science in the life sciences. They are able to apply what they have learned proficiently.

Content:

Rotating content, for example advanced aspects of analysis of multimodal, distributed data, modeling, simulation, optimization of cell systems or machine learning.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	4	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	60
			Preparation and follow-up, V	60
			On-campus time, Ü	30
Exercise	2	Work on assigned exercises	Preparation and follow-up, Ü	90
			Examination preparation and examination	60

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
	or
	Oral exam (approx. 20 minutes)
Module language:	English
Mandatory regular participation:	Participation recommended
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester
Frequency of offering:	Irregular
Applicability:	Master's degree program in Data Science

Module: Software Project in Data Science

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science

Persons responsible for module: Module instructors

Admission requirements: None

Qualification objectives:

Students master the development, through division of labor, of complex software systems for analysis of large, weakly structured data sets. They can independently divide a larger project into subprojects, define suitable interfaces, and draw up a schedule. They can organize themselves within a team and take on a leadership role. They also take gender and diversity aspects into account. From their own experience, they have an advanced understanding of quality, expense, acceptance, and success factors and also master communication techniques (oral, written) both internally, for successful planning and coordination of the above activities in a project team, and for negotiating with an external client (as a client project). In the process, they are able to apply methods of project management proficiently, especially in the area of design and realization of software systems (requirements determination, specification, designing architecture and modules, selecting technologies, implementation) and in the area of extracting information from large, weakly structured data sets.

Content:

The software project may have differing focuses. Working as a team, students produce a complex piece of software to solve an application- or data-oriented task from the field of data science, such as artificial intelligence (machine learning, computer vision, or pattern recognition), data management, Web technologies, or fields of application.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Project seminar	2	Ongoing reports regarding the state of the project, regular presentation of interim results	On-campus time Software development and data processing Preparation of presentations & documentation	30 240 30

Module exam:	Presentation (approx. 15 minutes) or poster presentation (approx. 15 minutes)
Module language:	English
Mandatory regular participation:	Yes
Total workload:	300 hours	10 credits
Duration of module:	One semester
Frequency of offering:	At least once per year, partly during the semester and partly during the period when courses are not in session as a block course
Applicability:	Master's degree program in Data Science

Module: Special Aspects of Data Science Technologies				
Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science				
Persons responsible for module: Module instructors				
Admission requirements: None				

Qualification objectives:

Students can apply the main terminology and results of a selected field in data analysis.

Content:

This module provides insight into a selected field of data science technologies, for example programming methods for large data volumes, semantic modeling, or presentation and visualization of knowledge. In addition, it also covers research questions and application areas.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	30
			Preparation and follow-up, V	30
Exercise	2	Regular written work on assigned exercise sheets, two oral presentations, each on the solution to a task in the exercise	On-campus time, Ü	30
			Preparation and follow-up, Ü	30
			Examination preparation and examination	30

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam. or Oral exam (approx. 20 minutes)
Module language:	English
Mandatory regular participation:	Participation recommended
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester
Frequency of offering:	Each summer semester
Applicability:	Master's degree program in Data Science

Module: Current Research Topics in Data Science Technologies

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science

Persons responsible for module: Module instructors

Admission requirements: None

Qualification objectives:

Students can apply the main terminology and techniques of a current research area within the field of data science technologies.

Content:

This module, which covers changing content, provides insight into one of the research topics covered in current projects at the Institute of Computer Science.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	2	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	30
			Preparation and follow-up, V	30
Exercise	2	Regular written work on assigned exercise sheets, two oral presentations, each on the solution to a task in the exercise	On-campus time, Ü	30
			Preparation and follow-up, Ü	30
			Examination preparation and examination	30

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
	or
	Oral exam (approx. 20 minutes)
Module language:	English
Mandatory regular participation:	Participation recommended
Total working time requirement:	150 hours	5 credits
Duration of module:	One semester
Frequency of offering:	Alternating, generally at least every second semester
Applicability:	Master's degree program in Data Science

Module: Selected Topics in Data Science Technologies

Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science

Persons responsible for module: Module instructors

Admission requirements: None

Qualification objectives:

The students know the fundamentals in a specific area or application field of data science technologies. They are able to apply what they have learned proficiently.

Content:

Rotating content, for example advanced aspects of distributed data storage, model-based analysis, and/or theoretical models of data representation, probabilistic data analysis or machine learning.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	4	Follow-up on VL content and independently developing supplementary literature	On-campus time, V	60
			Preparation and follow-up, V	60
Exercise	2	Regular written work on assigned exercise sheets, two oral presentations, each on the solution to a task in the exercise	On-campus time, Ü	30
			Preparation and follow-up, Ü	90
			Examination preparation and examination	60

Module exam:	Written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
	or
	Oral exam (approx. 20 minutes)

Module language:	English	
Mandatory regular participation:	Participation recommended	
Total working time requirement:	300 hours	10 credits
Duration of module:	One semester	
Frequency of offering:	Alternating, generally at least every second semester	
Applicability:	Master's degree program in Data Science	

Module: Data Science Database Systems	
Higher education institution/department/teaching unit: Freie Universität Berlin/Mathematics and Computer Science/Computer Science	
Persons responsible for module: Module instructor	
Admission requirements: None	

Qualification objectives:

At the end of this module, students are able to explain the structure of a database by way of example, explain the processing of commands using the database, create selected database models (such as ER models) from application descriptions, derive a relational model from a database schema, create a database based on a relational model, formalize a query in relational algebra, create queries regarding data analysis and execute these on a database, and create queries regarding a database and schema manipulation and execute these on the database. They can explain the motivation for normalizing data and can apply algorithms for normalizing data. They can explain typical alternative memory structures and compare them semantically. They can implement applications with access to a database. They can schematically illustrate and explain methods for accelerating database queries and implement these with suitable data structures. They can explain and apply the main methods of transaction management on databases and can apply the principles of simultaneous access to databases. They can explain and implement methods of data recovery. They can understand and apply fundamental methods of data mining. They can understand, explain, and apply trends in the area of database systems.

Content:

Database design with entity-relationship models and UML; theoretical basics of relational database systems, relational algebra; functional dependencies, normal forms, relational database development: data definition, foreign keys, other integrity conditions, object-relational mapping, security and protection concepts; transaction concept, transactional guarantees, synchronization of multi-user operation, fault tolerance features.

Forms of teaching and learning	On-campus studies (weekly credit hours = SWS)	Forms of active participation	Workload (hours)	
Lecture	3	Written work on assigned exercise sheets	On-campus time, V	45
			Preparation and follow-up, V	30
Exercise	1		On-campus time, Ü	15
			Preparation and follow-up, Ü	30
			Examination preparation and examination	30

Module exam:	Oral exam (approx. 15 minutes) or written exam (90 minutes), which may be administered in whole or in part as a multiple choice test or as an electronic exam.
Module language:	English
Mandatory regular participation:	Exercise: Yes, lecture: Participation recommended
Total workload:	150 hours	5 credits
Duration of module:	One semester
Frequency of offering:	Irregular
Applicability:	Master's degree program in Data Science

For the following three modules, please see the study and examination regulations for the master's degree in Bioinformatics of the Departments of Biology, Chemistry and Pharmacy, Mathematics and Computer Science of Freie Universität Berlin and Charité – Universitätsmedizin Berlin:

– Module: Machine Learning in Bioinformatics (5 credits),

– Module: Analysis of Large Data Sets in Bioinformatics (5 credits),

– Module: Network Analysis (10 credits).

For the following nine modules, please see the study and examination regulations for the master's degree program in Computer Science of the Department of Mathematics and Computer Science of Freie Universität Berlin:

– Module: Distributed Systems (5 credits),

– Module: Mobile Communication (5 credits),

– Module: Telematics (10 credits),

– Module: Higher Algorithmics (10 credits),

– Module: Computer Security (10 credits),

– Module: Pattern Recognition (5 credits),

– Module: Network-Based Information Systems (5 credits),

– Module: Artificial Intelligence (5 credits)

– Module: Special Aspects of Data Management (5 credits).

Annex 2: Sample study plans for the master's degree program in Data Science (all profile areas):

Semester	Modules			Credits
	Fundamental area	**Profile area**		
		Mandatory part	**Elective part**	
FS 1	Programming for Data Science, 5 credits Statistics for Data Science, 10 credits Machine Learning for Data Science, 10 credits Introduction to Profile Areas, 5 credits			30 credits
FS 2		Data Science in the Social Sciences, 15 credits or Data Science in the Life Sciences, 15 credits or Modules comprising 15 credits from the area of Data Science Technologies	Modules from the elective area from the chosen profile, 15 credits	30 credits
FS 3		Research Practice, 10 credits or Software Project in Data Science, 10 credits	Ethical Foundations of Data Science, 5 credits	Modules from the elective area from a different profile, 15 credits	30 credits
FS 4	Master's thesis with accompanying colloquium, 30 credits			30 credits

2.1 Sample study plan for the master's degree program in Data Science with the profile "Data Science in the Social Sciences"

Semester	Modules				Credits
	Fundamental area	**Profile area**			
		Mandatory part		**Elective part**	
FS 1	Programming for Data Science, 5 credits Statistics for Data Science, 10 credits Machine Learning for Data Science, 10 credits Introduction to Profile Areas, 5 credits				30 credits
FS 2		Data Sciences in the Social Sciences 15 credits			Modules from the elective area from the chosen profile, 20 credits	30 credits
FS 3		(of which, 10 credits in FS 2 and 5 credits in FS 3)	Research Practice, 10 credits	Ethical Foundations of Data Science, 5 credits	Modules from the elective area from a different profile, 10 credits	30 credits
FS 4	Master's thesis with accompanying colloquium, 30 credits				30 credits

2.2 Sample study plan for the master's degree program in Data Science with the profile "Data Science in the Life Sciences"

Semester	Modules				Credits
	Fundamental area	Profile area			
		Mandatory part		Elective part	
FS 1	Programming for Data Science, 5 credits Statistics for Data Science, 10 credits Machine Learning for Data Science, 10 credits Introduction to Profile Areas, 5 credits				30 credits
FS 2		Data Science in the Life Sciences, 15 credits			Modules from the elective area from the chosen profile, 20 credits	30 credits
FS 3		(of which, 10 credits in FS 2 and 5 credits in FS 3)	Research Practice, 10 credits	Ethical Foundations of Data Science, 5 credits	Modules from the elective area from a different profile, 10 credits	30 credits
FS 4	Master's thesis with accompanying colloquium, 30 credits				30 credits

2.3 Sample study plan for the master's degree program in Data Science with the profile "Data Science Technologies"

Semester	Modules				Credits
	Fundamental area	**Profile area**			
		Mandatory part		**Elective part**	
FS 1	Programming for Data Science, 5 credits Statistics for Data Science, 10 credits Machine Learning for Data Science, 10 credits Introduction to Profile Areas, 5 credits				30 credits
FS 2				Modules from the elective area from the chosen profile, 30 credits	30 credits
FS 3			Software Project in Data Science, 10 credits	Ethical Foundations of Data Science, 5 credits	Modules from the elective area from a different profile, 15 credits	30 credits
FS 4	Master's thesis with accompanying colloquium, 30 credits				30 credits

Annex 3: Report of Grades (sample)

Freie Universität Berlin
Departments of Mathematics and Computer Science and Education and Psychology

Report of Grades

Ms./Mr. [first name/last name],

born in [place of birth] on [Month DD, YYYY],

has successfully completed the joint master's degree program in

Data Science

on the basis of the examination regulations of April 18, 2019 (Freie Universität Official Announcements [15]/2019) with the overall grade of

[grade as number and text]

and earned the requisite 120 credits.

The student's performance on the exams was graded as follows:

Field(s) of study	Credits	Grade
Fundamental area	30 (25)	x.x
Profile area [XX]	60 (…)	x.x
Master's thesis	30	x.x

The topic of the master's thesis was: [XX]

Berlin, this [Month DD, YYYY]   (Seal)

The Dean   The Chair of the Examining Board

Grading scale: 1.0 – 1.5 very good; 1.6 – 2.5 good; 2.6 – 3.5 satisfactory; 3.6 – 4.0 sufficient; 4.1 – 5.0 insufficient:
Non-graded evaluations: BE – passed; NB – not passed
The credits awarded are in accordance with the European Credit Transfer and Accumulation System (ECTS).
Some coursework is not graded; the credits shown in parentheses reflect the scope of graded coursework that impacts the overall grade.

Annex 4: Diploma (sample)

Freie Universität Berlin
Departments of Mathematics and Computer Science and Education and Psychology

Certificate

Ms./Mr. [first name/last name], born in [place of

birth] on [Month DD, YYYY], has successfully

completed the master's degree program in **Data**

Science.

Pursuant to the examination regulations of April 18,

2019 (Freie Universität Official Announcements

[15]/2019), the university degree of **Master of Sci-**

ence (M. Sc.) is awarded.

Berlin, this [Month DD, YYYY]   (Seal)

The Dean   The Chair of the Examining Board

Bylaws on Admission to the Master's Degree Program in Data Science of the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin

Preamble

Based on Sec. 14 (1), first sentence, No. 2 of the Partial Basic Rules and Regulations (Teilgrundordnung) (test model) of Freie Universität Berlin dated October 27, 1998 (Freie Universität Official Announcements No. 24/1998) in conjunction with Sec. 10 of the Act on Admission to the Higher Education Institutions in the State of Berlin in Study Programs with Limited Admissions (Berlin Higher Education Admissions Act – BerlHZG) in the version thereof promulgated in the new version dated June 18, 2005 (Law and Regulatory Gazette p. 393), last amended on June 26, 2013 (Law and Regulatory Gazette p. 198), in conjunction with Sec. 10 (5), second sentence, of the Act on Higher Education in the State of Berlin (Berlin Higher Education Act – BerlHG) in the version thereof promulgated in the new version dated July 26, 2011 (Law and Regulatory Gazette p. 378), last amended on February 2, 2018 (Law and Regulatory Gazette p. 160), the Data Science Joint Commission appointed by the Department of Mathematics and Computer Science of Freie Universität Berlin and the Department of Education and Psychology of Freie Universität Berlin issued the following bylaws on April 18, 2019:*

Sec. 1
Scope

These bylaws govern admissions to the study program pursuant to Sec. 10 (5), second sentence, BerlHG and the selection procedure for the allocation of study placements pursuant to Sec. 10 (1), first sentence, No. 1 BerlHZG for the master's degree program in Data Science at the Department of Mathematics and Computer Science and the Department of Education and Psychology of Freie Universität Berlin (master's degree program). This program is a consecutive master's degree program in accordance with Sec. 23 (3), first sentence, No. 1 (a) BerlHG.

Sec. 2
Study placements and applying

(1) The number of study placements available for this master's degree program is determined for each admission date in the admission rules of Freie Universität Berlin.

(2) The application for admission must be submitted in electronic form, using the online application system, to the Executive Board of Freie Universität Berlin – Admissions Office.

* These bylaws were confirmed by the Executive Board of Freie Universität Berlin on May 16, 2019, and by the Berlin senate administration responsible for higher education institutions on June 21, 2019.

(3) The application deadline is May 31 of each year. The application deadline for the 2019/20 winter semester is August 15, 2019.

(4) Each application for admission to the study program must be accompanied by the applicant's first university degree qualifying him or her to practice a profession in accordance with Sec. 3 (1) hereof, in officially certified form.

(5) Applications for admission to the master's degree program can also be submitted if it is not yet possible to submit the university degree qualifying the applicant to practice a profession as mentioned in Sec. 3 (1) hereof because the grades for individual exams are not yet available and if, based on the student's past academic performance, and in particular on his or her exam grades to date, it is to be expected that the university degree qualifying the applicant to practice a profession as mentioned in Sec. 3 (1) hereof will be earned before the start of the master's degree program and the standards that constitute prerequisites for admission to the master's degree program pursuant to Sec. 3 (2) are also met in due time. This expectation is deemed to be met, in particular, if at least two-thirds of the overall workload has been graded and the applicant has registered for his or her final project and the start of work on the project has been scheduled in such a way that timely completion thereof before the start of the master's degree program is possible. The application is included in the selection process based on the average grade calculated on the basis of the applicant's exam grades to date as shown in the current transcript to be submitted by the applicant. The result of the university degree qualifying the applicant to practice a profession is thus disregarded in this respect in this case.

(6) Freie Universität Berlin is not obligated to investigate the facts of the matter ex officio.

Sec. 3
Admission requirements

(1) It is a prerequisite for admission to the master's degree program that the applicant must have a degree, either from Germany or an equivalent foreign degree, in a higher education program comprising at least six semesters that qualifies him or her to practice a profession, in the subject of mathematics, computer science, physics, bioinformatics, psychology, cognitive science, neuroscience, or sociology comprising at least 15 credits in modules related to mathematics – especially linear algebra, analysis, probability theory, and/or statistics – and at least five credits in modules related to computer science in which the applicant gained knowledge and skills in a higher programming language such as C/C++, Java, Python, Matlab or R.

(2) Any applicant who did not earn his or her university degree at an education institution where English is

the language of instruction is required to prove English language skills at level B2 of the Common European Framework of Reference for Languages (CEFR).

(3) The examining board decides whether the documentation submitted is equivalent.

With regard to the coursework related to computer science in the scope of not more than 5 credits, documentation of qualifications earned in industrial practice or through external programs (such as online certificates) can also be taken into account . Upon request, documentation will also be reviewed to determine whether it is equivalent even if no application process is currently pending.

Sec. 4
Selection quota; selection criteria; organizational matters

(1) Eighty percent of the study placements that have remained available after the pre-selection segments (quotas) are taken into account are awarded by way of the selection process set down in these bylaws (university's self-selection quota, or *Hochschulquote*). Twenty percent of study placements are awarded on the basis of Sec. 10 (1), first sentence, No. 2 BerlHZG. The quota for admissions pursuant to Sec. 10 (1), third sentence, BerlHZG is 5%.

(2) Selection takes place according to the following:

1. the degree of qualification measured according to the result of exams on the previous study program (Sec. 10 (2) No. 1 BerlHZG),

2. additional qualifications gained outside the higher education program (Sec. 10 (2) No. 5 BerlHZG).

(3) Selection points are awarded for the criteria pursuant to paragraph 2 Nos. 1 and 2 above as part of the selection process. The maximum point total that can be achieved is 100.

(4) Up to 60 selection points according to the Annex are awarded for the selection criterion pursuant to paragraph 2 No. 1, depending on the average grade achieved in the grade report for the previous degree.

(5) Up to 40 selection points are awarded for the selection criterion pursuant to paragraph 2 No. 2 as follows for proof of qualifications from outside the university setting that are relevant to the study program:

1. ten selection points on a one-time basis for proof of practical activity in the area of data science encompassing at least 150 hours (for example within the scope of a typical project in the area of data science).

2. ten selection points on a one-time basis for proof of qualifications earned through continuing education activities encompassing at least 40 hours (for example by earning certificates from an online learning platform).

3. up to 20 selection points for further qualifications that

provide insight into the applicant's particular qualifications for the master's degree program in Data Science.

These must be set out in an overview in table format and demonstrated through documentation.

(6) At least two selection officers are assigned to perform the selection process. These officers are designated by the joint commission, acting on behalf of the Executive Board. They must be authorized to administer examinations in the master's degree program and be full-time employees of Freie Universität Berlin. Substitution is not permitted.

Sec. 5
Admission decision

(1) The decision regarding selection is made by the Executive Board of Freie Universität Berlin – Admissions Office – on the basis of the results of the selection process.

(2) Selected applicants receive a notice of admission designating a time limit to accept the study placement in writing and enroll. If this time limit is missed, the study placement in question is awarded to a different applicant in accordance with the rankings that have been established.

(3) Applicants who have been selected on the basis of the transcript are admitted on a conditional basis and can enroll for the first subject-specific semester on a limited-term basis. These students are typically required to present the university degree qualifying the student to practice a profession as mentioned in Sec. 3 (1) hereof and demonstrate that the prerequisites associated with it are met at the end of the first semester in the subject. If the documentation is not provided in due time, the student's admission ceases to apply.

(4) Any applicant who is not admitted receives a notice of denial of his or her application with a statement of the reason(s).

(5) The documents submitted as part of the selection process must be stored until such time as the decision becomes final and binding and, in the event of a legal dispute, until a final and legally binding decision is rendered.

Sec. 6
Entry into force

These Bylaws enter into force on the day after publication hereof in the Official Announcements (Official Register of Freie Universität Berlin).

**Annex
(to Sec. 4 (4)):**

Allocation of selection points to the average grade shown in the certificate or transcript for the previous degree pursuant to Sec. 4 (4)

Average grade	Selection points
1.0	60
1.1	58
1.2	56
1.3	54
1.4	52
1.5	50
1.6	48
1.7	46
1.8	44
1.9	42
2.0	40
2.1	38
2.2	36
2.3	34
2.4	32
2.5	30
2.6	28
2.7	26
2.8	24
2.9	22
3.0	20
3.1	18
3.2	16
3.3	14
3.4	12
3.5	10
3.6	8
3.7	6
3.8	4
3.9	2
4.0	0